September 2001

final

City of Scottsdale Storm Water Management Plan

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ACRONYMS AND ABBREVIATIONS

ADEMA	Arizona Division of Emergency Management
ADEQ	Arizona Department of Environmental Quality (ADEQ),
ADOT	Arizona Department of Transportation
ALERT	[Maricopa County] Automated Local Evaluation in Real Time
ARS	Arizona Revised Statutes
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAP	Central Arizona Project canal
CC&Rs	Codes, Covenants, and Restrictions
CDS	Community Development System
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
COD	Chemical Oxygen Demand
CWA	Clean Water Act
EMC	Event mean concentration
EPCRA	Title III of the Superfund Amendments and Reauthorization Act (SARA)
ESA	Endangered Species Act
FCD	Maricopa County Flood Control District
FWS	Fish and Wildlife Service
IBW	Indian Bend Wash
IC/ID	Illicit connection/illegal dumping
LCS	Labaratory Control [blank] Spikes
LEPC	Local Emergency Planning Committee
MBAS	Methylene blue active substances
MEP	Maximum extent practicable
MG	Middle Gila
MPN	Most Probable No. [of bacteria]
MS	Matrix spikes
MS4	Municipal separate storm sewer system
MSGP	Multi-Sector General Permit
NCTCOG	North Central Texas Council of Governments

NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOI	Notice of intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation Recovery Act
RMFD	Rural Metro Fire Department
RPD	Relative percent difference
RQ	Reportable quantity
SIC	Standard Industrial Classification
SM	Standard Methods for Evaluation of Water and Wastewater
SOP	Standard Operating Procedures
SRL	Soil Remediation Level
SW	storm Water
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
US DOT	United States Department of Transportation
USEPA	U.S. Environmental Protection Agency
USGS	United StateS Geological Survey
UV	Ultra violet
WQA	1987 Water Quality Act

EXECUTIVE SUMMARY

This Storm Water Management Plan (Plan) provides a program that reduces pollution associated with storm water runoff and non-storm water discharges in the City of Scottsdale to the maximum extent practicable (MEP). The Plan describes how the City will comply with the provisions of its National Pollutant Discharge Elimination System Permit No. AZS000020 issued by the US EPA Region 9. The Plan provides a description of City programs as well as guidance to businesses and developers within the City to ensure compliance with the City municipal National Pollutant Discharge Elimination System (NPDES) permit. Management strategies include implementation of best management practices (BMPs) for municipal-owned facilities and for development within the urban fringe.

Program Management

The City is dedicated to maintaining a high standard of quality of life for its citizens; pollution control for surface waters is a key element in maintaining quality of life. The City encompasses two primary watersheds: an area north of the Central Arizona Project (CAP) and areas tributary to Indian Bend Wash (IBW) south of the CAP canal. The City will use a watershed approach to controlling surface water pollution through a set of integrated programs that address:

- Water quality controls for new development and significant redevelopment
- Water quality controls for existing urban areas
- Training and public education
- Surface water monitoring and reporting
- Oversight of industrial site permits and compliance
- Illicit connection and discharge identification and elimination

The City has established legal authority to enforce the provisions of its NPDES permit. The Floodplain and Stormwater Management Division has the lead role in the implementation of this Storm Water Management PLAN (SWMP), although other City departments such as Quality Compliance Division, Inspection Services, Environmental Planning and Design Office, Municipal Services Department and the Community Maintenance and Recreation Division will also play significant roles in program implementation and enforcement.

Requirements for Construction

The City will require a Storm Water Pollution Prevention Plan (SWPPP) for any construction project (municipal or private) that disturbs more than 1 acre of area. The project SWPPP will be reviewed by the City, and the field elements inspected by the City during construction. A Notice of Intent (NOI) must also be filed with the EPA Region 9.

The required SWPPP will include a description of the project and the construction schedule or sequence, an estimate of the total area to be disturbed and an identification of the sources of potential

pollutants and the mitigation measures to prevent pollutants from entering surface runoff. The SWPPP will also address endangered or threatened species that may be impacted by the project.

The City will review the SWPPP during the plan check process to ensure that it meets the general requirements detailed in the Clean Water Act and specific requirements from the City. During construction, the City will inspect the site in an oversight role to ensure that the SWPPP is on-site and is kept up to date, and will verify that control measures identified in the plan are being implemented during each phase of construction. The City has the authority to stop work on the project if construction site surface water controls are deemed inadequate.

Requirements for Urban Areas

Existing urban areas also contribute to surface water quality problems. The City has developed an integrated approach to the control of surface water quality that will be implemented by all City departments.

Street sweeping will be carried out on a regularly scheduled basis to remove gross pollutants (trash and debris) from the watershed. In addition, bike path cleaning, spill response, solid waste collection and storm drain system cleaning and maintenance programs will each contribute to preventing pollutants from reaching receiving waters. The program includes green waste collection, recycling, hazardous waste collection and pet waste disposal regulation and education.

The City will also review plans for new development and significant redevelopment. In general, the City requires that new development and significant redevelopment control post-development runoff to predevelopment levels. This program also includes extended detention for the volume of runoff generated by a storm event producing one-half in. of runoff for the purpose of water quality control.

Storm water runoff from new developments must also be managed to prohibit flow to the separate sanitary sewer system, which if unchecked could cause the sewer system to overflow. Newly constructed special facilities, such as fueling stations, will be isolated from the municipal storm drain system.

Training and Public Education

The City has a comprehensive training and public education program designed to avoid the pollution of surface water. Employees have been trained relative to the requirements of the Plan, and each City department has designated individuals for water quality program implementation.

The City public education program is based on public outreach through the internet, print and television media and through targeted programs such as drain inlet marking. Public education programs include Earth Day, Eco Gecko Environmental Year Calendar, Green Building Program, Green Gardening Program, a pesticide/herbicide control initiative, new homeowner information and telephone hotlines for information on illegal dumping or discharge, environmental concerns and recycling.

Storm Water Monitoring

A storm water monitoring and sampling program has been developed for the City. Sampling of storm water runoff is completed on an annual basis at five locations. The sampling sites have been selected to characterize the various City land uses. Sampling is completed for 17 chemicals, compounds and indicators. The results of the sampling program are reported annually to the US EPA. Unusual sampling results will be investigated by City staff. The results of the sampling program will also be used to refine and update the SWMP.

Industrial Discharge Requirements

Industrial discharges within the City are required to obtain coverage under the Multi-sector General Permit (MSGP) issued by the US EPA Region 9. Coverage under the MSGP requires that the industrial discharger develop a SWPPP and implement the program at the facility.

The City has developed a number of general guidelines and requirements for the minimization of storm water pollution from industrial facilities. The City will track all industrial facilities within the corporate limits, and will review the SWPPPs prepared by the discharger. In addition, the City will periodically inspect facilities to ensure that the elements of the SWPPP have been implemented and that each facility has a current NOI filed with the EPA.

Illicit Discharge Identification and Elimination Program

Illicit discharges are prohibited discharges that enter the municipal storm drain system. Such discharges can occur through illicit system connections or from illegal dumping. The City has developed a program to identify and eliminate illicit discharges and illegal connections.

Illicit connections and illegal dumping will be identified through the dry weather sampling program. Twenty percent of all major storm drain outfalls will be screened each year, with the entire municipal system screened every 5 years. Screening of the outfall includes an inspection for dry weather flow and if dry weather flow is found samples will be taken according to the field sampling protocols for laboratory analysis and enforcement follow up as appropriate.

The City also has a defined progressive spill response procedure. Both the Rural Metro Fire Department (RMFD) and the Floodplain and Stormwater Management Division are notified of spills so that appropriate clean up and documentation can be completed.

1.0 OVERVIEW OF THE STORM WATER MANAGEMENT PLAN

1.1 Introduction

This SWMP has been developed by the City of Scottsdale as a tool to be used for compliance with the municipal storm water National Pollutant Discharge Elimination System (NPDES) permit issued to the City by the U.S. Environmental Protection Agency (USEPA) Region 9. The objectives of this SWMP are to:

- Define storm water quality requirements for construction, new development and redevelopment.
- Define the responsibilities and duties of the City with respect to storm water runoff water quality.
- Define public participation, education and information programs.
- Define the water quality monitoring and sampling program.
- Define the City's oversight role with respect to industrial dischargers.
- Define the program for identification of illicit connections and illegal discharges.
- Serve as a reference for the City, engineers, and developers within the City.

This SWMP, when implemented, will reduce the discharge of pollutants from the City of Scottsdale municipal storm drain system to designated receiving waters to the MEP. The City is responsible for the implementation of this SWMP and will also serve an oversight role at construction sites and industrial sites within the City. Coverage under general permits from the USEPA is required for the sites and the terms of these permits must be complied with.

1.2 Permit, Laws, and Regulations

The City of Scottsdale has received coverage under NPDES permit No. AZS000020 for discharge of storm water from the City's municipal separate storm sewer system (MS4). This NPDES permit is required in accordance with the provisions of the 1987 Water Quality Act (WQA) for storm drain systems serving a population of 100,000 or more. The City of Scottsdale joins the Cities of Phoenix, Mesa, Tempe, Tucson and Pima County, Arizona, in obtaining an NPDES permit from the EPA for storm water discharge.

The WQA amended the Clean Water Act to include specific permitting provisions for storm water discharges. NPDES permits are required if storm water is to be discharged from (1) municipal systems serving a population of 100,000 or more; (2) construction sites of more than 5 acres (1 acre within the City); and (3) industrial sites with selected Standard Industrial Classifications (SIC) codes.

Application for coverage under the general construction permit is via the completion of a one-page form called a Notice of Intent (NOI), which is a promise that the applicant will comply with the

permit conditions. However, before the NOI is submitted (to the City and the EPA), a Storm Water Pollution Prevention Plan (SWPPP) must be prepared and submitted to the City. The Construction Permit contains the requirements which the EPA considers necessary to produce an acceptable SWPPP. Additional information relative to compliance with the construction general permit is provided in Section 3.

The MSGP is designed for those industrial activities that are of a non-construction nature. This is one large permit divided into numerous separate sectors. Each sector represents a different type of activity. A facility's sector within the MSGP is dependent upon its SIC code or narrative description. Application for a permit is by completion of a one-page form, the NOI (similar to the construction permit), in which the applicant promises to comply with the permit conditions. However, before the NOI is submitted a Storm Water Pollution Prevention Plan (SWPPP) must be prepared. The MSGP, within the sectors, contains the requirements which EPA considers necessary to produce an acceptable SWPPP. It is not necessary to submit the SWPPP to the EPA but it must be submitted to the City.

1.3 Facilities Covered

Figure 1-1 shows the City's municipal storm drain system. This SWMP covers discharges from the facilities shown on Figure 1-1, including all areas within the corporate boundary north and south of the Central Arizona Project (CAP) canal. Individuals, corporations, utilities, and other governmental agencies conduct activities within the City boundary. The City will regulate such activities through a permitting process to ensure that they are consistent with the requirements of the City NPDES permit.

1.4 Organization of SWMP

This SWMP is divided into eight sections with associated appendices, as applicable. The sections are briefly described below:

Section 1. Overview of Storm Water Management Plan – Background information on the requirements of the NPDES system, the facilities covered under the SWMP, and the organization of the SWMP

Section 2. Program Management – The goals of the City's storm water program, the responsibilities of the City, developers, corporations and individuals, and the legal authority and enforcement options available to the City

Section 3. Requirements for Construction – New Development and Significant Redevelopment. Describes the requirements for construction and post construction storm water quality controls, including the development of a SWPPP for new and redevelopment projects

Section 4. Requirements for Urban Areas –The programs to be carried out by the City including public education, maintenance of infrastructure and BMPs for flood control facilities

Section 5. Training and Public Education Programs – The training program for City staff to implement the SWMP as well as the public education program to be implemented by the City on an on-going basis.

Section 6. Monitoring, Program Evaluation and Reporting – The long-term sampling program implemented by the City and the parameters for annual reporting required by the EPA

Section 7. Industrial Discharge Requirements – The requirements of the MSGP and the oversight role of the City for SWPPP review and facility inspection of industrial facilities that are required by the EPA to be covered under an individual permit or by the MSGP

Section 8. Illicit Connection/Discharge Identification and Elimination – The City's program, including the maintenance, inspection of flood control infrastructure, and screening of selected outfalls focusing on illicit connection/illegal dumping (IC/ID)

Some sections may have one or more appendices in support of the material presented in the text. The appendices include most of the forms needed to comply with the construction general permit and the multi-sector general permit.

This SWMP is available electronically in portable document format (.pdf) on the City of Scottsdale website located at: http://www.ci.scottsdale.az.us. The file contains a 'hittable' table of contents and can be searched using key words. The SWMP will be updated periodically by the City in a continuing effort to maintain a state-of-the-art storm water quality management program.

Figure 1.1 City of Scottsdale Municipal Storm System

2.0 PROGRAM MANAGEMENT

2.1 Overview

The Storm Water Management Plan (SWMP) has been developed to assist the City in complying with the goals of the Clean Water Act. The program described in this SWMP will be implemented on an ongoing basis and will be updated and refined at a minimum every 5 years. This section describes the overall objectives of the City's storm water program, some of the local issues specific to the City's receiving waters, how the SWMP is implemented within the City by department, and an overview of the legal authority to implement and enforce the program.

The mission of the City is to promote a healthy and stable environment with good quality of life for its citizens. The City is responsible for the design, construction and maintenance of public infrastructure, as well as the oversight of design, construction and maintenance of private infrastructure. Implementation of the SWMP will assist in fulfilling the City's mission by ensuring good quality water resources.

2.2 Goals and Policy

The goals of the Scottsdale storm water management program are compliance with the Clean Water Act and the protection of water resources. The program described in the SWMP has been developed in support of these goals. The City's storm water program is based on a set of objectives and core principles designed to avoid contamination of storm water runoff or to remove pollutants from storm water runoff in the event of unavoidable contamination that may be detrimental to the quality of the receiving water. The objectives of the storm water program are to:

- Control pollutants that may adversely impact Indian Bend Wash and the Salt River.
- Implement Best Management Practices (BMPs) that provide water quality benefit and are cost effective.
- Implement a program that is compatible with environmental laws and regulations and with other programs within the City.

City policy will support these objectives through implementation of the six primary components of the storm water program:

1. Water quality controls for new development and significant redevelopment
2. Water quality controls for urban areas
3. Training and public education
4. Storm water runoff monitoring and reporting
5. Oversight of industrial site permits and compliance
6. Illicit connection/discharge identification and elimination

The City also recognizes the importance of the watershed approach to improving water quality. The City will work with the other NPDES permit holders in the Phoenix area to coordinate programs, such as public outreach and education, to attend meetings, to participate in special studies, and to report spills.

2.3 Discussion of Local Receiving Waters

Storm water runoff from the City of Scottsdale is collected in local municipal and private storm drain systems, which discharge principally to IBW, which ultimately discharges into the Salt River. Designated beneficial uses of IBW and other listed IBW elements are provided in Table 2.1.

Table 2.1 Designated Beneficial Uses of Receiving Waters in Scottsdale

Receiving Water	Designated Beneficial Uses
MG[1] Indian Bend Wash, Scottsdale	Aquatic and wildlife (warmwater)
	Partial body contact
	Fish consumption
MG[1] Indian Bend Wash Lakes, Municipal Park Lakes; Scottsdale	Aquatic and wildlife (warmwater)
	Partial body contact
	Fish consumption
MG[1] Indian School Park Lake, Municipal Park Lake; Indian School Road and Hayden Road, Scottsdale	Aquatic and wildlife (warmwater)
	Partial body contact
	Fish consumption

[1]MG is designation for "Middle Gila," the waterbody listed as primary in the Arizona Code for IBW.

The City encompasses 184 mi^2 and is divided into two distinct regions with respect to water quality and coverage under the NPDES permit. The area north of the Central Arizona Project (CAP) is not a part of the City NPDES permit. The northern area is not tributary to a designated receiving water but rather all runoff infiltrates in storage areas maintained by the Bureau of Reclamation adjacent to the CAP canal. Streams in this area are highly ephemeral with little runoff during most years. The area north of the CAP is currently urbanizing with associated implications for surface water quality. The SWMP was developed as a comprehensive management tool, and as such will be enforced throughout the City regardless of NPDES permit coverage limitations.

The portion of the City south of the CAP is largely tributary to IBW, a tributary of the Salt River. The City receives very little precipitation, averaging about 7 in./yr. Flow in most conveyances is ephemeral, although dry weather flow may be present in portions of IBW throughout the year from irrigation excess and urban activities.

2.4 Storm Water Management Responsibilities

The storm water program will be implemented by existing City departments with participation from the RMFD and the Maricopa County Flood Control District (FCD). The departments within the City that will implement the program are:

- Floodplain and Stormwater Management Division
- Quality Compliance Division
- Inspection Services
- Environmental Planning and Design Office
- Municipal Services Department
- Community Maintenance and Recreation Division

The Water and Wastewater Department, Legal Department, Communications and Public Affairs Division, and Financial Services Department will also contribute to implementation of the storm water program.

The Floodplain and Stormwater Management Division will assume the lead role in program implementation and coordinate the internal and external activities. The Floodplain and Stormwater Management Division will be responsible for the development of the annual report to Region 9, which includes a review of the program and a report of the storm water sampling data completed in the previous year.

The FCD will collect and analyze storm water samples from the City's five permanent sampling stations (see Section 6). The FCD will also provide services to collect and analyze dry weather flows resulting from illicit connection/illegal dumping inspections completed by the City (see Section 8).

2.5 Legal Authority and Enforcement

The City has established legal authority to enforce the provisions of its NPDES permit. Legal authority is provided in the Scottsdale Revised Code (Code) and through the Arizona Revised Statutes (ARS). Scottsdale Ordinance No. 3333 defines the City's authorities with respect to storm water pollution control. A copy of this Ordinance is included as Appendix 2-1. The Ordinance addresses the following items with respect to storm water quality:

- Maintenance requirements for storm water detention facilities
- Requirements for storm water quality protection including enforcement (violations and penalties) and abatement
- A description of activities considered a public nuisance, prohibited practices, permits, requirements for storm water quality management plans, and inspection

The City is also granted specific powers by the ARS for control of storm water quality:

- **ARS § 9-276(A)** - The City is authorized to regulate and prevent the throwing of offensive material in and prevent injury to any street, way, alley or public grounds; provide for the cleaning and purification of waters, watercourses and canals, and the draining or filling of ponds on private property when necessary to prevent or abate nuisances; regulate the

construction, repair and use of vaults, cisterns, areas, hydrants, pumps, sewers and gutters; and define nuisances, abate them, and impose fines upon persons creating or continuing nuisances.

- **ARS § 9-461.05(D)(1)** – The City is responsible for preparing a general plan to guide land use regulation within the City; this includes City zoning ordinances to control the uses of land which may contribute to the contamination of storm water runoff.

- **ARS § 11-952** – The City may enter into an intergovernmental agreement for services or joint/cooperative action. The City may consider an intergovernmental agreement for the management of storm water leaving state freeways that are within the jurisdiction of the Arizona Department of Transportation (ADOT). The City may also enter into an intergovernmental agreement with neighboring cities and/or Maricopa County to provide for an integrated storm water collection and regulation program.

- **ARS § 13-1602(A)(1)** – To prevent pollution of storm water, the City may invoke general state criminal laws that provide for the punishment of misdemeanors. These include criminal damage to property and criminal littering or polluting.

- **ARS § 13-1603(A)(1) and (2)** – Since the City owns a majority of the storm water collection system within Scottsdale, certain activities that pollute the storm water collection system may constitute criminal damage to City property. The City can prevent unlawful disposal of materials on public property, e.g., the storm water collection system, or the discharge of any sewage, oil products or other harmful substances into any waters of the State of Arizona (State) that lie within the jurisdiction of the City.

- **ARS § 49-107** – The City can receive a delegation of authority from the Arizona Department of Environmental Quality (ADEQ) for permitting, inspecting, monitoring, and enforcing some of ADEQ's programs.

- **ARS § 49-141(6)** – The pollution of domestic water is specifically defined as an environmental nuisance.

- **ARS § 49-143** – The City may issue abatement orders requiring owners or occupants of private property on which an environmental nuisance exists to remove the nuisance.

- **ARS § 49-144** – The City is authorized to enter premises for inspection or abatement of an environmental nuisance.

Legal authority to implement and enforce the City's NPDES permit is further discussed in the City's *Part 2 NPDES Municipal Separate Storm Sewer Permit Application,* submitted to the USEPA Region 9, dated October 26, 1998.

3.0 REQUIREMENTS FOR CONSTRUCTION

3.1 Overview

This portion of the SWMP describes measures to reduce the impact of construction activities on watercourses in the City of Scottsdale and the steps necessary to develop and implement a SWPPP for construction activities. A SWPPP is required by the City of Scottsdale for construction activities south of the CAP canal that disturb more than 1 acre or are part of a common plan of development that disturbs more than one acre. Construction activities in the City north of the CAP will also require a SWPPP at the discretion of the development servicecs staff. It is the responsibility of the applicant to determine the specific requirements for the project north of the CAP through consultation with City staff. Developing and implementing a SWPPP takes a significant amount of planning, and must be closely connected to the development of the overall site plan for construction. The USEPA does allow for an exemption for the preparation of SWPPPs for sites of less than 5 acres (which reduces to 1 acre in 2003) under certain rainfall conditions, however, the City does not recognize this exemption and requires a SWPPP for all sites that disturb more than one acre as indicated above. The SWPPP and Notice of Intent (NOI) must be submitted with the design review submittal.

Construction activities produce many different kinds of pollutants that may cause storm water contamination problems. Grading activities remove grass, rocks, pavement and other protective ground covers, exposing underlying soil to the elements. Because the soil surface is unprotected, dirt and sand particles are easily picked up by wind and/or washed away by rain through the process called erosion. The water carrying the particles eventually reaches a stream, river, or lake where it slows down, allowing the particles to fall onto the bottom of the streambed or lake. This process is called sedimentation. Gradually, layers of these clays and silt build up in the streambeds, choking the washes and stream channels. The particles also cloud waters causing aquatic respiration problems that can kill fish and plants growing in the river stream.

In addition, the construction of buildings and roads may require the use of toxic or hazardous materials such as petroleum products, pesticides, and herbicides, and building materials such as asphalt, sealants and concrete that may pollute storm water running off of the construction site. These types of pollutants often contain small amounts of metals and other toxic materials that may be harmful to humans, plants, and fish.

The best approach to storm water management for construction sites is the use of self-designed Storm Water Pollution Prevention Plans. These plans are based on the use of BMPs. For construction sites, there are three main types of BMPs, those that prevent erosion, others that prevent pollutants from construction materials from mixing with storm water, and those that trap pollutants before they can be discharged. Although these three types of BMPs have different functions, the basic principle is the same: these BMPs are designed to prevent, or at least control, the pollution of storm water before it has a chance to affect receiving streams. Using BMPs in this way is called storm water management or sediment and erosion control.

This portion of the SWMP contains the minimum requirements of the Storm Water Pollution Prevention Plan (SWPPP). These requirements are consistent with the EPA General Construction Permit published in the Federal Register February 17, 1998. Other sections describe the general philosophy for minimizing erosion and sediment transport on construction sites (Appendix 3-1), and

provide detailed guidance for the design and installation of the most common erosion and sediment controls (Appendices 3-2 and 3-3). A description of the common trouble points and minimum maintenance requirements is provided to guide inspectors. Several forms are included: Appendix 3-4 contains a form to aid in preparation and review of the SWPPP. This form must be filled out by the developer and submitted with the SWPPP. Appendix 3-5 includes a sample form that can be used in performing site inspections. Appendices 3-6 and 3-7 contain the Notice of Intent (NOI) and Notice of Termination (NOT) forms, while Appendix 3-8 contains information for evaluating the potential threat to endangered species.

The SWPPP is the key to controlling pollutants in storm water discharges. A permit consists of specific requirements for the plan, including deadlines for development and implementation, and for certain storm water control measures. This section provides a step-by-step explanation of how to develop and implement a Storm Water Pollution Prevention Plan for the City of Scottsdale.

The SWPPP focuses on two major requirements: (1) Providing a site description that identifies sources of pollution to storm water discharges associated with activity on site; and (2) Identifying and implementing appropriate measures to reduce pollutants in storm water discharges to ensure compliance with the terms and conditions of the general permit. All SWPPPs must be developed in accordance with sound engineering practices. The SWPPP must be signed by a professional engineer licensed in the State of Arizona certifying that the plan was developed in accordance with the requirements of the City of Scottsdale. The SWPPP must be prepared before submittal of a NOI and then updated as appropriate.

Inspection Services will check the SWPPP during the preconstruction conference, and will be responsible for verifying that the SWPPP adequately meets the City's requirements. The City may notify the permittee at any time that his plan does not meet one or more of the requirements. The notification will identify which requirements of the permit are not met and which elements of the SWPPP require modification. Within seven calendar days of receipt of notification, the required changes to the plan must be made and a certification submitted that the changes have, in fact, been made and implemented.

A notice regarding the permit and SWPPP must be conspicuously posted near the main entrance of the site. If this is not feasible, the notice can be posted in a local public building such as the town hall or public library. For linear projects, the notice must be posted at a publicly accessible location near the active part of the construction project *(e.g.,* where a pipeline project crosses a public road). The permit notice must include the following information:

- Project NPDES permit number
- Name and phone number of a local contact
- Brief project description
- Location of the SWPPP if it is not kept available on site

The permit does not require that the general public have access to the construction site nor does it require that copies of the plan be available or mailed to members of the public. However, permittees are strongly encouraged to provide public access to SWPPPs at reasonable hours. Upon request, the City intends to assist members of the public in obtaining access to permitting information, including SWPPPs. This approach will create a balance between the public's need for information on projects

potentially impacting their water bodies and the operator's need for safe and unimpeded working conditions.

Storm water pollution prevention plans must be revised whenever a change in design, construction method, operation, maintenance procedure, etc., may have a significant effect on the discharge of pollutants to surface waters or municipal separate storm sewer systems. The plan must also be amended if inspections indicate that the SWPPP is ineffective in eliminating or significantly reducing pollutants in the discharges from the construction site. In addition, the plan must be updated to identify any new operator who will implement a portion of the SWPPP.

The process of developing and implementing a SWPPP for construction activities has been divided into four elements. These elements are descriptions of:

- Site
- Controls that will be used on site
- Maintenance and inspection procedures
- Pollution prevention measures for any non-storm water discharges

3.2 Site Description Requirements

The SWPPP must be based on an accurate assessment of the potential of a site to generate and discharge pollutants. The permit requires the identification of potential sources of pollution that may reasonably be expected to impact the quality of the storm water discharges from that site. Each site must be described in the SWPPP, along with the anticipated construction activities to provide a better understanding of site runoff characteristics.

At a minimum, SWPPPs must contain the following:

- A description of the nature of the construction activity including the function of the project (e.g., low-density residential, shopping mall, highway, etc.)
- A description of the intended sequence of activities that disturb soil over major portions of the site (e.g., grubbing, excavation, grading)
- Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading or other activities, including off-site borrow/fill areas. It may be preferable to separately describe portions of the site, since they are disturbed at different stages of the construction process
- Estimates of the site's runoff coefficient (used for calculating the volume of runoff) for both pre-construction and post-construction conditions, as well as data describing the quality of any discharge from the site and the soil type

  The runoff coefficient is defined as the fraction of total precipitation that will appear at a conveyance as runoff (vs. infiltrated precipitation). Runoff coefficients can be estimated from site plan maps which show where impervious surfaces, vegetation and permeable surfaces are

located. These coefficients are used to help determine pollutant loadings, potential hydraulic impacts to receiving waters and flooding impacts. They are also used in the design of post-construction storm water management measures.

- A general location map (e.g., a portion of a city or county map)
- A site map indicating:

  (1) Anticipated drainage patterns and slopes after major grading activities

  (2) Areas of soil disturbance and areas that will not be disturbed

  (3) Locations of major structural and nonstructural controls identified in the SWPPP

  (4) Locations of planned stabilization measures

  (5) Locations of surface waters (including wetlands)

  (6) Locations of discharge points to surface waters

  (7) Off-site locations of equipment storage, material storage, waste storage and borrow/fill areas

  (8) All entrance/exit points

  Site maps should also include other major features and potential pollutant sources, such as locations of impervious structures and soil storage piles.

- A description of any discharge associated with industrial activity other than construction (including storm water discharges from dedicated asphalt plants, concrete plants, etc.) and the location of that activity on the construction site
- The name of receiving waters and the areal extent and description of wetlands or other special aquatic sites at or near the site that will be disturbed or which will receive discharges from disturbed areas of the project
- A copy of the permit requirements (attaching a copy of the EPA General Construction Permit is acceptable)
- Information on whether listed endangered or threatened species or critical habitat, are found in proximity to the construction activity and whether such species may be affected by the applicant's storm water discharges or storm water discharge-related activities. (See Appendix 3-8.)

The site map should be a drawing, to scale and topographic, of the construction site. The site map may be based on the project grading plan; alternatively, the site may be surveyed by a professional surveyor. The site map will be used in subsequent steps of the development of the pollution prevention plan. The scale of the map should allow easy identification of important features such as drainage swales and control measures that will be added later.

Soils information should be based on information from the specific site. Sources of soils information could include soil borings or other geotechnical investigations. Soil Conservation Service (SCS) soil surveys may also be used; surveys typically indicate whether a soil is erodible.

Runoff water quality data may sometimes be available from state or local government, e.g., the local MS4 authority. Runoff water quality information may be obtained from the U.S. Geological Survey (USGS), State, or local watershed protection agencies.

If the receiving water that will receive the runoff from the construction site is a tributary, include the name of the ultimate receiving body of water, if possible. If the site drains into a Municipal Separate Storm Sewer System, identify the system and indicate the receiving water into which the system discharges. This information is usually available from county, State, or USGS maps.

3.3 Description of Controls

Each SWPPP shall include a description of appropriate control measures (i.e., BMPs) that will be implemented as part of the construction activity, to control pollutants in storm water discharges. The SWPPP must clearly describe for each major activity that disturbs soil cover over a major portion of the site:

1. Appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented

2. The permittee responsible for implementation

3. For example, perimeter controls for one portion of the site will be installed by Contractor "A" after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site; then Contractor "B" will actively maintain perimeter controls until final stabilization of those portions of the site up-gradient of the perimeter control. Temporary perimeter controls will be removed by the owner after final stabilization).

The description and implementation of control measures shall address erosion and sediment controls, permanent storm water management, and other controls. Plan requirements are described below, while detailed descriptions of common erosion and sediment control measures are contained in Sections 4 and 5.

3.3.1 *Erosion and Sediment Controls*

3.3.1.1 Short- and Long-Term Goals and Criteria

The construction-phase erosion and sediment controls should be designed to retain sediment on site to the maximum extent practicable. All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections or other information indicate that a control has been used inappropriately or incorrectly, the permittee must replace or modify the control for site situations. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite (e.g., fugitive sediment in street could be washed into storm sewers by the next rain

and/or pose a safety hazard to users of public streets). Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50 percent. Litter, construction debris, and construction chemicals exposed to storm water shall be prevented from becoming a pollutant source for storm water discharges (e.g., screening outfalls, picked up daily). Offsite material storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the permitted project are considered a part of the project and shall be addressed in the SWPPP.

3.3.1.2 Stabilization Practices

The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, preservation of undisturbed desert space, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be avoided.

Mature trees have extensive canopy and root systems, which help to hold soil in place. Shade trees also keep soil from drying rapidly and becoming susceptible to erosion. Measures taken to protect trees can vary significantly, from simple ones such as installing tree armoring and fencing around the drip line, to more complex measures such as building retaining walls and tree wells.

The following records shall be maintained and attached to the SWPPP: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

It is imperative that stabilization be employed as soon as possible in critical areas. The Construction General Permit (CGP) requires that, except in three situations, stabilization measures must be instituted on disturbed areas as soon as practicable, but no more than 14 days after construction activity has temporarily or permanently ceased on any portion of the site. The three exceptions to this requirement are the following:

- When construction activities will resume on a portion of the site within 21 days of suspension of previous construction activities;

- In arid areas (areas with an average annual rainfall of 0 to 10 in.), semi-arid areas (10 to 20 in.) and areas experiencing droughts; where the initiation of stabilization measures is precluded by seasonal arid conditions, in which case, stabilization measures must be initiated as soon as precipitation occurs.

3.3.1.3 Structural Practices

The SWPPP must include a description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. When a new development is proposed, the Community Development Division will review the drainage plans and determine the required drainage stipulations for the project. The Development Quality and Compliance Division will then review the final plans to ensure that the stipululation have been incorporated. Structural stipulations may include but are not limited to: silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems,

gabions, and temporary or permanent sediment basins. The permittee should avoid placing structural practices in floodplains if possible, since installation of these devices may be subject to section 404 of the Clean Water Act (CWA).

For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2-yr, 24-hr storm from each disturbed acre drained, or equivalent control measures, shall be provided where feasible until final stabilization of the site. Rainfall/runoff calculations should be done as specified in the City of Scottsdale *Design Standards and Policies Manual* (1996). Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 ft^3 of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Detention basins are required to have a detention time of at least 24 hours for storms producing 0.5 inch of runoff for enhanced storm water quality, but not more than 36 hours for health and safety reasons.

In computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether it is feasible to install a sediment basin, the permittee may consider factors such as site soils, slope, available area on site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin; alternative sediment controls shall be used where site limitations would preclude a safe design.

For drainage locations that serve 10 or more disturbed acres at one time and where a temporary sediment basin or equivalent control is not practical, smaller sediment basins and/or sediment traps should be used. Where neither the sediment basin nor equivalent controls are practical due to site limitations, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down-slope boundaries of the construction area and for side-slope boundaries that are considered appropriate based on individual site conditions. The use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal is encouraged.

For drainage locations serving less than 10 acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down-slope boundaries (and for those side-slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2-yr, 24-hr storm or 3,600 ft^3 of storage per acre drained is provided.

3.3.2 *Storm Water Management*

3.3.2.1 Structural Measures

The SWPPP must include a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may also require a separate permit under section 404 of the CWA. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with construction activity have been eliminated from the site. However,

continued post-construction storm water BMPs that discharge pollutants from point sources once construction is completed may, in themselves, require authorization under a separate NPDES permit.

Such practices may include but are not limited to:

- Storm water detention structures; storm water retention structures;
- Flow attenuation by use of open vegetated or non-vegetated swales and natural depressions
- Sequential systems (which combine several practices)

The SWPPP shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels. This explanation should address which factors were evaluated including the pollutant removal efficiencies of the measures, costs of the measures, site-specific factors that will affect the utility of the measures, whether the measure is economically achievable at a particular site and any other relevant factors.

Developers must make provisions to manage runoff from the 100-yr 2-hr storm event, and post development runoff must be less than predevelopment runoff. To provide mitigation for storm water quality, detention facilities built to meet flood control requirements must be designed to provide a drain time of at least 24 hrs for a storm producing one-half inch of runoff.

Contractors must also follow the measures in the *Design Standards and Policies Manual*, which identifies other measures that must be in place to prevent storm water pollution. This manual is available for the cost of reproduction at the City's "One Stop," a centralized information and administration location operated by City employees for public contractors and designers. Section 2 (Drainage) of the *Design Standards and Policies Manual* identifies specific requirements for development designs. In summary, the manual is divided into the following discussions:

- Drainage Characteristics – Drainage Easements
- Drainage Policy – Downtown Scottsdale
- Alluvial Fan Development Policy – Specific to hazards associated with peak discharges and volumes of water; debris and sediment, potential erosion and scour; and relocation of the flow paths characteristics of alluvial fan flooding.
- Drainage Design Policy Guidelines
- Storm Water Storage Facilities
- Hydrology and Drainage Report Preparation – Modeling guidelines and statistical information on the City
- Hydraulics requirements for street drainage, storm drains, culverts, bridges, open channels and storage basins

A hydrology and drainage report must be submitted by each developer, addressing the concerns of adjacent jurisdictions including the City of Phoenix, the FCD, and the ADOT. Evaluation and discussion of six elements must be included in the report:

1. Description of the property and on-site and off-site watersheds

2. Estimation of storm water runoff
3. Evaluation of the effects of the project
4. Presentation of the basis for design of facilities to manage runoff
5. Presentation of the Basis for Selecting Elevations for the Lowest Floor
6. Description of the Provisions for Project Phasing (e.g., grading and erosion control plans)

Submittal of a Hydrology and Drainage Report is required for new residential, commercial and industrial developments. These plans must be developed to comply with the NPDES storm water regulations.

3.3.2.2 Non-Structural Measures

- ***Require street sweeping.*** If street sweeping is not covered by City activities, then Home Owners Associations, Codes, Covenants and Restrictions (CC&Rs) or Industrial Park Management should require regular street sweeping activities. If possible, provide litter/debris control and vacuum-sweep all parking lots with 100 or more spaces monthly.
- ***Maintain storm water system.*** If not covered by City activities, Home Owners Association, CC&Rs or Industrial Park Management, should require regular catch basin cleaning and maintenance, and stenciling of storm drains, etc.
- ***Specify car washing requirements.*** If feasible, prohibit car washing or construct a common car wash facility. Post a sign explaining proper use of the car wash facility and forbidding oil changing in the wash area and discharge of materials other than vehicle wash waters. Wash waters must be discharged to the sanitary sewer system.
- ***Specify waste management practices.*** Use covered bins or cover waste storage/recycling areas.
- ***Minimize discharge of floatables (trash and debris) from new and redeveloped commercial developments.*** Use screened, slotted or grated inlets for on-site drainage systems to minimize floatables (trash) discharges from a new commercial development.
- ***Create low-impact developments.*** Fit development to the existing terrain, helping to preserve tree canopy and other vegetative cover and thereby help offset the increase in storm water runoff from the development due to the addition of impervious surfaces.
- ***Use pervious surfaces effectively.*** A grass or landscaped strip between developed site and storm sewer system, especially creeks and drainage ways, can reduce TSS loads and additional absorption of runoff can occur.
- ***Use low-maintenance plants to limit the increase in pollutants (pesticide and fertilizer) discharged from new developments.*** Providing low maintenance vegetation that can also tolerate local conditions will reduce the amount of fertilizers and pesticides in storm water. Selection of low-maintenance plants will continue to provide water quality benefits as the development matures.

- ***Retain open space/park land.*** Development that contains open space or parkland provides additional pervious area in the local jurisdiction.

- ***Discharge roof drains to pervious surfaces.*** Builders or new homeowners often install roof drains to divert runoff away from entries and other areas. If downspouts are directed at pervious areas (yards) instead of impervious areas (driveway, etc.) additional absorption of runoff can occur.

- ***Provide public information.*** The builder of all new developments of 10 units or more shall be responsible for distributing literature supplied by the City in a 'move in' packet regarding homeowner responsibilities for storm water runoff pollution. The information will contain ways that homeowners can reduce potential contamination of storm water runoff.

3.3.3 *Other Controls*

No solid materials, including building materials, shall be discharged to waters of the United States, except as authorized by a permit issued under Section 404 of the CWA. Off-site vehicle tracking of sediments and the generation of dust shall be minimized. The SWPPP shall be consistent with applicable State, Tribal and/or local waste disposal, sanitary sewer or septic system regulations to the extent these are located within the permitted area.

The SWPPP shall include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP shall also include a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response. The SWPPP shall include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

The SWPPP shall include a description of measures necessary to protect listed endangered or threatened species, or critical habitat. Failure to describe and implement such measures will result in storm water discharges from construction activities that are ineligible for coverage under the general permit.

3.4 Maintenance and Inspections

All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections identify BMPs that are not operating effectively, maintenance shall be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

Qualified personnel (provided by the owner or his designee) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site, at least once every month and within 24 hr of the end of a storm event of 0.5 in. or greater.

Disturbed areas and areas used to store materials that are exposed to precipitation shall be inspected for evidence of or potential for pollutants entering the drainage system. Qualified personnel will inspect sediment and erosion control measures identified in the SWPPP to ensure that they are operating correctly. Accessible discharge locations or points must be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations should be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

Based on the results of the inspection, the SWPPP shall be modified as necessary (e.g., show additional controls on the map; revise description of controls) to include additional or modified BMPs designed to correct the problems identified. Revisions to the SWPPP shall be completed within 7 calendar days following the inspection. Any modification necessary to existing BMPs must be completed before the next anticipated storm event. If this is impracticable, BMPs will be modified as soon as possible. A report summarizing the scope of the inspection shall be made and retained as part of the SWPPP for at least 3 yr from the date that the site is finally stabilized. The report will include but not be limited to: name(s) and qualifications of inspecting personnel making the inspection; inspection date(s); and major observations relating to the implementation of the SWPPP including location(s) of discharges of sediment or other pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved to be inadequate for a particular location; and location(s) where additional BMPs are needed and should be constructed based on observations during inspection. See Appendix 3-5 for a sample inspection form.

Actions taken relative to water quality during construction shall be made a part of the storm water pollution prevention plan and retained for at least 3 yr from the date that the site is finally stabilized. Included will be identification of any incidents of non-compliance, or, in the absence of noncompliance reports, certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed.

3.5 Non-Storm Water Discharges

Sources of non-storm water that are combined with storm water discharges associated with construction activity must be identified in the SWPPP except for flows from fire-fighting activities. The SWPPP shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge. Specific measures that the City expects to be included in a SWPPP include:

- Designate waste container storage areas on-site and provide secondary containment and coverage for on-site hazardous waste containers.
- If construction includes use of hazardous or other liquid, store spill cleanup materials on site.
- Minimize entry of paving materials (e.g., concrete washout, asphalt, sand, gravel, coating and sealing products) into the storm drain system.
- For water-based paints, clean equipment in a sink connected to the sanitary sewer or collect wastewater and hold in a container (e.g., 55 gallon drum) for proper rinsate disposal. For other paints, clean equipment in a designated containment area and ensure proper disposal of all wastes.

- Dispose of vegetative debris as solid waste on a regular basis.
- Do not discharge concrete rinse waters (either from concrete truck washout or aggregate rinsing) to storm drain system, unless all concrete sediments have been removed, and will not be released to the system. Discharge concrete rinse waters from concrete truck washout into a pond, trench, or containment area. Aggregate rinse water shall be discharged onto dirt areas and spaded in.
- Do not hose out waste containers on-site. Waste containers should be washed out at owner's facility, and runoff discharged to sanitary sewer. Approval is required by publicly owned treatment works (POTW).
- If there is a spill, protect drain inlets and promptly clean up and properly dispose of spilled materials.
- Use designated areas away from storm drain inlets for on-site fueling and maintenance.
- Inspect and maintain vehicles regularly to minimize leaks and drips; place drip pans or absorbent materials under leak-prone machinery when idle.
- Avoid spillage of cleaning materials when cleaning paving equipment on-site; use secondary containment to catch drips, leaks, or spills.
- Do not wash vehicles or conduct steam cleaning on-site, or, if steam cleaning must occur, collect all steam cleaning wastewater and discharge to sanitary sewer.
- When cleaning streets in construction areas, remove as much of the material generated as possible through sweeping or other mechanical or manual methods; minimize the likelihood of mud being tracked. Direct wash water away from the storm drain system. Incidental water discharges from mechanical street sweeping operations are acceptable.
- Avoid paving during rain.
- Prevent discharge of paints, wash liquids, or solvents and other liquids to storm drain system.
- Only use licensed pesticide applicators for pesticide application. Carefully follow recommended usage instructions.
- Provide storm water related training/information for construction site managers.

4.0 REQUIREMENTS FOR URBAN AREAS

Typical urban pollutants introduced to water bodies by storm water may include heavy metals, nutrients, used oil and grease, sediment, bacteria, litter, and organic debris. BMPs designed to control these pollutants focus on the operation and maintenance of public streets, the maintenance of the storm water conveyance system, proper collection and disposal of wastes, and pesticide application regulations.

The specific measures to be implemented to improve runoff from urban areas are discussed below. They are arranged according to the City office responsible for their implementation. These offices include the Communications and Public Affairs Division, the Environmental Planning and Design Office, Field Services, Quality Compliance Division, Inspection Services, Solid Waste Management, and Community Maintenance and Recreation Division.

4.1 Cleaning and Maintenance Activities

4.1.1 Street Sweeping

Street sweeping removes debris, litter, and sediment from thoroughfares before it enters the storm drain system. Studies on street sweeping indicate effective removal of small sediments that may contain higher concentrations of heavy metals.

The City of Scottsdale will sweep all curbed streets regularly: main arterials once a week, business districts twice a week, and residential areas every three weeks. Congested areas and the downtown district will be swept twice a week at night. Daily logs will be kept to document the man-hours spent sweeping, areas swept and curb miles swept. This information will be reported annually to Region 9. The Field Services Division will be responsible for implementing the street sweeping program.

4.1.2 Bike Path Cleaning

Cleaning bike paths removes debris, litter, and sediment from thoroughfares before it enters the storm drain system. The City will sweep the multi-use bike path system a minimum of once a month. A Maintenance Log Sheet will be kept to document man-hours spent sweeping and curb miles swept. The Field Services Division will be responsible for implementing the bike path cleaning program.

4.1.3 Spill/Accident Response

The Spill/Accident Response team collects non-hazardous spills so that they are not released to surface waters. The Field Services Department will clean streets after floods, truck spills, and vehicle accidents. The illicit connection/illegal dumping program, which includes a discussion of spill response, is described in Section 8.

4.1.4 Storm Drain Conveyance System Cleaning and Maintenance

The storm drain system must be maintained and cleaned in order for it to operate properly. Materials removed from inlets and catch basins are effectively kept out of surface waters. Catch basins, storage structures, and culverts will be cleaned on an as-needed basis, when the debris in the basin compromises the basin's function. In general, cleaning will be conducted when the component is half-full. Although Scottsdale employees perform general maintenance, Scottsdale currently contracts with Hoffman Southwest, a vactor service, to clean the catch basins. The Field Services Department will be responsible for notifying the contractor when a storm drain system component needs cleaning or maintenance.

The Field Services Department began tracking and documenting storm drain system component cleaning in the Summer of 1998. Current information on storm drain system components will be gathered by field personnel and will be entered into the storm drain Management System. Each component will be evaluated annually by quarter section. The City's storm drain system maintenance program is discussed in more detail in Section 8.

4.2 Solid Waste Management

4.2.1 General Waste Collection

Proper collection and disposal of general wastes and debris helps prevent these materials from being disposed into the storm drain and surface waters. Scottsdale provides weekly general waste collection for all residents, or approximately 59,000 single-family households. The collection of commercial or business waste will be shared between Scottsdale and private hauling companies. The distribution of waste receptacles and collection of waste from public lands (e.g., parks and downtown Scottsdale) will also be conducted by Solid Waste Management.

4.2.2 Collection of Green Wastes and Bulk Items from Residential Properties

Collection of green wastes and bulk items (e.g., furniture and appliances) reduces the potential for wastes to impede or contribute pollutants to the storm water conveyance system. Uncontained green wastes and bulk items will be collected monthly in rear-loading packer trucks and will be hauled to the Salt River Landfill.

4.2.3 Recycling

Scottsdale runs a glass, paper, plastic, and aluminum recycling program for residential households. Recyclable materials are combined in specially marked bins and are picked up by the City weekly. Approximately 98.6 percent of the residential households participate in the recycling program. Recyclable materials are either hauled to the Transfer Station or directly to the recycler, which is located in the City of Phoenix. Approximately 20,000 tons of recycled material are collected and delivered to the recycler annually.

4.2.4 *Hazardous Waste Collection*

Hazardous waste collection reduces the potential for problem pollutants to enter storm drains through illicit discharge. Hazardous wastes are collected each year at an annual "Household Hazardous Waste Drop-Off Collection Event" held for Scottsdale residents. Residents bring materials to the Corporation Yard where they are collected by trained employees of the Solid Waste Management Division, Rural Metro employees, and Laidlaw Environmental Services employees. Materials collected are documented using an EPA Uniform Hazardous Waste Manifest form and are assigned a Resource Conservation Recovery Act (RCRA) EPA identification number.

4.2.5 *Pet Waste Disposal Regulation and Education*

Pet waste concerns will be included in the education/inspection/enforcement programs of the Solid Waste Management and Code Enforcement groups. In all parks located through the City, bags and trash receptacles will be provided so that animal wastes can be immediately and consistently cleaned up. Only police officers and the Maricopa County Animal Control are authorized to cite a person disobeying these rules. However, city staff who might observe an owner neglecting to pick up after their pet can inform them that they are in violation of Scottsdale's City Code, and advise them to clean up after their pet.

4.3 Plan Review for New Development and Significant Redevelopment

The Development Quality and Compliance Division employs technical staff members to review plans and to confirm submittal of NOI for construction sites disturbing more than one acre. Plans are reviewed against City, State and Federal requirements for circulation, drainage, sewage, water, landscaping, and zoning. Information/educational materials on storm water drainage are provided in the Design Standards and Policies Manual. The following areas will be reviewed by City staff to ensure that new developments mitigate the impacts of storm water runoff on the environment:

- Specialized storm water runoff drainage designs required for downtown Scottsdale, development on alluvial fans and in areas designated as special flood concern areas.

- Provisions by developers to manage runoff from the 100-yr 2-hr storm event (post development runoff must be less than predevelopment runoff). Criteria has been added requiring extended detention of the average annual storm to provide mitigation for storm water quality.

- Hydraulic criteria that must be incorporated into the drainage plans to avoid poor design and resultant inadequate capacity, overflow and scour of adjacent areas.

- Methods for containment and management of storm water to prevent discharge into the sanitary sewer or onto a city street, street gutter or alley. Storm water from these areas must be contained and managed on site and subsequently discharged to a storm drain system if available.

- Subdivision-wide drainage plans, for which the respective Homeowners Associations are responsible.

- Separation (at least 6 ft) between sanitary and storm sewer lines. No major landscaping features should be within 6 ft of water or sewer lines.

The City also provides a guidance document on the preparation of Hydrology and Drainage reports, including methods for estimating peak discharges and calculating runoff volumes. This report is available for use by developers. Finally, a development plan tracking system, Community Development System (CDS), will be maintained to track new development.

5.0 TRAINING AND PUBLIC EDUCATION PROGRAM

5.1 Overview

This section of the management plan describes the City's ongoing and new initiatives to educate the public and City employees regarding storm water quality issues. The training and education will address potential problems caused by contaminated storm water and available corrective measures.

Approach Scottsdale currently implements extensive public education efforts in areas related to storm water. The intent of the public education program in this management plan is to focus on these existing outreach programs and modify them as necessary to include a storm water protection message.

The management plan includes new requirements for both private and municipal construction and redevelopment. The training component discussed in this section is intended to inform City staff of storm water quality issues and educate them regarding their responsibilities regarding the new initiatives included in Sections 3 and 4 of this management plan.

Education and Training Goals The program provides information on the following adverse impacts of storm water runoff:

- *Aesthetic values* – Trash and debris carried from urban streets and yards can make waterways unsightly and unappealing.
- *Chemical and biological pollutants* – Oil, pesticides, and other chemicals can be toxic to waterway biota and can cause groundwater contamination.
- *Sediment* – Runoff from construction sites and other exposed areas can carry sediment which damage waterway biota and compromise the operation of drainage and flood protection facilities.
- *Waterway erosion and scouring* – Increased runoff volume due to the construction of impervious surfaces (roadways, roofs, driveways, etc.) can scour waterways, destroy habitat and greatly increase sediment load.

The goal of the education and training efforts is to educate the public and City staff regarding these problems and the specific measures that they can implement to minimize the problems.

5.2 Employee Training Program

The goal of the employee training program is to educate employees regarding their implementation responsibilities for the Storm Water Management Plan. An additional goal is to provide information on storm water quality problems, causes, and possible solutions so that the employees can take the initiative in reducing storm water pollution. After the training, City staff should have enough basic

information on storm water quality to review their own operations for opportunities to reduce storm water runoff pollution.

The specific roles and responsibilities addressed by the training are outlined in SWMP Sections 2 and 3, and outreach activities are described in Section 5.2.

5.2.1 Staff Training Relative to SWMP

Training for City staff is intended for managers and staff with key roles in implementation of the SWMP. The training addresses the following:

1. Review of storm water quality problems, causes, and controls
2. Regulatory background: Clean Water Act, regulations, permit, guidance, future developments (e.g., BMP guidance)
3. Overview of SWMP components and implementation responsibilities
4. Public education and other outreach activities
5. Interdepartmental coordination needs

5.2.2 Planning and Construction Program Requirements

This training is directed at staff responsible for implementing the requirements specified in SWMP Section 3, i.e., requirements imposed on developers and on other construction projects and the enforcement and guidance responsibilities of City staff: Topics will include:

1. Review of storm water quality problems, causes, and controls (construction focus)
2. Overview of SWMP, regulatory background, and assigned staff responsibilities
3. Site description requirements
4. Pollution prevention plans and description of controls
5. Maintenance and inspections
6. Management of non-storm water discharges

The training pertains primarily to Planning Systems, which consists of the following departments:

- *Community Development* – Manages master planning for large (300+) master planned developments, coordinates with Drainage Master Planning and Water Resource Master Planning; and writes project-specific specifications.

- *Development Quality and Compliance* – Reviews and approves construction documents that are prepared according to the case stipulations

- *Quality Compliance Division* – Provides guidance on City ordinances, application/permit processes, and fee requirements for developing land in Scottsdale; maintains current construction, parcel, permit and utility location records; and enforces the zoning ordinance

- *Inspection Services* – Ensures that all construction meets codes and standards, and provides survey information and an accurate record of construction.

5.2.3 Municipal Facility Program Requirements

This training is directed at staff responsible for implementing the requirements specified in Section 4 of the SWMP. The training will address the following:

1. Review of storm water quality problems, causes, and controls (focus on existing facilities and municipal projects)

2. Brief overview of SWMP, regulatory background and assigned staff responsibilities

3. Requirements for existing facilities (includes flood control facilities, municipal waste)

4. Requirements for municipal projects

5. Drainage system maintenance and inspections

5.2.4 Incorporation of Local Examples

To the extent possible, the training will incorporate Scottsdale-specific examples.

Municipal Services Department – The City conducted a testing program for application of dust palliatives to control dust on unpaved roads. Over a one-year demonstration period, various aspects of the application of dust palliatives were tested, which included dust control and health and safety issues with the application of these chemicals. The application of these chemicals appears to result in no apparent adverse health effects. A training element will describe potential implications of the program: dust control may reduce sediment runoff, chemicals used (e.g., nonylphenol) may have toxicity and impact water quality.

Solid Waste Management Division – The Division provides city residents with refuse/recycling collection, brush and bulk waste pick-up, specialized recyclables collection programs, rubbish roundups and household hazardous waste collection. The program also provides commercial bin collection and roll-off collection services for Scottsdale's businesses. A training element will focus on the need to keep liquids contained and pick up spills that may otherwise end up in storm water runoff.

Outreach - Environmental Hotline – The Environmental Hotline is staffed during working hours and will be supported in off-hours by voice mail. Questions are handled on a variety of topics and referrals are made to other government offices or environmental organizations as appropriate. As part of the general training (or specific training for hotline operators) reference materials will be provided so staff are able to respond appropriately to calls concerning storm water (spills, sewer overflows, ongoing contaminated discharges, etc.)

Capital Project Management Division This Division provides project management, engineering, plan review, and right-of-way services for the City's capital improvement program. Training will focus on the requirements stated in Section 3 and 4.3 of the SWMP and the need for the City to provide examples of appropriate controls for private developers.

Park and Greenbelt Maintenance – Training can reinforce the Park Maintenance goal of preventing brush, trash or other gross pollutants from entering the storm drain system, thus reducing the potential for these materials to affect storm water quality. The Community Maintenance and Recreation Division contracts out 90 percent of the operations that generate green waste. There may be a need to review contractor operations and provide training or guidance to ensure that drainage and waterways are protected during cleanup operations and waste disposal.

Pesticide Application – The City contracts approximately 70 percent of pesticide application. Although, the City contracts only with certified applicators and licensed companies, there may be a need to provide training or other guidance for contractor staff to ensure they are aware of the risks of overspray, runoff, or wastes entering waterways.

Flood Control Facility Management – Specific training will focus on flood control facility BMPs. The City uses existing storm water storage facilities to hold and treat storm water runoff. These facilities were designed for flood control purposes; however, they treat storm water by detention, allowing suspended solids to settle out before the water is released. Most of the City's municipal storm drain systems discharge to Indian Bend Wash. At most outlets, the City maintains a vegetative cover, usually grass, between the storm drain outfall and the wash channel. The buffer strip is intended to filter particulates, remove gross pollutants and infiltrate much of the discharge. The City maintains the existing buffer strips and will include additional buffer strips as part of capital improvement projects. The City may also install trash booms in existing channel infrastructure during repair or significant maintenance operations. Maintenance of the buffer strips and optimization of these controls will be a specific topic for training and staff guidance.

5.3 Public Education Program

This section describes the public education activities that are part of this management plan. Most of these activities are ongoing. Some programs will need to be modified or expanded to address storm water. These specific action items are identified, together with the responsible city department. The Floodplain and Stormwater Management Division has overall responsibility for the public education program.

5.3.1 Development and Maintenance of a Storm Water Web Site

The City currently provides a public web site with up to date information on environmental programs, volunteer activities, and government projects. The site also includes "CHUMS," a form for residents

to use to electronically submit concerns to the City. However, a new page dealing specifically with "Storm Water Quality Protection" should be established, with links from the main environmental web page and other related web pages, to include the following components:

Typical postings currently include:

- Earth Day activities
- Eco Gecko Environmental Year Calendar wherein a specific environmental topic is highlighted each month (e.g., September is for Pollution Prevention, October is for Water)
- Green Building Program
- Pollution prevention tips

Action Items:

1. Review the current web page to incorporate storm water quality topics. Examples include:
   - *Pollution Prevention Tips* – Add item to remind readers that trash, pet wastes, and anything else discarded in gutters can be washed into the waterways. For the existing message to "Contain auto fluids when doing maintenance" add, "Rain washes spilled fluids into our rivers and water supply."
   - *Environmental Issues List* - Add discussion of storm water problems and controls.
   - *Eco Gecko Environmental Year Calendar* – Add storm water quality discussion to items addressing pollution prevention and water.
   - *Environmental Directory* – This directory assists the public by providing environmental information and responses to questions. Add element addressing protection of storm water quality.
2. Add a new page regarding "Storm Water Quality Protection," with links from the main environmental web page and other related web pages, to include the following components:
   - What is storm water quality?
   - Why is it important?
   - What can be done to improve storm water quality?
   - (If possible, provide specific information on waste motor oil disposal, and other key problems)

- What is the storm drain stenciling program and how do you join it?

3. Add links to storm water pages of other organizations (federal, state, municipal)

Responsibility: Floodplain and Stormwater Management Division

5.3.2 Storm Drain Marking Program

The City of Scottsdale Storm Drain Marking Program will be a volunteer-based program intended to educate the public about non-point source pollution. Storm drains will be marked with a logo and a message similar to the following:

"STORM DRAIN – NO DUMPING"

The intent is to increase public awareness of how rainfall runoff can wash soil, yard waste, pet wastes, fertilizer, pesticides, motor oil, and other contaminants into waterways. Volunteer groups can be assigned a specific area and will have the responsibility to mark all storm drain locations within the assigned area.

Action Items:

1. Establish institutional support mechanisms (identify responsible City staff, develop tracking system, assign information telephone number, and purchase, assemble and store supplies).
2. Develop logo or select commercially available product, produce templates, purchase materials and set up kits with instructions.
3. Implement public outreach to inform public (web site notice, media announcements, handouts for libraries, mailings to youth organizations).

Responsibility: Floodplain and Stormwater Management Division

5.3.3 TV and Radio Public Education Initiative

The intent of this effort is to educate the public concerning the possible adverse effects of storm water runoff, other than flooding issues. The focus will be on the following causes and impacts:

- *Chemical pollutants (*waste oil, fuel, pesticides, and other chemicals) causing toxicity to biota and polluting ground water
- *Sediment* (construction site and exposed area runoff carrying sediment) leading to silting-up of waterways and compromising the operation of drainage facilities
- *Litter* decreasing the natural beauty of streams and washes
- *Increased runoff volume* (from construction of impervious surfaces – roadways, roofs, driveways, etc.) causing scouring of waterways, habitat destruction, and increased sediment load.

This effort will be organized regionally, in conjunction with Phoenix and other communities.

Action Items:

1. Work with other storm water programs to manage, fund, design, and implement media outreach program.

2. Review existing program to ensure appropriate management of questions and requests resulting from the initiative.

Responsibility: Floodplain and Stormwater Management Division

5.3.4 Green Gardening Program (Pesticide/Herbicide Control)

The City has an ongoing green gardening program that provides instruction on xeriscape landscaping (low water-use plants). The training takes place at periodic workshops.

Responsibility: Water and Wastewater Division

5.3.5 Pesticide/Herbicide Control Initiative

In some areas of the country, toxicity in urban storm water runoff has been traced to pesticides or herbicides. These chemicals generally have relatively short half-lives when exposed to sunlight and air; but may last considerably longer when infiltrated. Thus, they may pose an additional risk to groundwater. The City has an ongoing green gardening program, which will be augmented to include measures to reduce pesticide and herbicide use (see discussion above). The green gardening program will be supplemented by this initiative, which is intended to provide additional information to the public regarding the storm water runoff risks presented by these chemicals.

Action Items:

1. Ensure that the *TV and Radio Public Education Initiative previously* discussed includes appeals to the public to take care that pesticide use is minimized and that overspraying or spills do not end up contaminating runoff.

2. Develop point-of-purchase information sheets for retail outlets that include a brief summary of pesticide/herbicide risks and controls. This information can be in tear-sheet form attached to the shelves containing the chemicals. The information focuses on minimizing use, not overspraying, ensuring that left over material, spills, and rinse water do not end up where they may be washed off by storm water. (Stores will be requested to post the information.)

3. Produce more detailed information packages regarding alternatives to pesticides/ herbicides (see discussion in the Green Gardening Program). These will be distributed to garden stores, libraries, and similar locations.

4. Produce a "Scottsdale Gardener Calendar" with information on a sidebar to each month discussing a topic (soil pests, aphids, earwigs, lawn weeds, caterpillars, rose diseases, etc.) and specific information related to the topic regarding detection, less-toxic controls, and prevention.

Responsibility: Floodplain and Stormwater Management Division

5.3.6 New-Housing Information Package

The intent of this initiative is to have developers provide information to new homeowners which will assist them in reducing storm water pollution. The information package will incorporate material from the Green Gardening Program including new material on pesticide/herbicide control, specific suggestions for controlling sediment during landscaping, information regarding dumping of waste materials in storm drains, procedures for pool draining and maintenance, and discussion of the need to retain roof runoff onsite and minimize directly connected impervious surfaces so as to reduce storm flows.

Action Items: Develop information package as discussed above. This package may be combined with other environment-related material (recycling program, hazardous waste pickup, etc.) and will be provided with other move-in information.

Responsibility: Planning Systems – Quality Compliance Division (distribution); Environmental Planning & Design Office (package development)

5.3.7 Green Building Program

The Green Building Program provides home builders and prospective buyers with the information necessary to build or buy environmentally compatible homes. The voluntary program encourages the use of environmentally responsible building that incorporates healthy, resource- and energy-efficient materials and methods in the design and construction of homes. The program offers builders expedited plan review and other incentives. A green building checklist and rating system is used to qualify homes into the program.

Every builder and designer who enters a home into the Green Building Program is required to attend a City-sponsored green building workshop or seminar. The workshop serves as an introduction to energy/resource efficient and environmentally responsible buildings and features information and resources in the areas of site use, energy, building materials, indoor air quality, water and solid waste.

Action Items: Review the workshop materials to ensure they incorporate storm water quality topics, especially minimization of runoff through the use of infiltration-friendly surfaces (for drive-ways, parking areas) and onsite management of runoff (as opposed to directing roof leaders to the street gutter).

Responsibility: Quality Compliance Division Department

5.3.8 Operation of Telephone Hotlines

The City provides several hotlines relevant to pollution prevention and storm water quality control:

- Illegal Dumping Hotline (480) 312-2543
- Environmental Hotline (480) 312-7899
- Recycling (480) 391-5611

The Environmental Hotline is staffed during working hours, and questions are handled on a variety of topics. Callers are also referred to other appropriate government offices or environmental organizations.

Action Items:

1. Provide reference materials and training so that Environmental Hotline staff can respond appropriately to calls concerning storm water (spills, ongoing contaminated discharges, etc.). Provide off-hours support through voice mail or an alternative 24-hr number (*e.g.*, police or fire department).

2. Publicize the environmental hotline on the web page and through other media as the appropriate number to call for:

   Leaking sanitary sewer lines

   Malfunctioning septic systems

   Silt and sediment runoff from poorly controlled construction sites

   Leaking vehicles

   Using oil weed control

   Dumping of chemicals and any other spills

   Unnecessary and/or excessive use of fertilizers and pesticides

   Key pollutants: Motor Oil, Gasoline, Diesel

Responsibility: Environmental Planning & Design Office

5.3.9 Hazardous Waste Collection (Environmental Partnerships)

The City sponsors an annual Household Hazardous Waste Collection Day that is advertised in the newspaper and on posters and fliers in city service areas (e.g., the library, city hall), the utility bill, and on posters on the sides of the general waste collection trucks. This effort helps control wastes (crankcase oil, paints) that could otherwise end up dumped in storm drains.

Action Item: The City will join with major employers in the area to increase awareness among Scottsdale residents of the hazardous waste collection program. An example is the partnership between Solid Waste Management and Motorola's Space and Systems Technology Group, which also conducted a household hazardous waste collection event.

Responsibility: Solid Waste Management

5.3.10 *Maintenance of Scottsdale Pride Web Page and Newsletter*

The City helps focus residents on natural resource conservation and pollution prevention through an active outreach program, including:

- Volunteer Maintenance Program: Organizations and residents are encouraged to adopt a public landscaped area for maintenance or litter control. It is modeled after "Keep America Beautiful."
- Scottsdale web page: The City includes pollution-related issues in the environmental section of its web page.
- Pride Park Program: City surplus land is used to establish "pocket parks" in areas in need of beautification
- "Pride Newsletter," which is included with water bills and reaches 60,000 customers. It provides information on volunteer programs, water conservation tips, solid waste collection (e.g., green wastes and bulk items collection schedule) and includes "H to O," a question and answer section concerning Scottsdale's water resources.

Action Item: Review materials to ensure that storm water runoff issues are included.

Responsibility: Floodplain and Stormwater Management Division

5.3.11 *Pollution Prevention Outreach*

This ongoing project uses the municipal web page and handouts to educate the public regarding the following: source reduction (waste prevention), recycling, composting, and "closing the loop" (purchase of recycled or less wasteful products).

Action Item: Review materials to ensure that litter, pesticides, and other runoff issues are included.

Responsibility: Floodplain and Stormwater Management Division

5.3.12 *Home Improvement Guide* Publication

The Quality Compliance Division is responsible for the enforcement of City- adopted ordinances relating to the construction, alteration, repair and demolition of buildings and structures. To ensure

that construction complies with the City's ordinances, certain permits are required prior to commencing construction.

Action Item: Consider addition to *Home Improvement Guide* to address storm water reduction measures.

Responsibility: Quality Compliance Division

5.3.13 Municipal Planning Course

This course, CET 104/Section 7460, is sponsored by the City and is offered at Scottsdale Community College. The course covers issues of municipal planning with weekly topics such as economic development, financial management, transportation, traffic engineering, storm drainage management, community services, police, fire, land use, zoning, water resources, and property rights case law.

Action item: Review the course materials to ensure that they address storm water quality topics: runoff volume minimization and quality.

Responsibility: Transportation Department

5.3.14 Vision Check

This periodic publication includes update information on Scottsdale planning efforts.

Action item: Include item each year on storm water control (quality and volume).

Responsibility: Community Planning

5.3.15 Sustainability Indicators Project

Scottsdale tracks 30 indicators in the categories of environment, economy, and community.

Action item: Add an environmental indicator to track storm water (quality and volume).

Responsibility: TBD

6.0 STORM WATER MONITORING, DATA EVALUATION AND REPORTING

6.1 OVERVIEW

Part 2 of the City of Scottsdale, Arizona application for an NPDES permit (Permit No. AZS000020) to discharge storm water runoff through the City's MS4 (municipal separate storm sewer system) requires the submittal of a Storm Water Management Program (SWMP). A key component of the SWMP is to show compliance with the control of pollutants in storm water discharges to the MEP. To show compliance with MEP standards, the City is required to monitor the water quality at a minimum of five locations that are representative of residential, commercial and industrial land use drainages throughout the City.

This section of the SWMP provides an overview of the City's storm water runoff sampling (monitoring) program. The program design, site selection of sampling locations, equipment, sample collection procedures, analysis, quality assurance/quality control (QA/QC) and data management and evaluation are discussed. The sampling program is operated by the Maricopa County Flood Control District by agreement with the City of Scottsdale.

Specific requirements promulgated by the Environmental Protection Agency (EPA) under 40CFR Section 122.26 include that the City provide characterization data on the quantity and quality of the runoff from the representative monitoring locations set forth in the Part 1 Application and then presented with the Part 2 Application. The quantitative data gathered are to include chemical and physical characteristics of runoff and estimates of annual pollutant loads and event mean concentrations (EMCs) for those constituents presented in Table 6-1. The Part 2 Application specifies that once the samples collected during the Part 2 Application phase have been reported, a modified list of constituents will be assembled, which reflects all constituents detected during this initial wet weather monitoring program. However, because of the lack of rainfall, the City to date (since early 1998) has only been able to sample one storm at four locations and two storms at a fifth location as part of the Part 2 Application wet weather monitoring program. Data collected is, in many cases, insufficient to make valid decisions on the appropriate list of constituents for future analysis. The Part 2 Application does provide a list of the minimum recommended constituents for Permit monitoring based on CFR Section 122.26(d)(2)(iii)(A) and available monitoring data. The minimum recommended constituents with the addition of DDE will be monitored. The constituents which will be monitored can be seen in Table 6-1. Data collection for any future modified list of constituents shall be defined in a proposed monitoring program to be implemented during the remaining term of the permit.

6.2 MONITORING PROGRAM

This section describes the monitoring program to take place under the City's SWMP and to fulfill the terms of NPDES Permit No. AZS000020.

Table 6-1

Analytical Parameters, Methods, and Detection Limits for the City of Scottsdale Part 2 Application, NPDES Storm Water Permit Monitoring

Parameter	Sample Type	EPA Method	Target Reporting Limit
CONVENTIONAL			
Total Suspended Solids (TSS)	Composite	160.2	4 mg/L
Total Dissolved Solids (TDS)	Composite	160.1	10 mg/L
Biochemical Oxygen Demand (BOD)	Composite	405.1	1 mg/L
Chemical Oxygen Demand (COD)	Composite	410.1	1 mg/L
NUTRIENTS			
Total Phosphate	Composite	365.2	0.05 mg/L
Dissolved Phosphate	Composite	365.2	0.05 mg/L
Total Kjeldahl Nitrogen (TKN)	Composite	351.2	0.1 mg/L
Nitrate and Nitrite	Composite	352.1	0.05 mg/L
MICROBIOLOGICAL			
Fecal coliform	Grab	SM 9221E	2 MPN/100 mL
Fecal Streptococci	Grab	SM 9230B	2 MPN/100 mL
METALS			
Cadmium (total)	Composite	SM 3113B	0.2 mg/L
Chromium (total)	Composite	200.7/6010A	1 µg/L
Copper total)	Composite	SM 3113B	1 µg/L
Lead (total)	Composite	SM 3113B	1 µg/L
Zinc (total)	Composite	200.7/6010A	1 µg/L
ORGANIC COMPOUNDS			
Chlorinated pesticides (including DDE)	Composite	608	0.05 - 0.5 µg/L
Total oil and grease	Grab	413.2	0.2 mg/L

Notes:
SM = Standard Methods for the Examination of Water and Wastewater
MPN = Most Probable Number of Organisms

In general, the storm water monitoring program includes the selection and verification of sites, the design of automated, flow proportioning sampling equipment, the installation, testing and calibration

of such equipment, the sampling of storm events over the term of the Permit and the submittal of collected data in annual reports. Specific objectives of the monitoring program are as follows:

- Monitor five locations representing industrial, commercial and residential land uses throughout the term of the Permit.
- Instrument each location with automated flow measuring and sample collecting equipment.
- Sample using flow compositing and grab sampling techniques targeting three storm events (each year) over the term of the Permit as conditions allow.
- Analyze collected samples for the list of constituents in Table 6-2.
- Calculate EMCs and estimate seasonal pollutant loads for those constituents detected in the samples.
- Validate all collected data according to appropriate quality assurance criteria.
- Compile all collected data in the City's Storm Water Management System.
- Identify storm water quality concerns.
- Submit collected information in an annual report to the USEPA.

6.2.1 Study Design

Five sites have been or will be selected for monitoring during the Permit term. Three storm events will be sampled annually at each site. To meet the above objectives, the five stations will be sampled, determining mean concentrations of pollutants and pollutant load estimations for the constituents listed in Table 6-2 using methods specified in this section of the SWMP. During each monitored event, all samples (except for oil and grease and pathogens) will be collected using an automated approach and will be composited on a flow-weighted basis. Oil and grease and pathogens will be collected as "grabs" as soon as possible after the start of runoff at each station. An automated sampling approach, compared to a manual sampling method, allows for more representative and logistically feasible flow-weighted composite samples.

After the first year of Permit monitoring, the City may propose changes to the monitoring program. These changes may include a reduction in the number of constituents based on pollutants detected during the Part 2 Application and first year Permit monitoring. The City may also elect to incorporate selective storm water environmental indicators developed by the EPA in conjunction with the Center for Watershed Protection (Center for Watershed Protection, 1996).

Table 6-2
City of Scottsdale NPDES Permit Storm Water Monitoring

Parameter	Sample Type	EPA Method	Target Detection Limit	Maximum Allowable Holding Time	Preservation Methods and Sample Bottle Types
CONVENTIONAL					
Total Suspended Solids (TSS)	Composite	160.2	4 mg/L	7 days	4ºC
Total Dissolved Solids (TDS)	Composite	160.1	10 mg/L	7 days	4ºC
Biochemical Oxygen Demand (BOD)	Composite	405.1	3 mg/L	48 hr	4ºC
Chemical Oxygen Demand (COD)	Composite	410.1	4 mg/L	28 days	4ºC, pH<2 with H_2SO_4
NUTRIENTS					
Total Phosphorus-P	Composite	365.2	0.05 mg/L	28 days	4ºC, pH<2 with H_2SO_4
Dissolved Phosphate-P	Composite	365.2	0.05 mg/L	48 hr	Field filter with 0.45 micron filter
Total Kjeldahl Nitrogen (TKN)	Composite	351.3	0.1 mg/L	28 days	4ºC, pH<2 with H_2SO_4
Nitrate and Nitrite-N	Composite	353.1	0.1 mg/L	28 days	4ºC
MICROBIOLOGICAL					
Fecal coliform	Grab	SM 9221E	2-1,600,000 MPN/ mL	6 hr	4ºC
Fecal Streptococci	Grab	SM 9230B	2-1,600,000 MPN/ mL	6 hr	4ºC

Table 6-2 (continued)

Parameter	Sample Type	EPA Method	Target Detection Limit	Maximum Allowable Holding Time	Preservation Methods and Sample Bottle Types
METALS					
Cadmium (total)	Composite	213.2/200.8	0.2 mg/L	6 mo	pH<2 with HNO_3
Chromium (total)	Composite	218.2/200.8	1 µg/L	6 mo	pH<2 with HNO_3
Copper (total)	Composite	220.2/200.8	1 µg/L	6 mo	pH<2 with HNO_3
Lead (total)	Composite	239.2/200.8	1 µg/L	6 mo	pH<2 with HNO_3
Zinc (total)	Composite	289.2/200.8	5 µg/L	6 mo	pH<2 with HNO_3
ORGANIC COMPOUNDS					
Total Oil and Grease	Grab	413.2	0.2 mg/L	7 days (to extraction)	4ºC, pH<2 with H_2SO_4

Notes:

SM = Standard Methods for the Examination of Water and Wastewater

MPN = Most Probable Number of Organisms

6.2.2 Site Selection

Five primary sites were selected for monitoring based on drainage basin and land use characteristics during the Part 1 application process (Table 6-3). In addition, several secondary sites were identified as potential backups in case problems developed with the primary sites. The following factors were principally used in the assessment and selection of candidate sites:

- Land Use Classification. An effort was made to find sites that represent each of the City's primary land uses, which are industrial, commercial and residential. Higher consideration was given to those sites that receive runoff from mostly one type of land usage.

- Drainage Basin Size. Smaller drainage basins were favored over very large basins in order to promote monitoring of runoff that is representative of the entire basin during short-duration, high intensity storms that are typical of the City's summer wet weather season.

- Proximity of Monitoring Sites. Stations were located as close as possible to each other to minimize the travel time spent during storm events.

- Proximity of Existing Rain Gauges. Sites were selected that were within 3 miles of an FCD rain gauge to allow for more accurate rainfall and runoff correlation's.

After a list of candidate sites was developed, other factors such as the hydraulic properties of the conveyance, site safety and access, stable channel conditions and the proximity to utilities were used in finalizing the list of primary sites. In early 2000, field investigations were conducted to verify that the sites chosen for the Part 1 Application were representative of land uses within the City and to determine the feasibility of installing permanent flow monitoring and water quality sampling equipment. These investigations were done as part of the current monitoring plan described herein. Once land use and drainage basin characteristics were verified, specific criteria used to further evaluate existing and candidate sites were as follows:

- Ability to accurately and cost effectively measure flow by evaluating the extent of turbulent flow and potential backwater effects.

- Ability to sample runoff that is representative of the drainage basin in question.

- Ability to locate above ground automated sampling and flow monitoring equipment.

- Ability to access the site safely with minimal confined space entry.

- Proximity to electrical and telephone line connections.

The site assessments revealed that the installation of flow monitoring was not feasible and/or was cost prohibitive at Sites 47, 18, and 9 as defined in the Part 2 NPDES Permit Application. These sites were replaced with the Camelback, Hayden, and Thunderbird Sites where flow monitoring is more practical. Table 6-4 summarizes the drainage and land use characteristics of the five identified sites to be monitored under the SWMP and two alternate locations. Figure 6-1 provides an overview of the location of each site.

Figure 6-1

Table 6-3
Land Use and Basin Characteristics for Stations Selected Under the Part 1 Application and Sampled Under the Part 2 Application for the City of Scottsdale NPDES MS4 Permit

Station ID	Station Type	Basin Classification	Percent Impervious	Drainage Area (Acres)	No. of Storms Sampled to Date
6	Primary	Industrial	81.5	6.4	2
7	Primary	Industrial	79.5	12.8	1
9	Primary	Mixed commercial and residential	59.0	141	1
18	Primary	Residential	36.7	32.0	1
47	Primary	Commercial	85.0	70.4	1
22	Secondary	Mixed commercial and residential	65.3	38.4	0
27	Secondary	Residential	55.3	262	0

Table 6-4
Land Use and Basin Characteristics for Sites to be Monitored for the City of Scottsdale NPDES Permit

ID	Station Type	Name	Part 2 Application Station ID	Sampling Point Characteristics	Basin Classification	Land Use	Percent Impervious	Drainage Area (Acres)	Nearest ALERT System Rain Gauge
080620	Primary	Pierce	6	5-ft wide concrete channel (slope=0.0036) upstream of two 42-inch RCPs	Industrial	94% Industrial 2% Undeveloped 4% Residential	81.5	6.4	4600
080720	Primary	McKellips	7	Oulet of 42-inch RCP (slope=0.0140) into concrete drainage structure	Industrial	93% Industrial 7% Undeveloped	79.5	12.4	4600
130570	Primary	Camelback	27	Outlet of 60-in. RCP into concrete channel	Residential	43% Undeveloped	55.3	262	4615
160320	Primary	Hayden	NA	48-In. x 66-In. elliptical pipe	Residential	100% Residential	54	60	4615
250940	Primary	Thunderbird	50	72-in. RCP	Commercial	85% Commercial	78	666	4630

6.2.3 Equipment and Installation

For storm event monitoring, each land use station will be equipped with an acoustic Doppler area velocity meter with data logging and controller capabilities, cellular telecommunications equipment and a peristaltic pump sampler. In addition, a tipping bucket rain gauge was installed at each station.

All flow sensors will be installed using manufacturer supplied hardware and in accordance to the manufacturer's specifications. Sampler intakes will be mounted in each conveyance downstream of the velocity/depth sensors. Stainless steel fasteners will be used to secure the intakes to the invert of the conveyances. Sensor wires and intake tubing will be routed through conduit from the measuring points to 42 x 30 x 36-in. steel equipment enclosures mounted on 4 x 4 ft concrete pads positioned on level ground near each measuring point. The equipment enclosures will house the samplers, cellular modem equipment, flow metering electronics, and batteries. A cellular phone antenna and solar panel will be mounted on a pole located adjacent to the equipment enclosure. If required, a rain gauge will also be mounted on this pole. A typical example of the configuration and installation of sampling equipment can be found in Figure 6-2. The configuration of equipment at each of the land use stations can be found in Figures 6-3 through 6-7.

All components of each automatic sampling system used will undergo calibration and verification during installation and during maintenance and pre-storm visits. This may involve measuring the recovery of a known volume of water released passed the flow monitoring sensors.

Data containing storm and hydrologic information will be electronically recorded in the system data logger from each monitoring event. These records will contain information such as the intensity of flow at the time of each sample, cumulative rainfall, rainfall intensity and discharge volumes. Hydrologic data will be recorded for the entire storm season in order to determine total annual runoff volumes for each station. Continuous data records will be maintained in ASCII format. At a minimum, the continuous hydrological data records will contain 15-min average data based upon 60 measurements per hour. In addition, a daily record will be logged indicating minimum and maximum flow rates for each day and the time of their occurrence. Gaps in discharge data may be extrapolated from rainfall data.

6.2.3.1 Water Quality Samplers

The water quality samplers to be used at each site will be automatic and composed of a peristaltic pump, a liquid detector, and a base to hold a composite sample bottle and ice. Each time a pre-determined volume of liquid passes the sampling point, the flow meter data logger will signal the pump to deliver a self-calibrated sample volume. The suction hose used with the sampler will be 3/8-in. pure Teflon® tubing. Therefore, the sampler will be equipped with 3/8-in. silicon peristaltic tubing and a 3/8-in. stainless steel or Teflon® intake strainer. Strainers will be attached to the invert of each conveyance using stainless-steel fasteners. Samples will be collected into borosilicate glass bottles. Programming of the samplers is detailed in a protocol manual prepared by the Flood Control District of Maricopa County (1999).

[NOTE; FIGURES 6-21 THROUGH 6-7 WILL BE CONFIGURATION OF EQUIPMENT AT EACH OF THE LAND USE STATIONS]

Figure 6-2

Figure 6-3

Figure 6-4

Figure 6-5

Figure 6-6

Figure 6-7

Figure 6-8

All materials used in the collection of storm water samples will meet strict criteria to prevent any form of contamination. These materials will allow for both inorganic and organic trace toxicant analyses from the same sampler and composite bottle. Only Teflon® and the highest grade of borosilicate glass are suitable for both trace metal and organic analyses from the same composite sample bottle. All bottles will be cleaned according to protocols developed by the Flood Control District of Maricopa County (1999). Sample hoses will also receive a thorough cleaning prior to installation and before each monitoring event. These bottles and hoses will be evaluated through a blanking process to verify that the composite bottles and sample hoses are contamination-free and appropriately cleaned for both analyses of inorganic and organic analytes.

6.2.3.2 Flow Monitoring

A true flow-proportioned sample is a composite of individual sample aliquots that are collected for each set volume of water that passes by a sampling point. To obtain a valid composite sample, direct flow measurements will be made to control the sampling interval. The flow metering devices used will measure both liquid velocity and depth. These meters will have single-point, internally mounted, low profile depth and velocity sensors. A bubbler will be used to measure depth. Bubblers work by relating the pressure it takes to evacuate a bubble from a submerged tube to depth. The bubbler can be separate or integral to the velocity sensor. The velocity sensor will operate using the Doppler principal for measurement. The depth and velocity sensors will be secured to the invert of the conveyance using a mounting ring or mounting plate supplied by the manufacturer. Programming of the flow meters is detailed in the protocol manual prepared by the Flood Control District of Maricopa County (County of Maricopa, 1999).

There are several design specifications that were considered in designing the flow measuring points. The location at which flow will be measured must be at least 10 pipe diameters downstream and five pipe diameters upstream (or ten and five times the maximum anticipated head height) of any outfall, obstruction, inlet, or change in direction of the conveyance. The slope of the conveyance leading to the flow measuring point should be 2 percent or less. These two requirements are to ensure that the flow is fully developed and is subcritical at the point where flow is measured.

6.2.3.3 Rain Gauges

The rain gauges to be used at land use stations without a nearby ALERT gauge will be of a "tipping bucket" design that incorporates a small "bucket" which holds a known amount of rainfall. When the bucket is filled, it tips the water out, momentarily closes a switch, and then resets itself and starts the process again. The data logger counts each switch closure to accumulate rainfall totals. The rain gauges used should tip after every 0.01 in. of rain.

6.2.3.4 Power

The source of primary power for all stations will be 12-v deep-cycle marine batteries. A separate battery will be used to power the autosamplers, modems, and flow meters. Solar panels will be used to maintain the charge on the batteries.

6.2.3.5 Telecommunications

Cellular modem transceivers will be used to provide remote telecommunication access to the monitoring equipment. The ability to access a sampling station, monitor the status of the station in real-time, modify storm criteria and recover data allows for more cost effective, efficient monitoring.

A high performance base station antenna with filter will be installed; the filter will be installed from the lead-in of the antenna to prevent damage to the sampling station equipment due to nearby lightning strikes.

6.2.3.6 Maintenance and Calibration

A complete maintenance program will be performed at each land use station after each storm event during the monitoring period, or in the absence of rain, on a monthly basis. Maintenance will include checking the performance of all the equipment, checking power supplies, inspecting and clearing intake structures, cleaning contaminated equipment, and performing all necessary equipment calibrations. Calibrations will be conducted in accordance to specifications in the individual component manuals.

All storm water equipment maintenance visits will be thoroughly documented. Written documentation includes the action taken at a site as well as the date performed. Accurate and thorough records of every station visit will be maintained and will aid in the evaluation of each land use station.

6.2.4 Rainfall, Runoff and Sample Collection

Both automated flow composite samples and grab samples will be collected at each station during each storm event. The composite samples will be collected throughout the entire duration of each storm. Grab samples will be collected as soon as possible after the commencement of rain. Detailed procedures, necessary equipment to be used and log sheets can be found in a manual on field sampling protocols developed by the Flood Control District of Maricopa County (1999).

6.2.4.1 Preparation and Logistics

Success of the sampling effort requires careful preparation and planning to assure that high quality samples are obtained in association with each storm event.

During both the summer and winter wet weather seasons, the weather will be continually monitored with increased frequency as incoming systems are predicted. Sources of weather information to be used to track incoming storms include the following: National Weather Service, Weather Watch Service, Weather Network (WeatherNet), the ALERT system from Maricopa County, public broadcast information available on the Weather Channel and local news stations, and radar and satellite images downloaded from the Internet (e.g., www.weather.com).

Communication channels will be established for personnel to contact each other before and during a storm event. Phone lists with home and work numbers and other key contacts will be made available to all storm monitoring personnel. Two-way radio or cellular telephone communication links to monitoring personnel are essential for efficient storm water monitoring.

Prior to a storm event, the monitoring stations will be made ready to sample. This preparation includes entering the correct settings for sample pacing ("Volume to Sample" values), setting the sampler and the data logger to sampling mode, pre-icing the composite sample bottle, and performing a general equipment inspection. The latest weather forecast prior to each storm event will be examined to determine the proper "Volume to Sample" value to enter into the system. The amount of expected rainfall, how the station performed during the previous storm and how much water is needed

for analysis at the station for each storm event will be taken into consideration. To determine an initial "Volume to Sample" value, the drainage area in acres and the runoff coefficient, which is a number that reflects the permeability of the land in the study area, is multiplied together along with predicted rainfall and a conversion factor for the desired units. The number of sample aliquots necessary to obtain the desired amount of sample volume is then divided into this value. It is important that the "Volume to Sample" value is accurate as possible; if the value is too high, the system will not collect enough water to be analyzed, and if the value is too low, the system may sample too fast to be monitored effectively (i.e., the percent storm capture will drop).

Action levels based on the probability of precipitation will be used for mobilizing for a monitoring event. No action will be taken if the probability of 0.1-in. or greater of rain is less than 30 percent. If there is a 30-60 percent chance of 0.1-in. or greater of rain, then field personnel will mobilize equipment and supplies and stand-by for updated weather forecasts and a "go" decision. Whenever the probability of precipitation is greater than 60 percent, it will be an automatic "go" situation for mobilizing crews and preparing the stations for monitoring. However, physically turning on the stations for monitoring and entering the "Volume to Sample" values should be held off to after the last available forecast prior to the arrival of rain. These two actions can be conducted in a timely manner remotely from the office storm computer.

If storm events follow each other closely, then the antecedent dry period between storms must be greater than 6 hr for storm events to be considered separate.

6.2.4.2 Flow Composite Sampling

A priority objective of storm monitoring is to maximize the percent storm capture of the composite sample. This will be accomplished by ensuring that a composite bottle does not fill without being changed immediately. If a bottle does fill, the full sample bottle will be replaced and the system will be reset. If more rain and flow occur then what was predicted, the "Volume to Sample" setting can be adjusted at the time of a bottle change. This value can only be increased during a storm event. If a "Volume to Sample" setting is changed during an event the bottle(s) collected prior to the change must be adjusted for the change by discarding a proportional amount of the sample during the sub-sampling process.

During each event, someone will be responsible for monitoring each station remotely from the office (the storm event coordinator) in order to update field personnel on the status of the stations. This will greatly reduce the amount of time personnel will spend driving during storms. The monitoring of stations from a remote computer consists of calling each station and recording certain data for evaluation. When it is determined that a sampling system is close to filling a bottle, a field crew will be called and alerted to the status of the station. All remote interrogation of the storm stations should be logged. The storm event coordinator requires the latest weather forecasts to make informed decisions on the continued monitoring of the storm. The storm event coordinator will alert field crews that a storm is over after flow at each station drops to negligible levels.

After a storm event has ended, the stations need to be shut down. The station will be left ready for the next storm event in case there is insufficient time for a maintenance visit between storms. The following items will be taken care of:

1. The storm monitoring program will be reset to prepare for another storm event.

2. The sample bottle will be replaced and the sampler reset.

3. The station will be physically inspected to determine if any damage was sustained during the storm event. The flow sensor will be inspected to determine if it is blocked by debris, or the intake is clogged. (This is only possible if all confined space requirements are met).

4. The data will be retrieved. This will be done via modem from the remote monitoring computer.

5. All battery voltages will be checked; batteries that are low will be replaced.

Upon termination of storm event monitoring, evaluation of each station's performance will be documented and reviewed before the samples collected are deemed valid. Evaluation of a monitoring station's performance is based on the answers to the following questions:

Was the storm representative?

Was capture of peak flow or runoff achieved?

Did the equipment perform as designed throughout the duration of the storm event?

Did the samplers accurately collect equal and reliable storm sample aliquots?

All composite bottles collected after a storm will need to be sub-sampled into appropriate containers for shipment to the laboratory. Care must be taken to thoroughly mix the composited water to evenly distribute suspended particles while sub-sampling. The thoroughness of sub-sampling will be evaluated by submitting duplicate samples, using the same composite water, from one station during each storm event. Any necessary preservatives should be added to the sample containers during the time of sub-sampling.

6.2.4.3 Grab Sampling

Total petroleum hydrocarbons (TPH), oil and grease, and bacteriological (fecal coliform) samples are unsuitable for collection by automatic means. TPH and oil and grease are inappropriate because some material adheres to the surface of the tubing and the composite sample container. TPH and oil and grease will not be sampled as a part of this program since the new laboratory procedure (hexane extraction) gives a detection limit (5 mg/l) that is too high to be of much utility. Automatic sampling for bacteria is inappropriate because the sampling equipment is not sterile after installation and exposure to the elements. Because bacteria are unsuitable for collection using an automated approach, it will be collected as a manual grab sample during each monitored event.

It is imperative that collected grab samples are transferred to a designated meeting location immediately after the sampling has been completed. "Chain-of-Custody" forms for the samples will be completed and transport of the samples to the analytical laboratory will be coordinated to ensure that all samples are handled and analyzed within the proper holding times to the extent possible.

All grab samples will be collected as near to the sampling point as possible. When unable to collect a sample near the intake, one will be collected as near the center of flow as possible or in an area of sufficient velocity to ensure good mixing. Some sampling points may require using a collection device, such as a decontaminated stainless steel bucket on a pole, to collect the necessary grab samples. All containers will be filled with the mouth of the bottles faced into the current, if possible. Also, all containers will be labeled before they are filled, the station will be listed on the bottle to

coincide with the station sampled. Care must be taken not to overfill sample containers because of the presence of preservatives.

In addition to grabs for laboratory analysis, grabs will be taken to make field measurements of temperature, pH and electro-conductivity. The meters and probes used for these measurements will be calibrated with appropriate standards prior to their use.

6.2.4.4 Sample Tracking and Handling

Samples, regardless of their matrix, will be kept properly chilled and transferred to the analytical laboratory within holding times to achieve the highest quality data possible. To ensure proper tracking and handling of the samples, "Chain-of-Custody" forms will accompany all samples from the initial pickup to the final extractions and analysis.

Collected samples will be labeled with the following information:

Project name

Date

Time

Station name and number

Sampling location

Preservative

Collector's initials

Sample I.D. number

Analyte(s) to be analyzed

Grab or composite sample

Duplicate and QA/QC samples will be collected for all storm water sampled, where possible. Duplicate and QA/QC samples will be prepared from the volume of the sample collected. The crews collecting the samples will be fully briefed on the procedures for collecting QA/QC samples, and will be familiar with the sample identification numbering scheme for these samples because they are to be submitted to the laboratory as blind samples. These samples will be labeled, recorded on the "Chain-of-Custody" forms, and transported to the analytical laboratory.

6.2.5 Laboratory Analyses

Recommended analytical methods and detection limits for the Permit monitoring constituents are listed in Table 6-2. This list of constituents may be modified on an annual basis in association with the required annual report to exclude those constituents that are consistently non-detected. The detection limits in Table 6-2 are target detection limits. In some cases, detection limits may need to be adjusted due to limited sample volumes or potential matrix interference. In such cases, appropriate

data qualifiers will be applied to the associated data. Table 6-2 also contains a summary of the types of containers required for each analysis, along with holding times and preservative. Because additional volumes are necessary for laboratory QA/QC, sample containers should provide at least twice the volume necessary to perform the requested analysis. The volume of the storm water composite from each site is often the critical factor in determining the volume of sample that can be provided to the laboratory. Maricopa County personnel in conjunction with the laboratories will determine the allocation of sample volume for different analyses if sample volumes are not adequate to provide additional volume for each analysis.

6.2.6 Quality Assurance/ Quality Control (QA/QC)

Throughout the duration of the Permit monitoring, a strict QA/QC plan will be implemented as part of the monitoring plan. This plan will address field sampling procedures along with quantifying the precision and accuracy of analytical procedures. Field QA/QC samples are collected and used to evaluate potential contamination and sampling error introduced into a sample prior to its submittal to the analytical laboratory. Laboratory QA/QC activities provide information needed to assess potential laboratory contamination, analytical precision and accuracy, and representativeness.

6.2.6.1 Field QA/QC

Detailed Standard Operating Procedures (SOPs) will be developed and followed for all aspects of the field sampling. SOPs will be developed for the following field activities:

- Documentation
- Equipment operation calibration and maintenance
- Monitoring preparation
- Data retrieval
- Bottle replacement
- Grab sampling
- Sub-sampling
- Sample transfer and tracking

There will be two main types of field QA/QC samples submitted to the laboratories as part of the QA/QC plan; duplicates and blanks. A description of each type follows:

Duplicate Analyses - These analyses will be performed on one sample from each storm event and will require an additional set of sample containers. Duplicate samples will be analyzed for the full list of analytes. The relative percent difference between the duplicate and original sample will be determined. The results will allow evaluation of sampling error introduced by sub-sampling and laboratory analyses by showing the reproducibility of the sample collection and analyses. Duplicate samples will be sent "blind" to the laboratories.

Blanks - Blanks help verify that the equipment and the sample containers are not contaminated, and the sampling techniques used are non-contaminating. Field equipment and composite bottles will be rinsed with reagent grade analyte free deionized water separately. The collected rinsates will be analyzed for the full list of analytes for the primary samples. One set of equipment blanks will be submitted to the laboratory each time the equipment hoses have been decontaminated. Each time a batch of composite bottles is cleaned,10 percent of those bottles will be blanked.

6.2.6.2 Laboratory QA/QC

Analytical quality assurance for this program includes the following:

- Employing analytical chemists trained in the procedures to be followed
- Adhering to documented procedures, EPA methods, written SOPs, and other approved methods (e.g., Standard Methods).
- Calibrating analytical instruments.
- Providing complete documentation of sample tracking and analysis.
  - Assess data precision, accuracy and completeness
  - Recommend corrective actions

Internal laboratory quality control checks will include the use of method blanks, matrix spike/matrix spike duplicates, duplicates and laboratory control spikes. These QA/QC activities are discussed below, and their applicability to each analyte is summarized in Table 6-5. Quality assurance/quality control objectives for storm water samples are summarized in Table 6-6.

Replicates (Laboratory Split). On a frequency of one per batch of 10 or fewer samples, the laboratory will split/replicate one sample into two portions for each analytical method and analyze each portion. Duplicate analyses results are evaluated by calculating the relative percent difference (RPD) between the two sets of results. This serves as a measure of the reproducibility (precision) of the sample results. Typically, duplicate results will fall within an accepted RPD range, depending upon the analysis (see Table 6-6).

Method Blanks. For each day samples are analyzed, a method blank sample will be analyzed for each analytical method. A method blank is a sample of a known matrix that has been subjected to the same complete analytical procedure as the submitted samples to determine if potential contamination has been introduced into the samples during processing. Blank analysis results are evaluated by checking against reporting limits for that analyte. Results obtained should be less than the reporting limits for each analyte.

Spikes. Two different kinds of spikes will be used: matrix spikes (MS) and laboratory control (blank) spikes (LCS).

Matrix spikes involve adding a known amount of the analyte(s) of interest to one of the submitted samples being analyzed. One sample is split into three separate portions. One portion is analyzed to determine the concentration of the analyte(s) in question in an un-spiked state. The other two portions are spiked with a known concentration of the analyte(s) of interest. The recovery of the spike, after accounting for the concentration of the analyte in the original sample, is a measure of the accuracy of the analysis. An MS will be done once for every 10 or fewer samples.

Table 6-5

Laboratory Quality Control Samples by Analyte

Analyte	Blanks	Duplicates	MS/MSDs	LCS	Surrogates
CONVENTIONALS					
TSS	✓	✓	—	—	—
TDS	✓	✓	—	—	—
BOD	✓	✓	—	—	—
COD	✓	✓	—	—	—
Hardness	✓	✓	—	—	—
NUTRIENTS					
Total Phosphorus-P	✓	✓	✓	✓	—
Orthophosphate-P	✓	✓	✓	✓	—
TKN	✓	✓	✓	✓	—
Nitrate and Nitrite-N	✓	✓	✓	✓	—
Ammonia-N	✓	✓	—	—	—
MICROBIOLOGICAL					
Fecal Coliform	✓	✓	—	—	—
Fecal Streptococci	✓	✓	—	—	—
TOTAL AND DISSOLVED METALS					
Cadmium	✓	✓	✓	✓	—
Chromium	✓	✓	✓	✓	—
Copper	✓	✓	✓	✓	—
Lead	✓	✓	✓	✓	—
Nickel	✓	✓	✓	✓	—
Zinc	✓	✓	✓	✓	—
ORGANIC COMPOUNDS					
Chlorinated Pesticides	✓	✓	✓	✓	✓

Table 6-6

Water Matrix
Quality Assurance/Quality Control Objectives

Analyte	Project Detection Limit	Accuracy	Precision		Completeness
		Spike Recovery	Matrix Spike RPDs	Laboratory Duplicate RPDs	
CONVENTIONAL					
TSS	4 mg/L	—	—	±25%	95%
TDS	10 mg/L	—	—	±25%	95%
BOD	3 mg/L	—	—	±25%	95%
COD	4 mg/L	—	—	±25%	95%
Hardness	1 mg/L	—	—	±25%	95%
NUTRIENTS					
Total Phosphorus-P	0.05 mg/L	80-120%	±25%	±25%	95%
Orthophosphate-P	0.05 mg/L	—	—	±25%	95%
TKN	0.1 mg/L	—	—	±25%	95%
Nitrate and Nitrite-N	0.1 mg/L	80-120%	±25%	±25%	95%
Ammonia-N	0.1 mg/L	80-120%	±25%	±25%	95%
MICROBIOLOGICAL					
Fecal coliform	2-1,600,000 MPN/mL	—	—	—	95%
Fecal Streptococci	2-1,600,000 MPN/mL	—	—	—	95%
TOTAL AND DISSOLVED METALS					
Cadmium	0.2 mg/L	75-125%	±25%	±20%	95%
Chromium	1 µg/L	75-125%	±25%	±20%	95%
Copper	1 µg/L	75-125%	±25%	±20%	95%
Lead	1 µg/L	75-125%	±25%	±20%	95%
Nickel	2 µg/L	75-125%	±25%	±20%	95%
Zinc	5 µg/L	75-125%	±25%	±20%	95%
ORGANIC COMPOUNDS					
Chlorinated pesticides (including DDE)	0.05-0.5 µg/L	75-125%	±25%	±20%	95%

By determining MSD recoveries, another measure of precision (RPD) can be calculated. Both the RPD values and spike recoveries are compared against accepted and known method-dependent limits. Results outside these limits are subject to corrective action.

MS/MSD data is also useful in evaluating matrix interference. An MSD will be done once for every 20 or fewer samples analyzed.

The second spike type, the LCS, involves spiking known amounts of the analyte(s) of interest into a known, clean matrix to assess the possible matrix effects on spike recoveries. High or low recoveries of the analytes in the matrix spikes may be caused by interferences in the sample. LCSs assess these possible matrix effects because the matrix is known to be free from interferences. LCSs will be analyzed at a frequency of once every analytical batch.

6.2.6.3 Corrective Action

Corrective action is taken when an analysis is deemed unreasonable for some reason. These reasons include exceeding RPD ranges and/or problems with spike recoveries or blanks. The corrective action varies somewhat from analysis to analysis, but typically involves the following:

- Check procedures
- Review documents and calculations to identify possible errors
- Correct errors
- Use similar calculations to improve accuracy
- Re-analyze the sample extract, if available, to determine if results can be improved
- Re-process and re-analyze additional sample material, if available

A summary of the QA/QC results will be included with the Annual Report. It will include the basis for any qualification of sample results, and detail any analysis or sample problems and the potential effects on the results.

6.3 DATA MANAGEMENT AND EVALUATION

Data collected for the Permit monitoring will consist of the following:

Rainfall

Runoff

Field Measurements

Field observations

Laboratory data

QA/QC data

All data collected will be held in a centralized location and held under the control of project management. Project management will be responsible for tracking the analytical process to assure that laboratories are meeting the required turnaround times and are providing a complete deliverable package. Project management receives the original hard copy from the laboratory, verifies completeness and logs the date of receipt. A copy of the data set will be filed in the project management central filing system with all other original project documentation in order to maintain complete project records, and another copy is provided to the designated Database Manager.

Laboratories will be requested to provide data in both hard copy and electronic formats. The form of electronic submittals will be provided to the laboratories to ensure that the files can be imported into the project database with a minimum of editing. A relational database will be used for all data. All laboratory data will be maintained and managed with Microsoft Excel and Microsoft Access.

Files from the storm water monitoring stations will also be stored in the same database system and linked to the laboratory database. The data logger files will include rainfall, sampling and discharge data.

Site characteristics will be stored in a separate file and linked to both the chemical and datalogger files in order to enable useful data queries.

On an annual basis, data collected will be used to calculate EMCs and pollutant load estimates. Pollutant loads, the quantities of pollutants washed off land surfaces by storm water runoff, can be estimated by the use of a USGS empirical model (Lopes et al., 1995). In order to better understand the quality of storm water in regional urban areas, the FCD and USGS in the early 1990's initiated the development of a sampling database for the Phoenix Metropolitan Area. This database allowed the USGS to develop relationships in terms of empirical equations between chemical concentrations and physical parameters describing storm characteristics and land use. The resultant equations use user-designed variables to estimate pollutant loads on a pollutant-specific basis. The variables in the equation include the following: total storm rainfall; drainage area; impervious area; industrial land use; commercial land use; undeveloped land use; storm intensity; and mean rainfall.

An advantage of using the USGS model to estimate pollutant loads is that the empirical models are developed using site data and time is saved in not having to perform calibrations. Another advantage is that the USGS model does not assume that the pollutant loads are directly related to land use. Data has shown that only some constituent loads are dependent on land use (Lopes et al., 1995). A limitation of the USGS model is that it is not time-dependent and it therefore cannot be used to evaluate changes in constituent loads over time. The list of constituents includes those listed in 40 CFR Section 122.26(d)(2)(iii)(B).

The USGS Model equations described by Lopes et al. (1995) were developed to estimate pollutant loads for only individual storms with a given rainfall. These equations have been incorporated into the City of Scottsdale's GIS Management System. For each storm an average pollutant load will be estimated by using mean storm rainfall depth applied to the USGS Model equations. This will then allow for the estimation of EMCs for individual City basins by dividing the average load by the total runoff volume. To calculate an annual pollutant load, the calculated EMCs will be multiplied by the estimated annual runoff volume for each basin, which is determined by multiplying the annual rainfall for the region by the basin area and a weighted runoff coefficient.

6.4 REPORTING

In compliance with Permit No. AZS000020, the City of Scottsdale will submit an annual report summarizing activities of the previous year, including a summary of the monitoring data collected for the previous year. This summary will include calculated EMCs and annual pollutant load estimates, which in turn can be used to assess water quality improvements or degradation. Annual reports are due on September 30 of each year starting with the Year 2000. Monitoring data collected through June 30 of each year will be included in the Annual Report.

Specific items to be included in the monitoring portion of the Annual Report are as follows:

- Cumulative rainfall by event
- Annual rainfall for each monitored basin
- Runoff coefficient for each monitored basin
- Rainfall intensities
- Runoff volumes for each monitored event
- Annual runoff volumes for each monitored basin
- Hydrographs for each station and for each monitored event
- Field measurements for temperature, pH and conductivity
- Field Observations
- All laboratory data summarized in an organized format
- QA/QC data and report
- Calculated EMCs
- Annual pollutant load estimates

7.0 INDUSTRIAL DISCHARGE REQUIREMENTS

The purpose of this section is to establish a program for review and inspection of industrial facilities, including those covered under the MSGP. The program for the inspection of industrial facilities is described. The program will be prioritized to the facilities that pose the greatest potential threat to storm water quality.

7.1 General Guidelines for Industrial Facilities

The City has developed a number of general guidelines and requirements for the minimization of storm water pollution from industrial facilities. In addition, a development plan tracking system, the CDS, has been developed to track industrial facilities.

7.1.1 Required Measures

The following areas will be reviewed by Quality Compliance Division to assure that industrial facilities mitigate the impacts of storm water runoff on the environment:

- A 6-ft separation must be maintained between sanitary and storm sewer lines. No major landscaping features are permitted within 6 ft of water or sewer lines.

7.1.2 Additional Measures

Although such additional measures are not currently required, the City has identified a number of such measures that industrial facilities will be encouraged to implement and to include in Storm Water Pollution Prevention Plans where a plan is required. These include:

- Industrial facilities should provide litter/debris control and vacuum sweep all parking lots with 100 or more spaces monthly.
- Industrial Park management or industrial facility operators will be encouraged to perform regular catch basin cleaning and maintenance, stenciling of storm drains, etc.
- Industrial facilities will be encouraged to use covered bins or cover waste storage/ recycling areas.
- Uncovered paved material loading and unloading areas and material storage and handling areas should have litter/debris controls and be vacuum swept monthly.
- Complying with Federal NPDES Multi-Sector General Permit requirements for storm water discharges associated with industrial activity.
- Facilities should minimize pollution of storm water runoff from loading/unloading areas.
- Facilities should prevent pollution of storm water runoff from vehicle/equipment washing activities. Conduct vehicle/equipment maintenance indoors or in a managed area.

- Significant sources of oil and grease (auto shops, foodservice, etc.) should strengthen relevant controls.

7.2 Review of MSGP SWPPPs

General permits for storm water discharges associated with industrial activity require the submittal of a NOI prior to the authorization of such discharges. Operators of storm water discharges associated with industrial activity that discharge through Scottsdale's municipal separate storm sewer system must notify the City of the discharge and submit a copy of their NOI to the Water Resources Department. Prior to submittal of the NOI, a Storm Water Pollution Prevention Plan (SWPPP) for the facility must be developed. The SWPPP is not included with the NOI submitted to the EPA, but will be required to be included with the NOI submitted to the City. The City will then review the plan for completeness using the form in Appendix 7-1.

NOIs to be covered under the general permit and NOT to terminate coverage under this permit should be sent to the following addresses:

Storm Water Notice of Intent (4203)
401 M Street, S.W.
Washington, DC 20460

and

The City of Scottsdale
Floodplain and Stormwater Management Division
7447 E. Indian School Road
Scottsdale AZ, 85251
Attn: Bill Erickson

The types of industries listed in Table 7-1 must apply for coverage under the MSGP.

Table 7-1

Industry Required to Obtain Stormwater Permit

40 CFR 122.26(b)(14) Subpart	Description
(i)	Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutants effluent standards under 40 CFR. Subchapter N [except for facilities which are exempt under category (xi)].
(ii)	Facilities classified as: SIC 24 .....Lumber and Wood Products (except 2434) SIC 24 .....Paper and Allied Products (except 265 and 267) SIC 28 .....Chemicals and Allied Products (except 283 and 285) SIC 29 ..... Petroleum and Coal Products SIC 311 .....Leather Tanning and Finishing SIC32 ..... Stone, Clay, and Glass Products (except 323) SIC 33 .....Primary Metal Industries SIC 3441..... Fabricated Structural Metal SIC 373 ..... Ship and Boat Building and Repairing
(iii)	Facilities classified as SIC 10 through 14, including active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts, or waste products located on the site of such operations. SIC 10 ..... Metal Mining SIC 11 ..... Anthracite Mining SIC 12 .....Coal Mining SIC 13 ..... Oil and Gas Extraction SIC 14 ..... Nonmetallic Minerals, except Fuels
(iv)	Hazardous waste treatment storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of the Resource Conservation and Recovery Act (RCRA).
(v)	Landfills, land application sites, and open dumps that receive or have received any industrial wastes including those that are subject to regulations under subtitle Or RCRA.

Table 7-1 (continued)

40 CFR 122.26(b)(14) Subpart	Description
(vi)	Facilities involved in the recycling of material including metal scrapyards, battery reclaimers, salvage yards, and automobile junkyards, **including but not limited** to those classified as: SIC 5051 ..... Motor Vehicle Parts, Used SIC 5093 ..... Scrap and Waste Materials
(vii)	Steam electric power generating facilities, including coal handling site.
(viii)	Transportation facilities which have vehicle maintenance shops, equipment cleaning operations, or airport de-icing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fuelling, and lubrication), equipment cleaning operations, or airport de-icing operations, or which are otherwise listed in another category, are included. SIC 40 ..... Railroad Transportation SIC 41 ..... Local and Suburban Transit SIC 42 ..... Motor Freight and Warehousing (except 4221-25) SIC 43 ..... Water Transportation SIC 45 ..... Air Transportation SIC 5171 ..... Petroleum bulk Stations and Terminals
(ix)	Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including lands dedicated to the disposal of the sewage sludge that are located within the confines of the facility, with a design flow of 1.0 million gallons per day or more, or are required to have an approved pretreatment program under 40 CFR Part 403. Not included are farm lands, domestic gardens, or lands used for sludge management where the sludge is beneficially reused and which are not physically located in the confines of the facility, or areas that are in compliance with Section 405 of the CWA.
(x)	Construction activity including clearing, grading, and excavation activities except operations that result in the disturbance of less than 5 acres of total land area and those that are not part of a larger common plan of development or sale.

Table 7-1 (continued)

40 CFR 122.26(b)(14) Subpart	Description
(xi)	Facilities under the following SICs [which are not otherwise included in categories (ii) – (x)], including only storm water discharge where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, byproducts, or industrial machinery are exposed to storm water. SIC 20 .....Food and Kindred Products SIC 21 ..... Tobacco Products SIC 22 ..... Apparel and Other Textile Products SIC 2434 .....Wood Kitchen Cabinets SIC 25 ..... Paperboard Containers and Boxes SIC 267 .....Converted Paper and Paper Board Products (except containers and boxes) SIC 27 .....Printing and Publishing SIC 283 ..... Drugs SIC 285 ..... Paints, Varnishes, Lacquer, Enamels SIC 30 .....Rubber and Miscellaneous Plastic Products SIC 31 .....Leather and Leather Products (except 31) SIC 323 .....Products of Purchased Glass SIC 34 ..... Fabricated Metal Products (except 3441) SIC 35 ..... Industrial Machinery and Equipment (except Electrical) SIC 36 ..... Electronic and Other Electric Equipment SIC 37 .....Transportation Equipment (except 373) SIC 38 ..... Instruments and Related Products SIC 39 ..... Miscellaneous Manufacturing Industries SIC 4221 .....Farm Products Warehousing and Storage SIC 4222 .....Refrigerated Warehousing and Storage SIC 4225 .....General Warehousing and Storage

The storm water pollution prevention plan (SWPPP) requirements are intended to facilitate a process whereby the operator of the industrial facility thoroughly evaluates potential pollution sources at the site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff. There are specific requirements in the general permit that vary according to the type of industrial activity; however, there are a number of requirements that are common to all facility types and should be reviewed. Industry specific information is available on the Arizona Department of Environmental Quality website at:

<http://www.adeq.state.az.us/environ/water/permits/npdes.html>.

The general process for developing the SWPPP involves the following four steps:

1. Formation of a team of qualified plant personnel who will be responsible for preparing the plan and assisting the plant manager in its implementation

2. Assessment of potential storm water pollution sources

3. Selection and implementation of appropriate management practices and controls

4. Periodic evaluation of the effectiveness of the plan to prevent storm water contamination and comply with the terms and conditions of this permit; authorization to include best management practices in the permit to control or abate the discharge of pollutants is derived from 40 CFR 144.45(k).

Two classes of management practices are generally employed at industries to control the non-routine discharge of pollutants from sources such as storm water runoff, drainage from raw material storage and waste disposal areas, and discharges from places where spills or leaks have occurred. The first class of management practices includes those that are low in cost, applicable to a broad class of industries and substances, and widely considered essential to a good pollution control program. Some examples of practices in this class are good housekeeping, employee training, and spill response and prevention procedures. The second class includes management practices that provide a second line of defense against the release of pollutants. This class addresses containment, mitigation, and cleanup.

Experience with these practices and controls has shown that they can be used in permits to reduce pollutants in storm water discharges in a cost-effective manner. EPA has developed guidance entitled "Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices," September 1992, to assist permittees in developing and implementing pollution prevention measures.

7.2.1 Pollution Prevention Team

As a first step in the process of developing and implementing a storm water pollution prevention plan, permittees are required to identify a qualified individual or team of individuals to be responsible for developing the plan and assisting the facility or plant manager in its implementation. When selecting members of the team, the plant manager should draw on the expertise of all relevant departments within the plant to ensure that all aspects of plant operations are considered when the plan is developed. The plan must clearly describe the responsibilities of each team member as they relate to specific components of the plan. In addition to enhancing the quality of communication between team members and other personnel, clear delineation of responsibilities will ensure that every aspect

of the plan is addressed by a specified individual or group of individuals. Pollution Prevention Teams may consist of one individual where appropriate (e.g., in certain small businesses with limited storm water pollution potential).

7.2.2 Description of Potential Pollution Sources

Each SWPPP must describe activities, materials, and physical features of the facility that may contribute significant amounts of pollutants to storm water runoff or, during periods of dry weather, result in pollutant discharges through the separate storm sewers or storm water drainage systems that drain the facility. This assessment of storm water pollution risk will support subsequent efforts to identify and set priorities for necessary changes in materials, materials management practices, or site features, as well as aid in the selection of appropriate structural and nonstructural control techniques. Some operators may find that significant amounts of pollutants are running onto the facility property. Such operators should identify and address the contaminated run-on in the storm water pollution prevention plan. If the run-on cannot be addressed or diverted by the permittee, the permitting authority should be notified. If necessary, the permitting authority may require the operator of the adjacent facility to obtain a permit.

Although there are specific requirements for certain industries, the SWPPs generally must describe the following elements:

7.2.2.1 Drainage

The plan must contain a map of the site that shows the location of outfalls covered by the permit (or by other NPDES permits), the pattern of storm water drainage, an indication of the types of discharges contained in the drainage areas of the outfalls, structural features that control pollutants in runoff, surface water bodies (including wetlands), places where significant materials are exposed to rainfall and runoff, and locations of major spills and leaks that occurred in the 3 years prior to the date of the submission of a NOI to be covered under this permit. The map also must show areas where the following activities take place: fueling, vehicle and equipment maintenance and/or cleaning, loading and unloading, material storage (including tanks or other vessels used for liquid or waste storage), material processing, and waste disposal. For areas of the facility that generate storm water discharges with a reasonable potential to contain significant amounts of pollutants, the map must indicate the probable direction of storm water flow and the pollutants likely to be in the discharge. Flows with a significant potential to cause soil erosion must also be identified. In order to increase the readability of the map, the inventory of the types of discharges contained in each outfall may be kept as an attachment to the site map.

7.2.2.2 Inventory of Exposed Materials

Facility operators are required to carefully conduct an inspection of the site and related records to identify significant materials that are or may be exposed to storm water. The inventory must address materials that within 3 years prior to the date of the submission of a Notice of Intent (NOI) to be covered under this permit have been handled, stored, processed, treated, or disposed of in a manner to allow exposure to storm water. Findings of the inventory must be documented in detail in the pollution prevention plan. At a minimum, the plan must describe the method and location of onsite storage or disposal; practices used to minimize contact of materials with rainfall and runoff; existing structural and nonstructural

controls that reduce pollutants in runoff; and any treatment the runoff receives before it is discharged to surface waters or a separate storm sewer system. The description must be updated whenever there is a significant change in the types or amounts of materials, or material management practices, that may affect the exposure of materials to storm water.

7.2.2.3 Significant Spills and Leaks

The plan must include a list of any significant spills and leaks of toxic or hazardous pollutants that occurred in the 3 years prior to the date of the submission of a Notice of Intent to be covered under this permit. Significant spills include, but are not limited to, releases of oil or hazardous substances in excess of quantities that are reportable under Section 311 of CWA or Section 102 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Significant spills may also include releases of oil or hazardous substances that are not in excess of reporting requirements and releases of materials that are not classified as oil or a hazardous substance.

The listing should include a description of the causes of each spill or leak, the actions taken to respond to each release, and the actions taken to prevent such spills or leaks in the future. This effort will aid the facility operator as she or he examines existing spill prevention and response procedures and develops any additional procedures necessary to fulfill the requirements of the MSGP.

7.2.2.4 Non-Storm Water Discharges

Each pollution prevention plan must include a certification, signed by an authorized individual, that discharges from the site have been tested or evaluated for the presence of non-storm water discharges. The certification must describe possible significant sources of non-storm water, the results of any test and/or evaluation conducted to detect such discharges, the test method or evaluation criteria used, the dates on which tests or evaluations were performed, and the onsite drainage points directly observed during the test or evaluation. Acceptable test or evaluation techniques include dye tests, television surveillance, observation of outfalls or other appropriate locations during dry weather, water balance calculations, and analysis of piping and drainage schematics.

Except for flows that originate from fire fighting activities, sources of non-storm water that are specifically identified in the permit as being eligible for authorization under the general permit must be identified in the plan. Pollution prevention plans must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water discharge. Where a discharge of a hazardous substance or oil in excess of reporting quantities is caused by a non-storm water discharge (e.g., a spill of oil into a separate storm sewer), that discharge is not authorized and the discharger must report the discharge as required to the EPA and City.

If certification is not feasible, the plan must describe why. For example, access by facility personnel to an outfall, manhole, or other point of access to the conduit that ultimately receives the discharge certification was not feasible. Permittees who cannot certify that discharges have been tested or evaluated must notify the City.

7.2.2.5 Sampling Data

Any existing data on the quality or quantity of storm water discharges from the facility must be described in the plan, including data collected for part 2 of the group application process. These data may be useful for locating areas that have contributed pollutants to storm water. The description should include a discussion of the methods used to collect and analyze the data. Sample collection points should be identified in the plan and shown on the site map.

7.2.2.6 Summary of Potential Pollutant Sources

The description of potential pollution sources culminates in a narrative assessment of the risk potential that identified site sources of pollution pose to storm water quality. This assessment should clearly point to activities, materials, and physical features of the facility that have a reasonable potential to contribute significant amounts of pollutants to storm water. Any such activities, materials, or features must be addressed by the measures and controls subsequently described in the plan. In conducting the assessment, the facility operator must consider the following activities: fueling areas, liquid storage tanks, vehicle maintenance or cleaning areas, loading and unloading operations; outdoor storage activities; outdoor manufacturing or processing activities; significant dust or particulate generating processes; and onsite waste disposal practices. The assessment must list any significant pollution sources at the site and identify the pollutant parameter or parameters (i.e., biochemical oxygen demand, suspended solids, etc.) associated with each source.

The plan should include a materials inventory consisting of

- Description of significant materials handled, treated, stored, or disposed of such that exposure to storm water occurred in the last 3 yr
- Description of the method and location of storage or disposal
- Current list of significant material exposed to storm water
- List of significant spills and leaks that occurred in the 3 yr prior to the effective date of the permit.
- Description of areas with high potential for significant soil erosion

7.2.3 Measures and Controls

Following completion of the source identification and assessment phase, the permit requires the permittee to evaluate, select, and describe the pollution prevention measures, best management practices (BMPs), and other controls that will be implemented at the facility. BMPs include processes, procedures, schedules of activities, prohibitions of practices, and other management practices that prevent or reduce the discharge of pollutants in storm water runoff.

The implementation of pollution prevention measures and BMPs that reduce possible pollutant discharges at the source should be emphasized. Source reduction measures include, among others, preventive maintenance, chemical substitution, spill prevention, good housekeeping, training, and proper materials management. Where such practices are not appropriate to a particular source or do

not effectively reduce pollutant discharges, the use of source control measures and BMPs such as material segregation or covering, water diversion, and dust control may be implemented. Like source reduction measures, source control measures and BMPs are intended to keep pollutants out of storm water. The remaining classes of BMPs, which involve recycling or treatment of storm water, allow the reuse of storm water or attempt to lower pollutant concentrations prior to discharge.

The pollution prevention plan must discuss the reasons why each selected control or practice is appropriate for the facility and how each will address one or more of the potential pollution sources identified in the plan. The plan also must include a schedule specifying the time or times during which each control or practice will be implemented. In addition, the plan should discuss ways in which the controls and practices relate to one another and, when taken as a whole, produce an integrated and consistent approach for preventing or controlling potential storm water contamination problems. The permit requirements included for the various industry sectors generally require that the portion of the plan that describes the measures and controls address the following minimum components.

When "minimize/reduce" is used relative to pollution prevention plan measures, the objective is to consider and implement best management practices that will result in an improvement over the baseline condition as it relates to the levels of pollutants identified in storm water discharges with due consideration to economic feasibility and effectiveness.

7.2.3.1 Good Housekeeping

Good housekeeping involves using practical, cost-effective methods to identify ways to maintain a clean and orderly facility and keep contaminants out of separate storm sewers. It includes establishing protocols to reduce the possibility of mishandling chemicals or equipment and training employees in good housekeeping techniques. These protocols must be described in the plan and communicated to appropriate plant personnel.

7.2.3.2 Preventive Maintenance

Permittees must develop a preventive maintenance program that involves regular inspection and maintenance of storm water management devices and other equipment and systems. The program description should identify the devices, equipment, and systems that will be inspected; provide a schedule for inspections and tests; and address appropriate adjustment, cleaning, repair, or replacement of devices, equipment, and systems. For storm water management devices such as catch basins and oil/water separators, the preventive maintenance program should provide for periodic removal of debris to ensure that the devices are operating efficiently. For other equipment and systems, the program should reveal and enable the correction of conditions that could cause breakdowns or failures that may result in the release of pollutants.

7.2.3.3 Spill Prevention and Response Procedures

Based on an assessment of possible spill scenarios, permittees must specify appropriate material handling procedures, storage requirements, containment or diversion equipment, and spill cleanup procedures that will minimize the potential for spills and in the event of a spill enable proper and timely response. Areas and activities that typically pose a high risk for spills include loading and unloading areas, storage areas, process activities, and waste disposal activities. These activities and areas, and their accompanying drainage points, must

be described in the plan. For a spill prevention and response program to be effective, employees should clearly understand the proper procedures and requirements and have the equipment necessary to respond to spills.

7.2.3.4 Inspections

In addition to the comprehensive site evaluation, facilities are required to conduct periodic inspections of designated equipment and areas of the facility. When required, qualified personnel must be identified to conduct inspections at appropriate intervals specified in the plan. A set of tracking or follow-up procedures must be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections must be maintained. These periodic inspections are different from the comprehensive site evaluation, even though the former may be incorporated into the latter. Equipment, area, or other inspections are typically visual and are normally conducted on a regular basis, e.g., daily inspections of loading areas. Requirements for such periodic inspections are specific to each industrial sector, whereas the comprehensive site compliance evaluation is required of all industrial sectors. Area inspections help ensure that storm water pollution prevention measures (e.g., BMPs) are operating and properly maintained on a regular basis. The comprehensive site evaluation is intended to provide an overview of the entire facility's pollution prevention activities.

7.2.3.5 Employee Training

The pollution prevention plan must describe a program for informing personnel at all levels of responsibility of the components and goals of the storm water pollution prevention plan. The training program should address topics such as good housekeeping, materials management, and spill response procedures. Where appropriate, contractor personnel also must be trained in relevant aspects of storm water pollution prevention. A schedule for conducting training must be provided in the plan. Annual training should be considered a minimum level; however, more frequent training may be necessary at facilities with high turnover of employees or where employee participation is essential to the storm water pollution prevention plan.

7.2.3.6 Record Keeping and Internal Reporting Procedures

The pollution prevention plan must describe procedures for developing and retaining records on the status and effectiveness of plan implementation. At a minimum, records must address spills, monitoring, and inspection and maintenance activities. The plan also must describe a system that enables timely reporting of storm water management-related information to appropriate plant personnel.

7.2.3.7 Sediment and Erosion Control

The pollution prevention plan must identify areas that, due to topography, activities, soils, cover materials, or other factors have a high potential for significant soil erosion. The plan must identify measures that will be implemented to limit erosion in these areas.

7.2.3.8 Management of Runoff

> The plan must contain a narrative evaluation of the appropriateness of traditional storm water management practices (i.e., practices other than those that control pollutant sources) that divert, infiltrate, reuse, or otherwise manage storm water runoff so as to reduce the discharge of pollutants. Appropriate measures may include, among others, vegetative swales, collection and reuse of storm water, inlet controls, and infiltration devices.

Based on the results of the evaluation, the plan must identify practices that the permittee determines are reasonable and appropriate for the facility. The plan also should describe the particular pollutant source area or activity to be controlled by each storm water management practice. Reasonable and appropriate practices must be implemented and maintained according to the provisions prescribed in the plan.

In selecting storm water management measures, it is important to consider the potential effects of each method on other water resources, such as ground water. Although storm water pollution prevention plans primarily focus on storm water management, facilities must also consider potential ground water pollution problems and take appropriate steps to avoid adversely impacting ground water quality. For example, if the water table is unusually high in an area, an infiltration pond may contaminate a ground water source unless special preventive measures are taken.

7.2.4 Comprehensive Site Compliance Evaluation

The permit requires that the storm water pollution prevention plan describe the scope and content of the comprehensive site evaluations that qualified personnel will conduct to 1) confirm the accuracy of the description of potential pollution sources contained in the plan, 2) determine the effectiveness of the plan, and 3) assess compliance with the terms and conditions of the permit. Note that the comprehensive site evaluations are not the same as periodic or other inspections described for certain industries. However, in the instances when frequencies of inspections and the comprehensive site compliance evaluation overlap they may be combined allowing for efficiency, as long as the requirements for both types of inspections are met.

The plan must indicate the frequency of comprehensive evaluations, which must be at least once a year, except where comprehensive site evaluations are shown in the plan to be impractical for inactive mining sites, due to remote location and inaccessibility. The individual or individuals who will conduct the comprehensive site evaluation must be identified in the plan and should be members of the pollution prevention team. Material handling and storage areas and other potential sources of pollution must be visually inspected for evidence of actual or potential pollutant discharges to the drainage system. Inspectors also must observe erosion controls and structural storm water management devices to ensure that each is operating correctly. Equipment needed to implement the pollution prevention plan, such as that used during spill response activities, must be inspected to confirm that it is in proper working order.

The results of each comprehensive site evaluation must be documented in a report signed by an authorized company official. The report must describe the scope of the comprehensive site evaluation, the personnel making the comprehensive site evaluation, the date(s) of the comprehensive site evaluation, and any major observations relating to implementation of the storm water pollution prevention plan. Comprehensive site evaluation reports must be retained for at least 3 years after the date of the evaluation.

Based on the results of each comprehensive site evaluation, the description in the plan of potential pollution sources and measures and controls must be revised as appropriate within 2 weeks after each comprehensive site evaluation. Changes in procedural operations must be implemented on the site in a timely manner for non-structural measures and controls not more than 12 weeks after completion of the comprehensive site evaluation. Procedural changes that require construction of structural measures and controls are allowed up to 3 years for implementation.

7.3 Special Requirements for Storm Water Discharges Associated with Industrial Activity from Facilities Subject to EPCRA Section 313 Requirements.

There are special requirements for permittees subject to reporting requirements under Section 313 of the EPCRA (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA)). EPCRA Section 313 requires operators of certain facilities that manufacture (including import), process, or otherwise use listed toxic chemicals to report annually their releases of those chemicals to any environmental media. Listed toxic chemicals include more than 500 chemicals and chemical classes listed at 40 CFR Part 372 (including the recently added chemicals published November 30, 1994).

The special requirements for facilities subject to reporting requirements under EPCRA Section 313 for a water priority chemical, except those that are handled and stored only in gaseous or non-soluble liquids or solids (at atmospheric pressure and temperature) state that storm water pollution prevention plans, in addition to the baseline requirements for plans, must contain special provisions addressing areas where Section 313 water priority chemicals are stored, processed, or otherwise handled. These requirements reflect the Best Available Technology for controlling discharges of water priority chemicals in storm water. The permit provides that appropriate containment, drainage control, and/or diversionary structures must be provided for such areas.

An exemption from the special provisions for Section 313 facilities will be granted if the facility can certify in the pollution prevention plan that all water priority chemicals handled or used are gaseous or non-soluble liquids or solids (at atmospheric pressure and temperature). At a minimum, one of the following preventive systems or its equivalent must be used: curbing, culverting, gutters, sewers, or other forms of drainage control to prevent or minimize the potential for storm water run-on to come into contact with significant sources of pollutants; or roofs, covers, or other forms of appropriate protection to prevent storage piles from exposure to storm water and wind.

In addition, the permit establishes requirements for priority areas of the facility. Priority areas of the facility include the following: liquid storage areas where storm water comes into contact with any equipment, tank, container, or other vessel used for Section 313 water priority chemicals; material storage areas for Section 313 water priority chemicals other than liquids; truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals; and areas where Section 313 water priority chemicals are transferred, processed, or otherwise handled.

The permit provides that drainage from priority areas should be restrained by valves or other positive means to prevent the discharge of a spill or other excessive leakage of Section 313 water priority chemicals. Where containment units are employed, such units may be emptied by pumps or ejectors; however, these must be manually activated. Flapper-type drain valves must not be used to drain containment areas, as these will not effectively control spills. Valves used for the drainage of containment areas should, as far as is practical, be of manual, open-and-closed design. If facility drainage does not meet these requirements, the final discharge conveyance of all in-facility storm

sewers must be equipped to be equivalent with a diversion system that could, in the event of an uncontrolled spill of Section 313 water priority chemicals, return the spilled material or contaminated storm water to the facility. Records must be kept of the frequency and estimated volume (in gallons) of discharges from containment areas.

Additional special requirements are related to the types of industrial activities that occur within the priority area. These requirements are summarized below:

(1) Liquid Storage Areas. Where storm water comes into contact with any equipment, tank, container, or other vessel used for Section 313 water priority chemicals, the material and construction of tanks or containers used for the storage of a Section 313 water priority chemical must be compatible with the material stored and conditions of storage, such as pressure and temperature. Liquid storage areas for Section 313 water priority chemicals must be operated to minimize discharges of Section 313 chemicals. Appropriate measures to minimize discharges of Section 313 chemicals may include secondary containment provided for at least the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation, a strong spill contingency and integrity testing plan, and/or other equivalent measures. A strong spill contingency plan would typically contain, at a minimum, a description of response plans, personnel needs, and methods of mechanical containment (such as use of sorbents, booms, collection devices, etc.), steps taken for removal of spill chemicals or materials, and procedures to ensure access to and availability of sorbents and other equipment. The testing component of the plan would provide for conducting integrity testing of storage tanks at set intervals such as once every 5 years, and conducting integrity and leak testing of valves and piping at a minimum frequency, such as once per year. In addition, a strong plan would include a written and actual commitment of manpower, equipment and materials required to comply with the permit and to expeditiously control and remove any quantity of spilled or leaked chemicals that may result in a toxic discharge.

(2) Other Material Storage Areas. Material storage areas for Section 313 water priority chemicals other than liquids that are subject to runoff, leaching, or wind must incorporate drainage or other control features to minimize the discharge of Section 313 water priority chemicals by reducing storm water contact with Section 313 water priority chemicals.

(3) Truck and Rail Car Loading and Unloading Areas. Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals must be operated to minimize discharges of Section 313 water priority chemicals. Appropriate measures to minimize discharges of Section 313 chemicals may include the placement and maintenance of drip pans (including the proper disposal of materials collected in the drip pans) where spillage may occur (such as hose connections, hose reels, and filler nozzles) when making and breaking hose connections; a strong spill contingency and integrity testing plan; and/or other equivalent measures.

(4) Other Transfer, Process, or Handling Areas. Processing equipment and materials handling equipment must be operated to minimize discharges of Section 313 water priority chemicals. Materials used in piping and equipment must be compatible with the substances handled. Drainage from process and materials handling areas must minimize storm water contact with Section 313 water priority chemicals. Additional protection such as covers or guards to prevent exposure to wind, spraying or releases from pressure relief vents to prevent a discharge of Section 313 water priority chemicals to the drainage system, and overhangs or door skirts to enclose trailer ends at truck loading/unloading docks must be provided as appropriate. Visual inspections or leak tests must be

provided for overhead piping conveying Section 313 water priority chemicals without secondary containment.

Facilities may provide a certification that all Section 313 water priority chemicals handled and/or stored onsite are only in gaseous or non-soluble liquid or solid (at atmospheric pressure and temperature) forms in lieu of the additional requirements. By allowing such a certification, the application of the special requirements of the permit will be limited to those facilities with 313 water priority chemicals that truly have the potential to contaminate storm water discharges associated with industrial activity.

Because of the potential for serious environmental impacts from these chemicals, a higher level of preventive maintenance and good housekeeping, facility security, and employee training should be included in the SWPPP.

Finally, facilities subject to EPCRA Section 313 requirements must amend the pollution prevention plan when significant modifications are made to the facility, such as the addition of material handling areas or chemical storage units.

7.4 Inspections of Industrial Dischargers

The Water Resources Department will assume primary responsibility for administration and management of the industrial inspections and monitoring portions of the City's NPDES storm water program will be the Department of Water and Wastewater. It will be the responsibility of that department to oversee facility inspections, storm water monitoring activities, and reporting requirements. The City may review inspection and monitoring results to determine if corrective action will be recommended to the EPA. A system has been established for tracking the SWPPP reviews and facility inspections. This information will be used for submission in the City's annual report.

The City also may monitor industrial facilities that are not regulated by NPDES sampling requirements. The inspection results and monitoring data will be reviewed by the City, who will determine if corrective action through its permit term monitoring program, field screening program, or storm sewer investigations is required to comply with the City's NPDES storm water permit. If corrective action has not been taken, as determined necessary by the City, the City will inform the EPA to ensure compliance with the permit responsibilities set forth in the City's NPDES permit.

Several industrial facilities in the City are governed by the monitoring, reporting, and inspection requirements of their own NPDES storm water permit. The storm water leaving these sites ultimately reaches the City storm sewer system; therefore, the quality of this water must also be in compliance with the goals contained in the City's MS4 NPDES storm water permit. Current NPDES permit holders include:

- Rolamech
- Calcomp
- Microsemi
- Federal Express

- Motorola
- Paradise Valley Water Company
- Scottsdale Corporation Yard
- Scottsdale Municipal Airport
- Gainey Ranch Water Reclamation Facility

The City will ensure that these facilities comply with storm water regulations that prevent pollutants from entering the storm drain system and that SWPPPs for these facilities are updated regularly.

In order to provide a tool for evaluating the effectiveness of the pollution prevention plan, the majority of industries covered under the MSGP must perform quarterly visual examinations of storm water discharges. These visual examinations will assist with the evaluation of the pollution prevention plan. This section provides a general description of the monitoring and reporting requirements. The visual examination provides a simple, low cost means of assessing the quality of storm water discharge with immediate feedback. Most facilities are required to conduct a quarterly visual examination of storm water discharges associated with industrial activity from each outfall, except discharges exempted under the representative discharge provision. The visual examination of storm water outfalls should include any observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, or other obvious indicators of storm water pollution. No analytical tests are required to be performed on these samples.

The examination of the sample must be made in well-lit areas. The visual examination is not required if there is insufficient rainfall or runoff or if hazardous conditions prevent sampling. Whenever practicable, the same individual should carry out the collection and examination of discharges throughout the life of the permit to ensure the greatest degree of consistency possible in recording observations. Grab samples for the examination shall be collected within the first 30 min (or as soon thereafter as practical, but not to exceed 1 hr) of when the runoff begins discharging. Reports of the visual examination include: the examination date and time, examination personnel, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. The visual examination reports must be maintained on site with the pollution prevention plan.

When conducting a storm water visual examination, the pollution prevention team, or team member, should attempt to relate the results of the examination to potential sources of storm water contamination on the site. For example, if the visual examination reveals an oil sheen, the facility personnel (preferably members of the pollution prevention team) should conduct an inspection of the area of the site draining to the examined discharge to look for obvious sources of spilled oil, leaks, etc. If a source can be located, then this information allows the facility operator to immediately conduct a cleanup of the pollutant source, and/or to design a change to the pollution prevention plan to eliminate or minimize the contaminant source from occurring in the future.

To be most effective, the personnel conducting the visual examination should be fully knowledgeable about the storm water pollution prevention plan, the sources of contaminants on the site, the industrial activities conducted that are exposed to storm water, and the day-to-day operations that may cause unexpected pollutant releases.

Other examples include; if the visual examination results in an observation of floating solids, the personnel should carefully examine the solids to see if they are raw materials, waste materials or other known products stored or used at the site. If an unusual color or odor is detected, personnel should attempt to compare the color or odor to the colors or odors of known chemicals and other materials used at the facility. If the examination reveals a large amount of settled solids, the personnel may check for unpaved, unstabilized areas or areas of erosion. If the examination results in a cloudy sample that is very slow to settle-out, the personnel should evaluate the site that is draining to the discharge point for fine particulate material, such as dust, ash, or other pulverized, ground, or powdered chemicals.

If the visual examination results in a clean and clear sample of the storm water discharge, this may indicate that no visible pollutants are present. This would be an indication of a high quality result, however, the visual examination will not provide information about dissolved contamination. If the facility is in a sector or subsector that is required to conduct analytical (chemical) monitoring, the results of the chemical monitoring, if conducted on the same sample, would help to identify the presence of any dissolved pollutants and the ultimate effectiveness of the pollution prevention plan. If the facility is not required to conduct analytical monitoring, it may do so if it chooses to confirm the cleanliness of the sample.

While personnel are conducting the visual examinations, they should constantly be attempting to relate any contamination that is observed in the samples to the sources of pollutants on site. When contamination is observed, the personnel should be evaluating whether or not additional BMPs should be implemented in the pollution prevention plan to address the observed contaminant, and if BMPs have already been implemented, evaluating whether or not these are working correctly or need maintenance. Permittees may also conduct more frequent visual examinations than the minimum quarterly requirement, if they so choose. By doing so, they may improve their ability to ascertain the effectiveness of their plan. Using this guidance, and employing a strong knowledge of the facility operations, facility operators should be able to maximize the effectiveness of their storm water pollution prevention efforts through conducting visual examinations which give direct, frequent feedback to the facility operator or pollution prevention team on the quality of the storm water discharge.

This quick and simple assessment will help the facility operator determine the effectiveness of his/her plan on a regular basis at very little cost. Although the visual examination cannot assess the chemical properties of the storm water discharged from the site, it will provide meaningful results upon which the facility may act quickly. The visual examination should be conducted at different times than the chemical monitoring. In addition, more frequent visual examinations can be conducted if the permittee so chooses. In this way, better assessments of the effectiveness of the pollution prevention plan can be achieved. The frequency of this visual examination will also allow for timely adjustments to be made to the plan. If BMPs are performing ineffectively, corrective action must be implemented. A set of tracking or follow-up procedures must be used to ensure that appropriate actions are taken in response to the examinations. The visual examination should be performed by members of the pollution prevention team. This hands-on examination will enhance the staff's understanding of the site's storm water problems and the effects of the management practices that are included in the plan.

In addition to the inspections by the facility operator, the City will inspect permitted facilities annually. Other industrial facilities will be inspected as appropriate. The goal of these inspections is to verify compliance with the facility SWPPP. A checklist describing items to be inspected is included in Appendix 7-1.

8.0 ILLICIT DISCHARGE IDENTIFICATION AND ELIMINATION PROGRAM

Illicit discharges are prohibited non-storm water discharges, which enter the storm water system through illicit connections and illegal dumping. An illicit connection is a direct connection to a storm drain that allows non-permissible discharges into the storm water system. Examples include sanitary sewer cross connections, industrial process waters and floor drains. Illegal dumping is the intermittent discharge of pollutants into the storm water conveyance system through either legal connections such as catch basins and drains, or by direct dumping into creeks, streams or channels. This could include the disposal of used motor oil, paint or wash water.

EPA regulations require inspection of outfalls as well as sampling of locations where dry weather flow is present. The requirements for an illicit discharge and illegal-dumping program are described in CFR 40, Part 122.26. The general requirements are as follows:

1. Field Element
   - System inspection
   - Field testing of dry weather flow to follow-up on system inspections
   - Procedures to prevent, contain and respond to spills that may discharge to the storm drain system
2. Regulatory Element
   - A program to enforce ordinances preventing illicit discharges
   - A program to limit infiltration from sanitary sewers to storm drains
3. Education Element
   - A program to promote the public reporting of illicit discharges or illegal dumping
   - Public education programs to facilitate the management and disposal of used oil and toxic materials

The objectives of the City's Illicit Discharge Identification and Elimination Program are to comply with the requirements listed above. Following is a description of the City's program organized by field element, regulatory element and education element. The program is generally referred to as the Illicit Connection/Illegal Discharge IC/ID Program.

8.1 Field Element

A flow chart summarizing the responsibilities of each of the departments involved in the IC/ID program is presented as Figure 8-1.

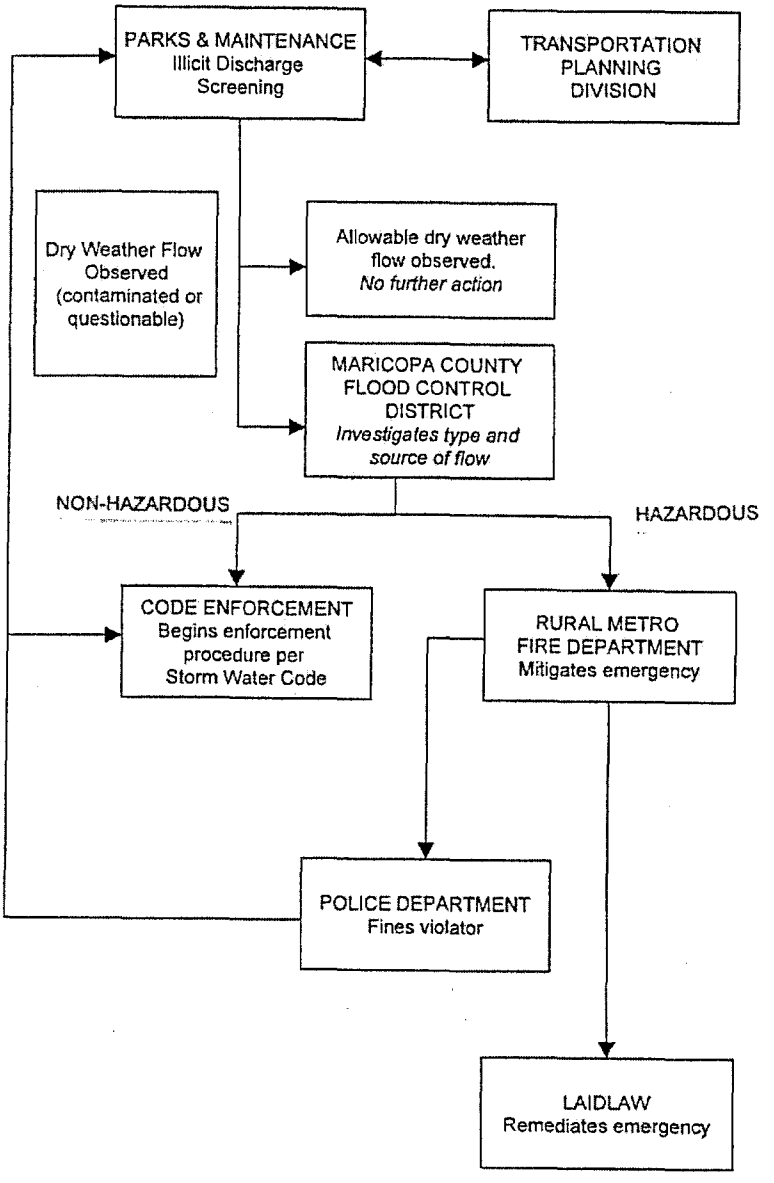

Figure 8-1. Organization of the Illicit Discharge Identification and Elimination Program

Field Screening and Inspection - The Field Services Division will conduct field inspection of the outfalls. A Field Inspection and Documentation Manual is provided in Appendix 8-1. As required by the permit, at a minimum twenty percent of all major outfalls will be screened each year with the entire system screened in 5 yr. The major outfalls, and outfall locations are given in Table 8-1 and Figure 8-2 respectively. If dry weather flow is observed, Maricopa County FCD will be contacted and, as appropriate, two grab samples will be taken during a 24 hour period, with a minimum of four hours between samples, in accordance with the Field Sampling guidelines provided in Appendix 8-2.

If the field sampling personnel determine that a discharge is hazardous, the RMFD will mitigate the emergency, and a hazardous waste contractor will remediate the site. If the discharge is not hazardous and is prohibited, the City will first try to work with the violator to get the issue resolved amicably. If this doesn't work, the Code Enforcement Group in Community Services will be notified and will begin enforcement procedures per the Storm Water Ordinance.

The City's storm drain system is comprised of relatively recent construction and was built and inspected according to strict codes to prohibit cross connections and illegal connections. As a result, the City will only be actively inspecting inlet and outfall areas area for illegal connections; the field screening and sampling program will be used to detect such connections (if any) through identification and testing of non-storm water discharges (see Appendices 8-1 and 8-2).

Spill response – There is a progressive response procedure in place within the City. Any identified illegal or suspected illegal dumping or spill is reported to the Fire Department or the City hotline. The Fire Department is the first line of defense for hazardous situations and has been specifically trained for this function and has the equipment necessary to provide an immediate response. The Floodplain and Stormwater Management Division and the Police Department are also notified and respond immediately after the Fire Department notification. The Floodplain and Stormwater Management Division will ensure an inspector is dispatched to the scene to document the incident using the Field Inspection Manual (Appendix 8-1). Final clean-up is usually completed by a private remediation contractor. In addition, the Arizona Department of Environmental Quality is notified when spills occur in aquatic habitats and the EPA is notified if spills of more than a Reportable Quantity (RQ) occur (see Appendix 8-1, Attachment 1).

Reporting – A record of all incidents of illegal dumping and spills will be retained on file. Incidents will be summarized and reported to the Region 9 in the annual report unless the severity of the incident requires a special report. All complaint responses will be tracked in writing and reported as appropriate to the EPA.

Allowable discharges - The City has determined that on a general basis, the following discharges are not a threat to receiving water quality and are not prohibited from the storm drain system. If contamination is observed in these discharges however, they will be referred to Maricopa County FCD for sampling per the guidance in Appendix 8-2.

A list of Allowable Discharges to the Storm Drain System (if not contaminated) includes:

1. Water line flushing
2. Landscape irrigation
3. Diverted stream flows

Table 8-1

Storm Drain System Outfalls

OUTFALL No.	DESCRIPTION	LOCATION
010090	1-48" diam pipe	300' south of McKellips, 1460' east of Miller
010520	1-24" diam pipe	McKellips Lake
010620	Roadway	Miller Rd 1/4m south of McKellips
020090	1-78" diam pipe	Roosevelt 160' west of 77th St.
020450	1-3'H x 6'W Box	McDowell Rd, 490' east of Miller
020650	Improved Channel	280' south of Roosevelt 230' west of 77th St.
020740	Improved Channel	520' north of Roosevelt, 940' east of Miller
020820	1-18" diam pipe	340' east of Miller, 1270' north of McDowell
030060	Roadway	Scottsdale Rd, 150' south of Roosevelt
030640	Roadway	College Avenue, 150' south of Continental
040070	2-48" diam pipes	Eldorado Park at Miller and Oak
040420	1-15" diam pipe	Murray Lane 500' east of Miller
050160	2-6'H x 6'W boxes	350' south of Thomas, 1290' west of Hayden
051570	1-97" diam pipe	South of Osborn, 1230' west of Hayden
051930	1-48"diam pipe	230' north of Osborn, 1170' west of Hayden
052020	Improved Channel	North of Thomas Rd 1050' west of Hayden
060130	1-96" diam pipe	Corner of 2nd and 78th Streets
060600	1-96" diam pipe	IBW at Indian School, 730' west of Hayden
061020	Roadway	IBW at Hayden Road, 200' south of Glenrosa
061120	1-18" diam pipe	IBW 1040' west of Hayden, 780' south of Indian School Rd
070120	Roadway	Thomas Road 190' west of 56th St
070740	Roadway	56th Street, 200' south of Thomas
070820	Roadway	SWC 56th Street and Windsor Ave.
070920	Roadway	SWC 56th Street and Wilshire
071040	Roadway	West of 56th Street, 150' north of Oak
080070	1-36" diam pipe	260' south of McKellips 1490' east of Miller
080350	Roadway	Roosevelt and 77th St.
080620	2-42" diam pipes	1160' west of Hayden, 1070' north of McKellips
080720	1-42" diam pipe	McKellips Lake
090190	Roadway	Granite Reef 250' south of McKellips
100060	Roadway	Pima and McKellips
110020	1-36" diam pipe	South of Thomas Rd 770' west of Hayden
110200	1-72" diam pipe	140' south of McDowell, 630' east of Miller
110330	1-18" diam pipe	240' west of Coronado, 660' north of McDowell
110430	1-18" diam pipe	Eldorado Park at Miller and Oak
120020	1-18" diam pipe	IBW 220' west of Hayden, 740' south of Indian School Rd
120120	Roadway	Osborn Rd 590' west of Hayden
120240	1-66" diam pipe	620' west of Hayden, 1000' north of Thomas
120440	1-36" diam pipe	North of Thomas Rd 770' west of Hayden
130080	1-72" diam pipe	IBW at SWC Indian School and Hayden
130430	1-24" diam pipe	IBW at South of Glenrosa, 530' east of Hayden
130570	1-60" diam pipe	IBW at Camelback 550' east of Hayden
130720	3-30" diam pipes	IBW at 81st St and Meadowbrook
130830	1-24" diam pipe	IBW 350' east of Hayden, 1130' north of Camelback
140070	1-96" diam pipe	IBW 520' SE of Chaparal and Hayden
140220	1-30" diam pipe	Vista Drive 550' east of Hayden
150090	1-66" diam pipe	260' east of Hayden, 470' south of Jackrabbit
150230	2-12" diam pipes	450' SE of McDonald and Hayden

Table 8-1 (continued)

OUTFALL No.	DESCRIPTION	LOCATION
150530	1-24" diam pipe	370' east of Hayden, 1040' south of McDonald
150720	Improved Channel	McDonald 720' east of Hayden
150820	Roadway	IBW 790' north of Lincoln
150920	Roadway	IBW at Lincoln
151020	1-18" diam pipe	IBW 1/4m. south of Lincoln
160040	Roadway	IBW Hayden and Chapparal
160220	Improved Channel	Chaparal west of Hayden
160320	1-36" diam pipe	IBW 220 west of Hayden 1210' south of Chaparal
160440	1-54" diam pipe	IBW at Camelback and Hayden
170110	2-6.2'H x 8'W boxes	IBW at Camelback and Hayden
171030	Improved Channel	Indian School and 63rd place
180090	2-3.7H x 8.5W boxes	IBW Chapparal 310' west of Hayden
190080	2-4.5H x 9.0W boxes	Hayden and McDonald
190620	1-36" diam pipe	180' west of Hayden, 990' north of Jackrabbit
190720	Roadway	Hayden and Starlight Way
190820	Roadway	Hayden and Jackrabbit
200070	Improved Channel	IBW at the Arizona Canal
200450	Improved Channel	IBW north of Indian Bend Road at Lake Playa
210040	Roadway	Hollyhock and Citrus Ave
210320	Improved Channel	60th St 750' south of Indian School Rd
220140	1-42" diam pipe	Via Nueva and Indian Bend Road
220430	Improved Channel	IBW at Camino Dr and 84th Pl.
220520	4-30" diam pipes	Hayden Road, 780' south of Via de Ventura
220620	Improved Channel	IBW at Lake Santa Fe
230040	1-36" diam pipe	IBW 100' south of McCormick Parkway
230130	1-30" diam pipe	IBW 100' south of McCormick Parkway
230320	1-18" diam pipe	IBW 250' north of McCormick Parkway
230420	1-18" diam pipe	IBW 1700' south of McCormick Parkway
240170	Improved Channel	64th Street, 230 ft. south of Mountain View
240420	Roadway	W. of 60th St, 1/4 m. north of Cholla
240530	Improved Channel	1/4 m. west of 64th St, 360' south of Cholla
250360	3-5'H x 10'W Boxes	Mountain View, 700ft. west of Scottsdale Rd.
253160	2-3'H x 10'W Boxes	Scottsdale Rd and Mountain View
253350	Improved Channel	Mountain View and 67th St.
253450	Improved Channel	Mountain View and 68th St.
253520	Improved Channel	Mountain View, 900ft. west of 70th St.
260630	2-4'H x 12'W Boxes	Via de Ventura, 270ft. east of Via del Lago
265250	Improved Channel	170' south of McCormick Pkway 810' east of Scottsdale Rd
265460	1-36" diam pipe	SEC of Scottsdale and McCormick Pkway
270570	4-5'H x10'W Boxes	IBW 1/4m. north of San Lorenzo Dr.
275440	Improved Channel	IBW at Lake Angela
275560	Improved Channel	IBW 1120' west of Via de Ventura 320' south of Via Marina
275620	Improved Channel	IBW at Lake Heritage
275720	Improved Channel	IBW at Via Rico and Via Linda
280190	1-24" diam pipe	Shea and 104th Street
280310	Improved Channel	Indian land and 1100' east of 96th Street
282240	2-3'H x 10'H Boxes	Shea and 100th Street
283780	Improved Channel	Indian land and 96th Street
284120	Improved Channel	Indian land and 750' west of 96th Street
284220	Improved Channel	600ft south of Via Linda, 740ft east of 90th St.
284390	Improved Channel	Indian land and Pima Road
290060	Improved Channel	Border of SRIC at 99th Way

Table 8-1 (continued)

OUTFALL No.	DESCRIPTION	LOCATION
290120	Improved Channel	Border of SRIC at 100th St.
290230	Improved Channel	Indian land and 104th Street
290320	Improved Channel	Border of SRIC at 104th Place
290440	Improved Channel	Border of SRIC, 1210ft west of 112th St.
300020	Improved Channel	Outfall onto Indian land at Power Line corridor
300210	Improved Channel	Border of SRIC at 112th St.
300570	1-3'H x 10'W Box	Border of SRIC 270' east of 115th St.
300640	3-24" diam pipes	Border of SRIC 250' east of 116th St.
300780	2-3'H x 10'W Boxes	Border of SRIC 150' east of 119th St.
310020	1-42" diam pipe	South of Doubletree and 620' West of 124th Street
310140	1-60" diam pipe	South of Doubletree and 220' East of 124th Street
310230	Improved Channel	South of Doubletree and 850' East of 124th Street
310320	Improved Channel	South of Doubletree and 850' West of 128th Street
310420	Roadway	South of Doubletree at 128th Street
310520	Improved Channel	South of Doubletree and 220' East of 128th Street

Figure 8-2

Color foldout

4. Rising ground waters
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35/2005(20) to separate storm sewers
6. Uncontaminated pumped ground water
7. Discharges from potable water sources
8. Foundation drains
9. Air conditioning condensate
10. Irrigation water
11. Springs
12. Water from crawl space pumps
13. Footing drains
14. Lawn water
15. Individual residential car washing
16. Flows from riparian habitats and wetlands
17. Dechlorinated swimming pool discharges
18. Street wash water

Field inspection personnel will attempt to determine whether one of the above sources is responsible for the identified discharge during the site inspection.

Drain maintenance inspections - The City also has a storm drain maintenance inspection program in place for the maintenance of open channel and closed conduit storm conveyance systems. The purpose of the inspection program is to ensure that the City flood control and drainage system is properly maintained, and that debris or other material that has been illegally dumped does not interfere with the conveyance of storm water runoff or does not become a pollutant. Appendix 8-3 summarizes the City storm drain inspection program. Suspected illegal discharges will be referred to the City field inspection team. Illegal dumping of non-hazardous materials will be handled by the maintenance staff. Illegal dumping of hazardous materials will be referred to the RMFD. The storm drain maintenance inspection program and the field screening program described in Appendix 8-1 are both performed by the field services division.

Outfall prioritization - Based on investigations completed to date, and a review of the City land use, it is concluded that no single outfall, or group of outfalls appear to have a higher probability for illicit connections or illegal discharges. Therefore, the City will implement the inspection program of

outfalls as shown in Table 8-1 and use the information gained from the program to refine and prioritize the investigation in subsequent years.

8.2 Regulatory Element

The City's storm water ordinance is described and contained in the Part 2 permit application. The City's Municipal Code prohibits illicit discharges or illegal connections to the storm drain conveyance system. A violation initiates an enforcement action against the violator.

The Storm Water Enforcement Officer may exercise enforcement powers as may be necessary to effectively implement and enforce the City code. The enforcement officer is empowered by ordinance to do the following:

1. Take necessary samples during the inspection in order to implement and enforce the provisions of the code.

2. Issue a notice and order to any person owning or occupying a premises to cease and desist all activities that may cause or contribute to a discharge in violation to the code.

3. Issue a notice and order to any person owning or occupying a premise requiring such person to clean up and abate any release of pollutants on those premises that may result in a violation of this code.

4. Require monitoring of discharges from any premises to the storm water conveyance system.

5. Order the mitigation of circumstances, which may result in illegal discharges to the maximum extent practicable.

6. Establish the elements of a storm water pollution prevention plan and to require any business to adopt and implement such plan as may be reasonably necessary to fulfill the requirements of the NPDES program.

7. Establish the elements of an employee training program, as may be necessary to fulfill the purposes of the NPDES program where such a program has been required as an element of a storm water pollution prevention plan.

8. Establish, as appropriate, the requirements of best management practices for any premises pursuant to the municipal code.

9. Penalties - Any person, firm or corporation violating any of the provisions of the municipal code shall be deemed guilty of a misdemeanor and subject to the provision of the general penalty clauses set forth in the Scottsdale Municipal Code.

10. Design Standards for Storm Drains and Sewer Systems - The City has design standards in place requiring a minimum of 6 ft of separation between the sewer system and the storm drain system (City of Scottsdale, Design Standards and Policies Manual, Section 2-304). In addition, the storm drain system is generally required to be 2 ft higher in elevation than the sanitary sewer system. These design standards effectively prohibit infiltration from the sewer system to the storm drain system. Field sampling will verify that there are no facilities that have been constructed improperly.

8.3 Education Element

Public Reporting - To promote public reporting of illicit discharges, spills, or water quality impacts associated with discharges, the City will advertise the Environmental Planning and Design Office telephone hotline number and arrange for enforcement measures to follow up on calls. The hotline number will be staffed during normal business hours. If a spill occurs during non-business hours, the caller will be instructed to dial the Rural Metro Fire Department.

Outreach education concerning what constitutes illegal dumping and what the citizen response should be, will be an ongoing effort.

Public Education - Public education will take place throughout the community as a means to prevent illegal dumping.

The City has a program of public education on the nature of storm drains and the harmful environmental effects, which can result from the improper use or disposal of common household, yard and automotive products. The program components are as follows:

1. A public information pamphlet explaining the problem, why it is important to Scottsdale and suggesting ways individuals can contribute to the solution – The pamphlets will be mailed to residents or made available at public information counters throughout the City.

2. Development of a student awareness program within the local schools – Community officials that visit schools will include the public information pamphlet as a part of the information they distribute.

3. Storm drain inlet marking – This action will raise the public's level of understanding regarding the consequence of discharging harmful materials into the storm drain.

4. System surveillance – Surveillance will be conducted by city employees working on or about the city streets and public rights-of-way. These employees are present daily and randomly throughout the city. Through increased public awareness, the City can expect accelerated reporting of illegal dumping within the community.

5. Complaint response – The Scottsdale community will be educated through the use of pamphlets that they should contact the City's hotline when there is an accidental spill. When a spill is reported, the Environmental Planning and Design Office contacts the Fire Department for immediate scene response. As part of the response and subsequent investigation, every possible measure will be taken to contain and recover the spill. In addition, maximum effort will be made to learn the identity of the violator.

6. Coordination of alternative disposal – The City refers residents to 1800cleanup.org in order to learn about more about used motor oil disposal.

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Appendix 2-1
Scottsdale Ordinance No. 3333
Relating to the Prevention of Pollution of Water from Discharges of Storm Water

Appendix 3-1

General Guidelines for Erosion Control

APPENDIX 3-1
GENERAL GUIDELINES FOR EROSION CONTROL

The following planning and construction practices were described by the U.S. Environmental Protection Agency (EPA, 1993) and North Carolina (North Carolina, 1993) to illustrate the types of measures that can be applied successfully to achieve a reduction in the amount of erosion occurring on active construction sites. These practices are used to reduce the amount of sediment that is detached during construction and to prevent sediment from entering runoff. Erosion control is based on two main concepts:

- Disturb the smallest area of land possible for the shortest period of time, and
- Stabilize disturbed soils to prevent erosion.

3. 1.1 Review and Consider all Existing Conditions in Initial Site

In selecting a site for the project, initial review should involve consideration of all existing conditions. Select a site that is inherently suitable rather than force the terrain to conform to development needs (Figure 3-1.1). Ensure that development features follow natural contours. Steep slopes, areas subject to flooding, and highly erodible soils severely limit a site's use, while level, well-drained areas offer few restrictions. Any modification of a site's drainage features or topography requires protection from erosion and sedimentation.

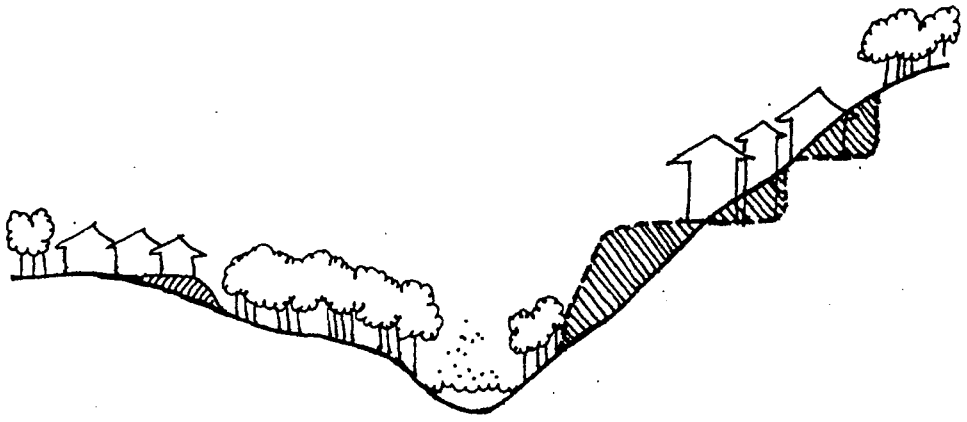


Figure 3-1.1 Examples of Proper and Improper Siting (North Carolina, 1993)

3-1.2 Use Project Scheduling to Reduce Erosion Potential

Often a project can be scheduled during the time of year that the erosion potential of the site is relatively low. In many parts of the country, there is a certain period of the year when erosion potential is relatively low and construction scheduling could be very effective. In the Scottsdale area, rainfall amounts are generally lower April through June and the warm temperatures quickly dry out exposed soils. During the wetter months, construction vehicles can easily turn the soft, wet ground into mud, which is more easily washed offsite.

Scheduling can be an effective means of reducing the hazards of erosion. Schedule construction activities to minimize the exposed area and the duration of exposure. In scheduling, take into account the season and the weather forecast. Stabilize disturbed areas as quickly as possible.

Avoid area wide clearing of construction sites. Plan and stage land disturbance activities so that only the area currently under construction is exposed. As soon as the grading and construction in an area are complete, the area should be stabilized.

3-1.3 Manage Material

3-1.3.1 Locate Potential Nonpoint Pollutant Sources Away from Critical Areas

Material stockpiles, borrow areas, access roads, and other land-disturbing activities can often be located away from critical areas such as steep slopes, highly erodible soils, and areas that drain directly into geologically sensitive features. Locate potential nonpoint pollutant sources away from steep slopes, streams, and critical areas.

3-1.3.2 Stockpile/Reapply Topsoil to Revegetate Site

Because of the high organic content of topsoil, it cannot be used as fill material or under pavement. Topsoil is typically removed when a site is cleared. Since topsoil is essential to establish new vegetation, it should be stockpiled and then reapplied to the site for revegetation, if appropriate. Although topsoil salvaged from the existing site can often be used, it must meet certain standards and topsoil may need to be imported onto the site if the existing topsoil is not adequate for establishing new vegetation.

3-1.3.3 Cover and Stabilize Topsoil Stockpiles

Unprotected stockpiles are very prone to erosion; therefore stockpiles must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized with erosion blankets, seeding, and/or mulching.

3-1.4 Protect Vegetation

Existing or newly planted vegetation that has been planted to stabilize disturbed areas should be protected by routing construction traffic around the areas and protecting natural vegetation with fencing, tree armoring, retaining walls, or tree wells.

By clearing only those areas immediately essential for completing site construction, buffer zones are preserved and soil remains undisturbed until construction begins (Figure 3-1.2). Physical markers, such as tape, signs, or barriers, indicating the limits of land disturbance, can ensure that equipment operators know the proposed limits of clearing. The area of the watershed that is exposed to construction is important in determining the net amount of erosion. Reducing the extent of the disturbed area will ultimately reduce sediment loads to surface waters. Avoid disturbing vegetation on steep slopes or other critical areas.

Tree armoring protects tree trunks from being damaged by construction equipment. Fencing can also protect tree trunks but should be placed at the tree's drip line - the minimum area around a tree in which the tree root system should not be disturbed by cut, fill, or soil compaction. Since traffic by heavy equipment can cause soil compaction, where possible, construction traffic should be routed through areas that have been or will be disturbed for other construction activity. This will reduce the area that is cleared and susceptible to erosion. When cutting or filling must be done near a tree, a retaining wall or tree well should be used to minimize the cutting of the tree's roots or the quantity of fill placed over the roots.

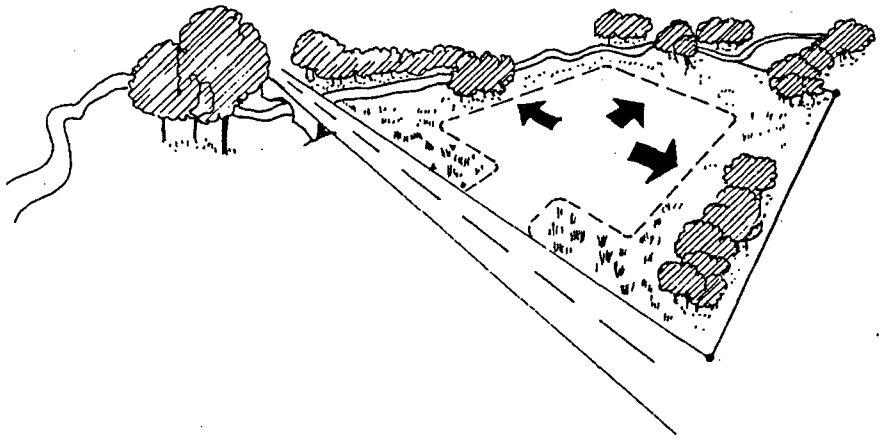


Figure 3-1.2 Example of Conservative Site Clearing (North Carolina, 1993)

3-1.5 Use Wind Erosion Controls

Although not required by the rules, wind erosion controls can reduce the impact of construction on adjacent tracts. These controls limit the movement of dust from disturbed soil surfaces and include many different practices. Wind barriers block air currents and are effective in controlling soil blowing. Different materials can be used as wind barriers, including solid board fences, and snow fences. Sprinkling moistens the soil surface with water and must be repeated as needed to be effective for preventing wind erosion; however, applications must be monitored to prevent excessive runoff and erosion from that source.

3-1.6 Keep Runoff Velocities Low

Earth dikes, perimeter dikes or swales, or diversions can be used to intercept and convey runoff above disturbed areas (Figure 3-1.3). An earth dike is a temporary berm or ridge of compacted soil that channels water around or away from disturbed areas. A perimeter dike/swale or diversion is a swale with a supporting ridge on the lower side that is constructed from the soil excavated from the adjoining swale. A pipe slope drain, also known as a pipe drop structure, is a temporary pipe placed from the top of a slope to the bottom of the slope to convey concentrated runoff down the slope without causing erosion. These devices should be used to intercept flow from denuded areas or newly seeded areas to keep the disturbed areas from being eroded from the uphill runoff. The structures should be stabilized within 14 days of installation or as soon as practicable, using vegetation, slope coverings or other appropriate erosion prevention measures.

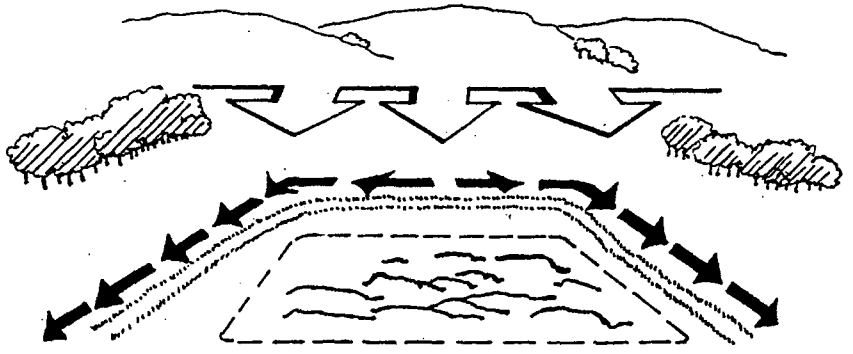


Figure 3-1.3 Diversion of Runoff away from Construction Area (North Carolina, 1993)

3-1.7 Reduce Runoff Velocities

3-1.7.1 Clear Existing Vegetation

Clearing existing vegetation reduces surface roughness and infiltration rate and thereby increases runoff velocities and volumes. The use of measures that break the slopes (Figure 3-1.4) and decrease concentrated flow volumes and runoff velocities and will reduce the problems associated with them. Practical ways to reduce velocities include conveying storm water runoff away from steep slopes to stabilized outlets, preserving natural vegetation where possible, and mulching and vegetating exposed areas immediately after construction.

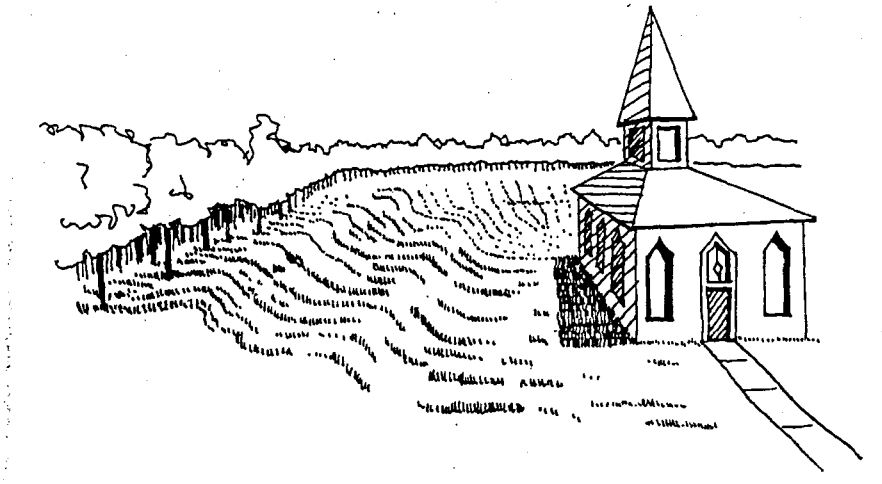


Figure 3-1.4 Slow Runoff by Breaking Slopes (North Carolina, 1993)

3-1.7.2 Break Up Slopes

Benches, terraces, or ditches break up a slope by providing areas of low slope in the reverse direction. This keeps water from running unimpeded down the slope at increasing volume and velocity. Instead, the flow is directed to a suitable outlet, such as a sediment basin or trap. The frequency of benches, terraces, or ditches will depend on the erodibility of the soils, steepness and length of the slope, and rock outcrops. This practice should be used if there is a potential for erosion along the slope.

Retaining walls can be used to decrease the steepness of a slope, thus decreasing the runoff velocity and consequently decreasing the erosion potential.

3-1.7.3 Provide Linings for Urban Runoff Conveyance Channels

Construction often increases the velocity and volume of runoff, which causes erosion in newly constructed or existing urban runoff conveyance channels. If the runoff during or after construction will cause erosion in a channel, the channel should be lined or flow control BMPs installed. The first choice of lining should be grass or sod since this reduces runoff velocities and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, then riprap, concrete, or gabions can be used.

3-1.7.4 Use Check Dams

Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce the erosion in a swale or channel. Check dams should be used when a swale or channel will be used for a short time and therefore it is not feasible or practical to line the channel or implement flow control BMPs.

3-1.8 Stabilize the Site

Removing the vegetative cover and altering the soil structure by clearing, grading, and compacting the surface increases an area's susceptibility to erosion. Apply stabilizing measures as soon as possible after the land is disturbed (Figure 3-1.5). Plan and implement temporary or permanent vegetation, mulches, or other protective practices to correspond with construction activities. Protect channels from erosive forces by using protective linings and the appropriate channel design. Consider possible future repairs and maintenance of these practices in the design.

Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once a dense vegetative cover has been established. However, often seeding and fertilizing do not produce as thick a vegetative cover as do seed and mulch or netting. Newly established vegetation does not have as extensive a root system as existing vegetation and therefore is more prone to erosion, especially on steep slopes. Care should be taken when fertilizing to avoid untimely or excessive application. Since the practice of seeding and fertilizing does not provide any protection during the time of vegetative establishment, it should be used only on favorable soils in very flat areas and not in sensitive areas.

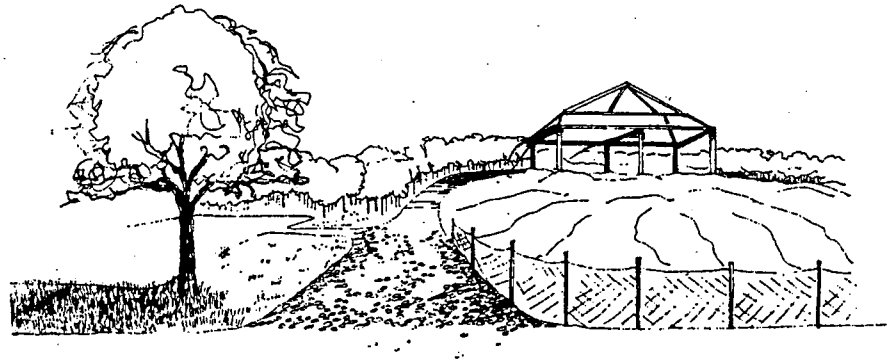


Figure 3-1.5 Stabilization of Disturbed Areas (North Carolina, 1993)

The management of land by using ground cover reduces erosion by reducing the flow rate of runoff and the raindrop impact. Bare soils should be seeded or otherwise stabilized within 14 calendar days after final grading or where construction activity has temporarily ceased for more than 21 days. In very flat, non-sensitive areas with favorable soils, stabilization may involve simply seeding and fertilizing. Mulch and/or sod may be necessary on steeper slope, for erodible soils, and near sensitive areas.

Mulching/mats can be used to protect the disturbed area while vegetation becomes established. Mulching involves applying plant residues or other suitable materials on disturbed soil surfaces. Mulches/mats used include tacked straw, wood chips, and jute netting and are often covered by blankets or netting. Mulching alone should be used only for temporary protection of the soil surface or when permanent seeding is not feasible. The useful life of mulch varies with the material used and the amount of precipitation, but is approximately 2 to 6 months.

During times of year when vegetation cannot be established, soil mulching should be applied to moderate slopes and soils that are not highly erodible. On steep slopes or highly erodible soils, multiple mulching treatments should be used. Interlocking ceramic materials, filter fabric, and netting are available for this purpose. Before stabilizing an area, it is important to have installed all sediment controls and diverted runoff away from the area to be planted. Runoff may be diverted away from denuded areas or newly planted areas using dikes, swales, or pipe slope drains to intercept runoff and convey it to a permanent channel or storm drain. Reserved topsoil may be used to revegetate a site if the stockpile has been covered and stabilized.

Consideration should be given to maintenance when designing mulching and matting schemes. Plastic nets are often used to cover the mulch or mats; however, they can foul lawn mower blades if the area requires mowing.

Sod can be used to permanently stabilize an area. Sodding provides immediate stabilization of an area and should be used in critical areas or where establishment of permanent vegetation by seeding and mulching would be difficult. Sodding is also a preferred option when there is high erosion potential during the period of vegetative establishment from seeding.

3-1.9 Plan for Temporary Structural Controls

Retain Sediment on the Site. Even with careful planning, some erosion is unavoidable. The resulting sediment must be trapped on the site. Plan the location where sediment deposition will occur and maintain access for cleanout. Protect low points below disturbed areas by building barriers to reduce sediment loss. Whenever possible, plan and construct sediment traps and basins before other land-disturbing activities (Figure 3-1.6).

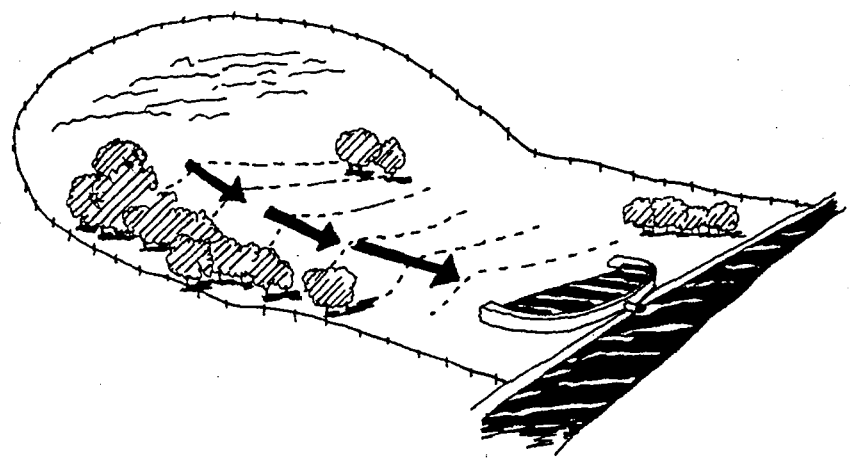


Figure 3-1.6 Retention of Eroded Sediment on Site

Appendix 3-2

Temporary Erosion Control BMPs

APPENDIX 3-2
TEMPORARY EROSION CONTROL BMPs

Temporary erosion controls should be considered the first line of defense for prevention of water pollution during construction activities. It is much simpler to maintain the soil cover than to trap the sediment once it has been mobilized. In addition effective erosion prevention can result in cost savings, since repair of erosion damage can be minimized.

The primary goal of erosion control is to divert runoff away from unstable areas or to provide a stable surface that will resist the effects of rain and runoff. The principal measures for diverting runoff include perimeter swales and dikes, and slope drains. These measures can direct flow around the active construction area or transport storm water runoff across unstable areas.

The flow in swales, dikes, and storm drain systems should be discharged in such a way that erosion is minimized. Therefore, outlet stabilization and level spreaders should be implemented to reduce the effects of concentrated flow.

Existing trees and vegetation should be protected to help maintain a stable ground surface and prevent loss of valuable topsoil. Where temporary vegetation is used to prevent erosion, blankets, matting and mulches can stabilize the area until the vegetation is established.

The following sections describe some of the common erosion controls. The types and application of the controls are summarized in Table 3-2.1.

3-2.1 Interceptor Swale

Interceptor swales are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. They may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. The outflow from a swale should be directed to a stabilized outlet or sediment-trapping device. The swales should remain in place until the disturbed area is permanently stabilized. A schematic of an interceptor swale is shown in Figure 3-2.1.

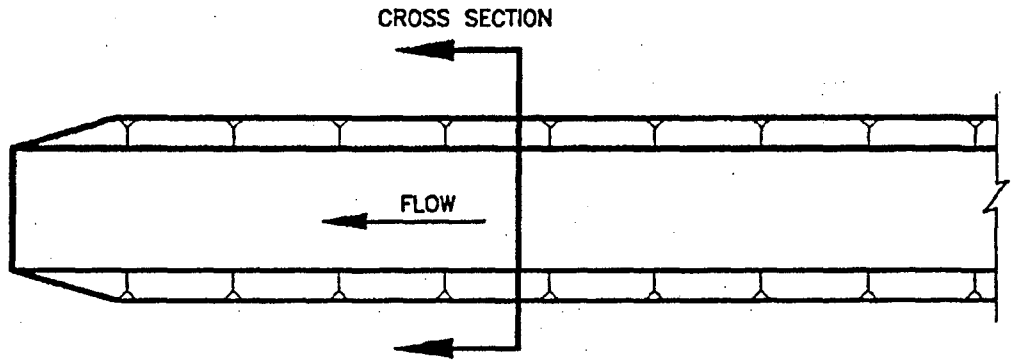
Materials:

1) Stone stabilization should be used when grades exceed 2 percent or velocities exceed 6 fps and should consist of a layer of crushed stone, 3 in. thick, riprap or high-velocity erosion control mats.

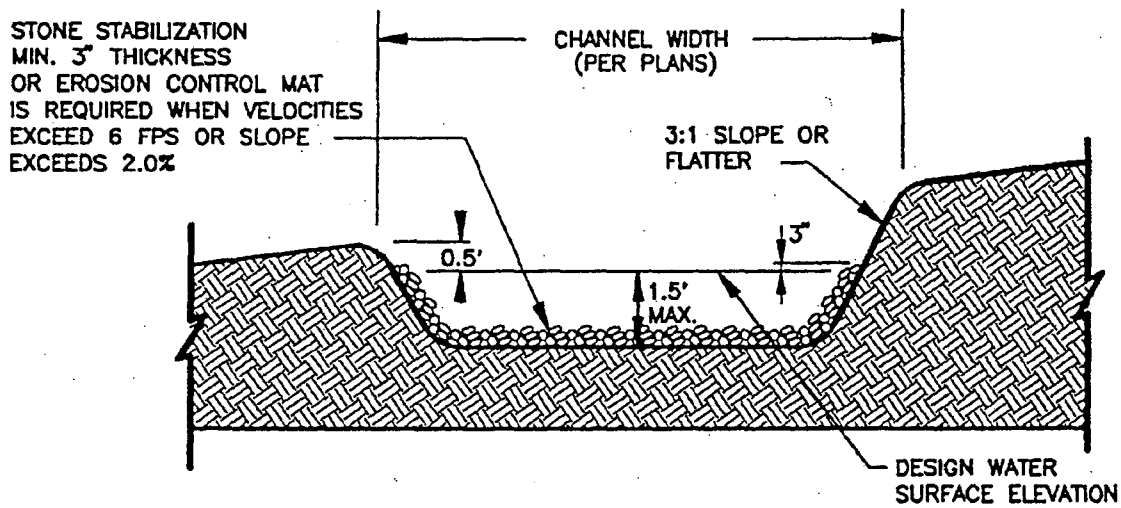
2) Stabilization should extend across the bottom of the swale and up both sides of the channel to minimum height of 3 in. above the design water surface elevation based on a 2-yr, 24-hr storm.

Table 3-2.1 Summary of Temporary Erosion Control Practices

Practice	Area	Application	Notes
Interceptor Swale	< 5 ac	Used as a perimeter control or to shorten slope	Maximum flow velocity 6 ft/s unless stabilized
Diversion Dike	<10 ac	Used to route runoff away from disturbed areas	
Pipe Slope Drain	<5 ac	Transport runoff down steep, erodible slopes	
Outlet Stabilization	NA	Prevent erosion at outlet of channel or conduit	
Level Spreader	Based on flow	Outlet device for dikes and diversions	Slope <10% and stable, flowrate <20 cfs
Subsurface Drain	NA	Prevent soils from becoming saturated and prevent seeps	
Tree Protection	NA	Erosion control and aesthetic benefits	
Temporary Vegetation	NA	Temporary stabilization of disturbed areas	One of the most effective measures, highly recommended
Blankets/Matting	NA	Used in channels and on steep slopes	Slope <15%
Mulch	NA	Stabilization of newly seeded areas	Slope <15%
Sod	NA	Immediate stabilization in channels, around inlets, or for aesthetics	
Dust Control	NA	In areas subject to surface and air movement of dust where on- or off-site damage may occur	



PLAN VIEW
N.T.S.



CROSS SECTION
N.T.S.

Figure 3-2.1. Schematic Diagram of an Interceptor Swale

Installation:

1) An interceptor swale should be installed across exposed slopes during construction and should intercept no more than 5 acres of runoff.

2) All earth removed and not needed in construction should be disposed of in an approved spoils site so that it will not interfere with the functioning of the swale or contribute to siltation in other areas of the site.

3) All trees, brush, stumps, obstructions and other material should be removed and disposed of so as not to interfere with the proper functioning of the swale.

4) Swales should have a maximum depth of 1.5 ft with side slopes of 3:1 or flatter. Swale should have positive drainage for its entire length to an outlet.

5) When the slope exceeds 2 percent, or velocities exceed 6 fps (regardless of slope), stabilization is required. Stabilization should be crushed stone placed in a layer of at least 3 in. thick or may be high velocity erosion control matting. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary.

Minimum compaction for the swale should be 90 percent standard proctor density.

Inspection and Maintenance Guidelines:

1) Swales should be inspected monthly and after each rain event to locate and repair any damage to the channel or clear debris or other obstructions so as not to diminish flow capacity.

2) Damage from storms or normal construction activities such as tire ruts or disturbance of swale stabilization should be repaired as soon as practical.

3-2.2 Diversion Dikes

A temporary diversion dike is a barrier created by the placement of an earthen embankment to reroute the flow of runoff to an erosion control device or away from an open, easily erodible area. A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure. These controls can be used on the perimeter of the site to prevent runoff from entering the construction area. Dikes are generally used for the duration of construction to intercept and reroute runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized. A schematic of a diversion dike is shown in Figure 3-2.2.

Materials:

1) Stone stabilization (required for velocities in excess of 6 fps) should consist of riprap placed in a layer at least 3 in. thick and should extend a minimum height of 3 in. above the design water surface up the existing slope and the upstream face of the dike.

2) Geotextile fabric should be a non-woven polypropylene fabric designed specifically for use as a soil filtration media with an approximate weight of 6 oz./yd^2, a Mullen burst rating of 140 psi, and having an equivalent opening size (EOS) greater than a #50 sieve.

Installation:

1) Diversion dikes should be installed prior to and maintained for the duration of construction and should intercept no more than 10 acres of runoff.

2) Dikes should have a minimum top width of 2 ft and a minimum height of compacted fill of 18 in. measured form the top of the existing ground at the up-slope toe to top of the dike and having side slopes of 3:1 or flatter.

3) The soil for the dike should be placed in lifts of 8 in. or less and be compacted to 95 percent standard proctor density.

4) The channel, which is formed by the dike, must have positive drainage for its entire length to an outlet.

5) When the slope exceeds 2 percent, or velocities exceed 6 fps (regardless of slope), stabilization is required. Situations in which velocities do not exceed 6 fps, vegetation may be used to control erosion.

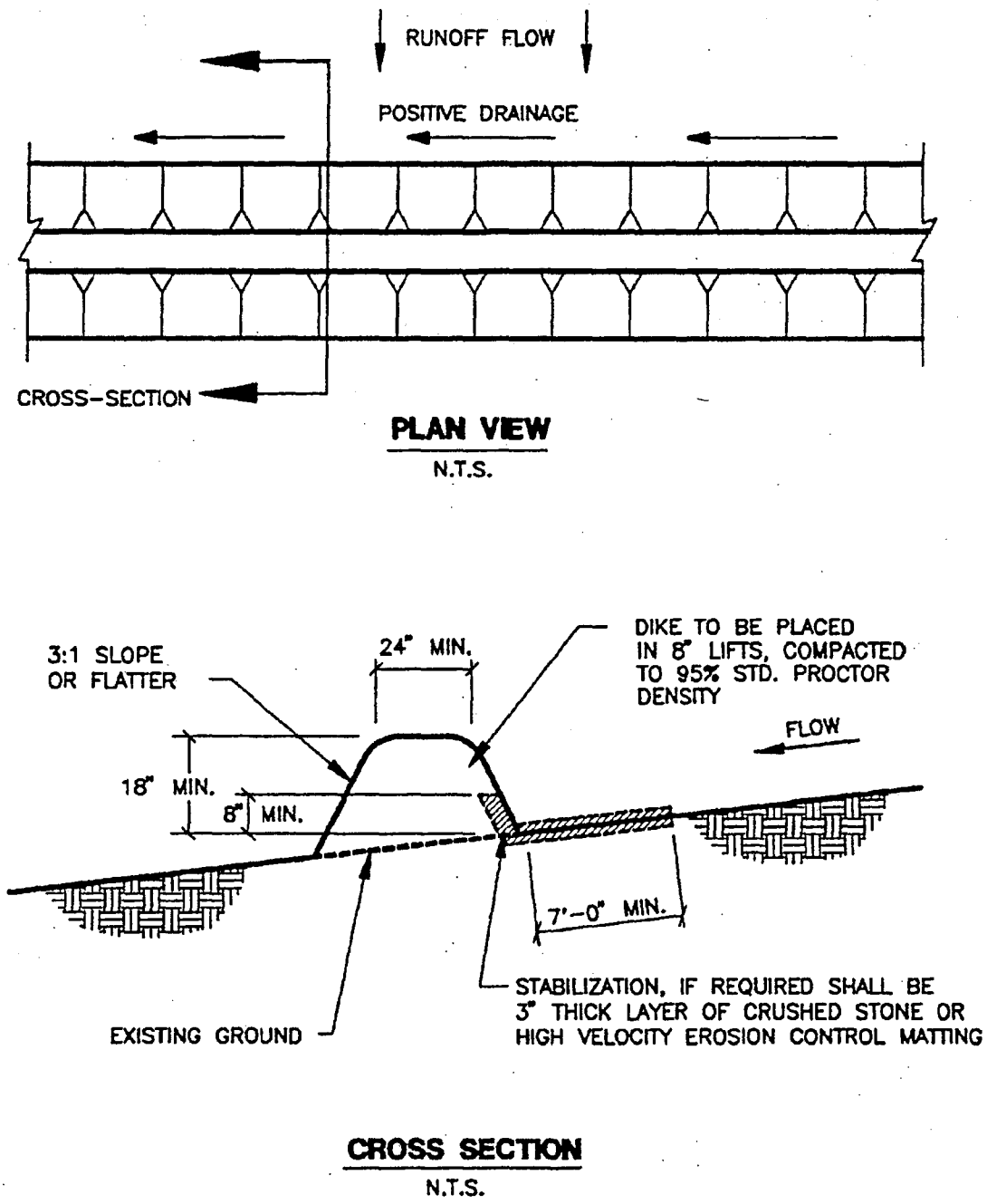


Figure 3-2.2 Schematic of a Diversion Dike (NCTCOG, 1993b)

Inspection and Maintenance Guidelines:

1) Swales should be inspected monthly and after each rain event to determine if silt is building up behind the dike or if erosion is occurring on the face of the dike. Locate and repair any damage to the channel or clear debris or other obstructions so as not to diminish flow capacity.

2) Silt should be removed in a timely manner.

3) If erosion is occurring on the face of the dike, the slopes of the face should either be stabilized through mulch or seeding or the slopes of the face should be reduced.

4) Damage from storms or normal construction activities such as tire ruts or disturbance of swale stabilization should be repaired as soon as practical.

3-2.3 Pipe Slope Drain

A temporary pipe slope drain is an erosion control device that combines an earthen embankment and a rigid of flexible pipe to carry runoff over an exposed slope to a stabilized outlet apron. A diagram of a slope drain is shown in Figure 3-2.3.

Materials:

1) The drainpipe may be made of any material, rigid or flexible, which is capable of conveying runoff. The drainpipe should be completely watertight so that no water leaks on to the slope to be protected.

2) Riprap to be used in the outlet apron should consist of either crushed stone or broken Portland cement concrete. All stones used should weigh between 50 and 150 lb each and should be as nearly uniform as is practical.

Installation:

1) A diversion dike should be constructed at the top of the slope that is to be protected. This dike should be sized so that no runoff may overtop the dike. The soil around and under the entrance section of the drainpipe should be hand-tamped in 8-in. lifts to prevent piping failure around the inlet.

2) The height of the diversion dike at the centerline of the inlet should be equal to the diameter of the pipe plus 12 in.

3) A rigid section of pipe should be installed through the dike. A standard flared-end section with an integral toe plate extending a minimum of 6 in. from the bottom of the end section should be attached to the inlet end of the pipe using watertight fittings.

4) A riprap-lined apron should be excavated to accept the runoff from the pipe and dissipate the energy of the flow. The width of the bottom of the apron should be 3 times the pipe diameter and the length should be a minimum of 6 times the pipe diameter. The apron

should be a minimum of 12 in. deep and lined with riprap with a thickness of at least 12 in. The apron should be designed so that the released flow has a velocity less than 3 fps.

Inspection and Maintenance Guidelines:

1) Pipe slope drains should be inspected monthly and after each rain event to locate and repair any damage to joints or clogging of the pipe.

2) In cases where the diversion dike has deteriorated around the entrance of the pipe, it may be necessary to reinforce the dike with sandbags or to install a concrete collar to prevent failure.

Signs of erosion around the pipe drain should be addressed in a timely manner by stabilizing the area with erosion control mats, crushed stone, concrete or other appropriate method.

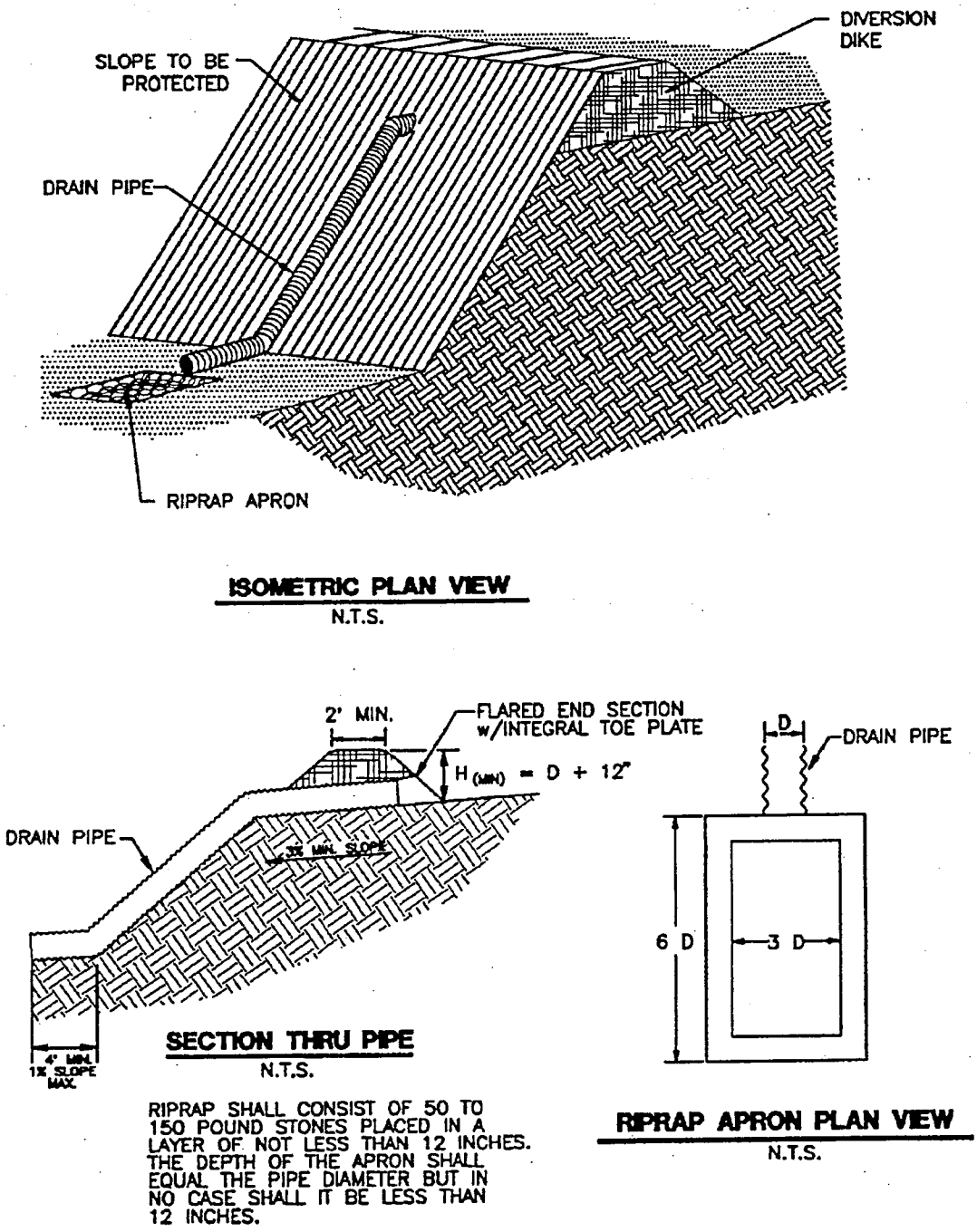


Figure 3-2.3 Schematic Diagram of a Slope Drain (NCTCOG, 1993)

3-2.4 Outlet Stabilization

The goal of outlet stabilization is to prevent erosion at the outlet of a channel or conduit by reducing the velocity of flow and dissipating the energy. This practice applies where the discharge velocity of a pipe, box culvert, diversion, open channel, or other water conveyance structure exceeds the permissible velocity of the receiving channel or disposal area.

The outlets of channels, conduits, and other structures are points of high erosion potential, because they frequently carry flows at velocities that exceed the allowable limit for the area downstream. To prevent scour and undermining, an outlet stabilization structure is needed to absorb the impact of the flow and reduce the velocity to non-erosive levels. A riprap-lined apron is the most commonly used practice for this purpose because of its relatively low cost and ease of installation. The riprap apron should be extended downstream until stable conditions are reached even though this may exceed the length calculated for design velocity control.

Riprap-stilling basins or plunge pools reduce flow velocity rapidly. They should be considered in lieu of aprons where overfalls exit at the ends of pipes or where high flows would require excessive apron length. Consider other energy dissipaters such as concrete impact basins or paved outlet structures (see Figure 3-2.4) where site conditions warrant for permanent operation.

Materials:

1) Materials—Ensure that riprap consists of a well-graded mixture of stone. Larger stone should predominate, with sufficient smaller sizes to fill the voids between the stones. The maximum stone diameter should be no greater than 1.5 times the d_{50} size.

2) Thickness—Make the minimum thickness of riprap 1.5 times the maximum stone diameter.

3) Stone quality—Select stone for riprap from field stone or quarry stone. The stone should be hard, angular, and highly weather-resistant. The specific gravity of the individual stones should be at least 2.5.

4) Geotextile Fabric—Install appropriate barrier to prevent soil movement through the openings in the riprap. The barrier should consist of a graded gravel layer or a synthetic filter cloth.

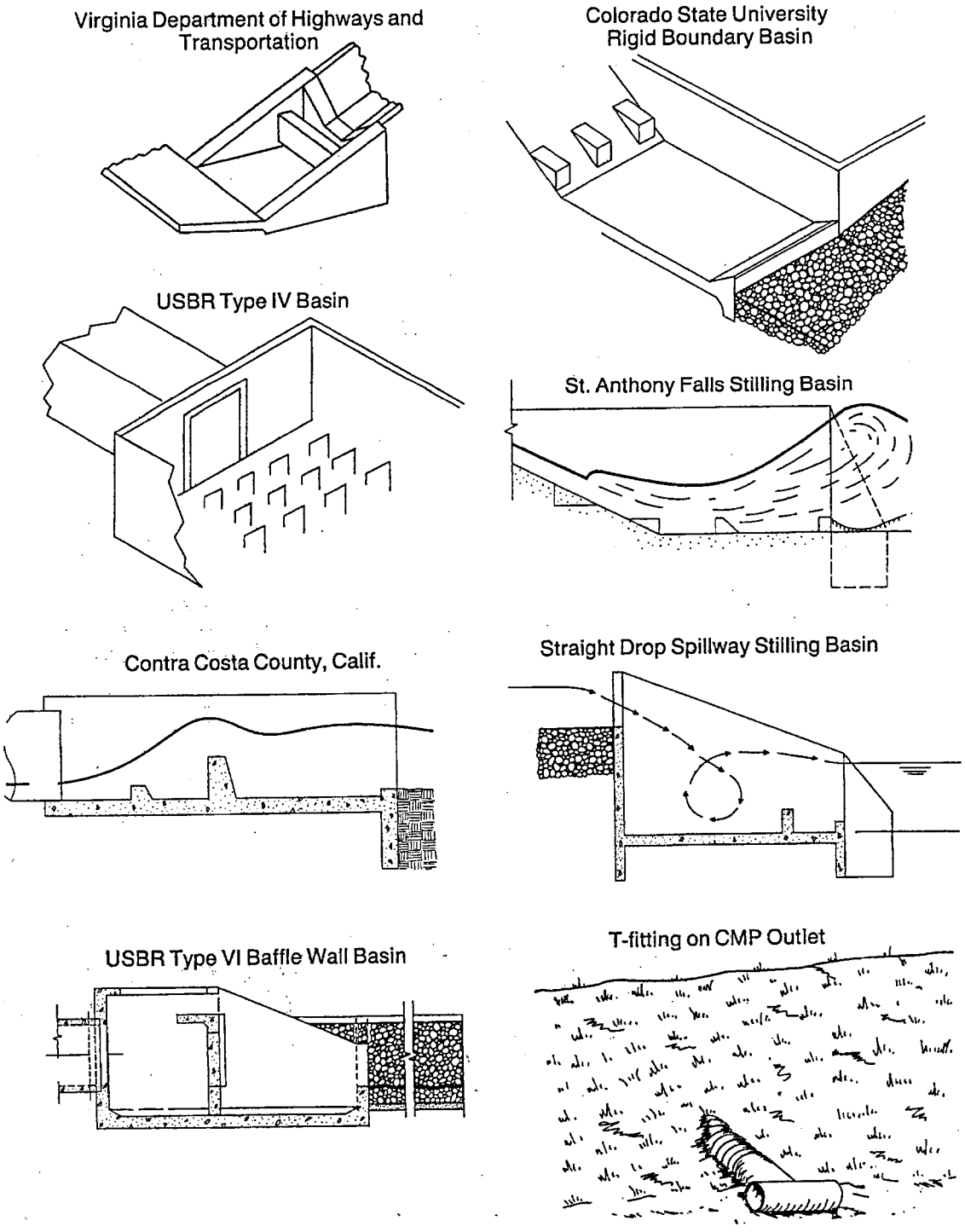


Figure 3-2.4 Examples of Stilling Basin Designs (North Carolina, 1993)

Design Guidelines:

Capacity—10-yr, 3-hr peak runoff or the design discharge of the water conveyance structure, whichever is greater.

1) Apron size – If the water conveyance structure discharges directly into a well-defined channel, extend the apron across the channel bottom and up the channel banks to an elevation of 0.5 ft above the maximum tailwater depth or to the top of the bank, whichever is less (see Figure 3-2.5). Determine the maximum allowable velocity for the receiving stream, and design the riprap apron to reduce flow to this velocity before flow leaves the apron. Calculate the apron length for velocity control or use the length required to meet stable conditions downstream, whichever is greater.
2) Grade – Ensure that the apron has zero grade. There should be no overfall at the end of the apron; that is, the elevation of the top of the riprap at the downstream end should be the same as the elevation of the bottom of the receiving channel or the adjacent ground if there is no channel.
3) Alignment – The apron should be straight throughout its entire length, but if a curve is necessary to align the apron with the receiving stream, locate the curve in the upstream section of riprap.

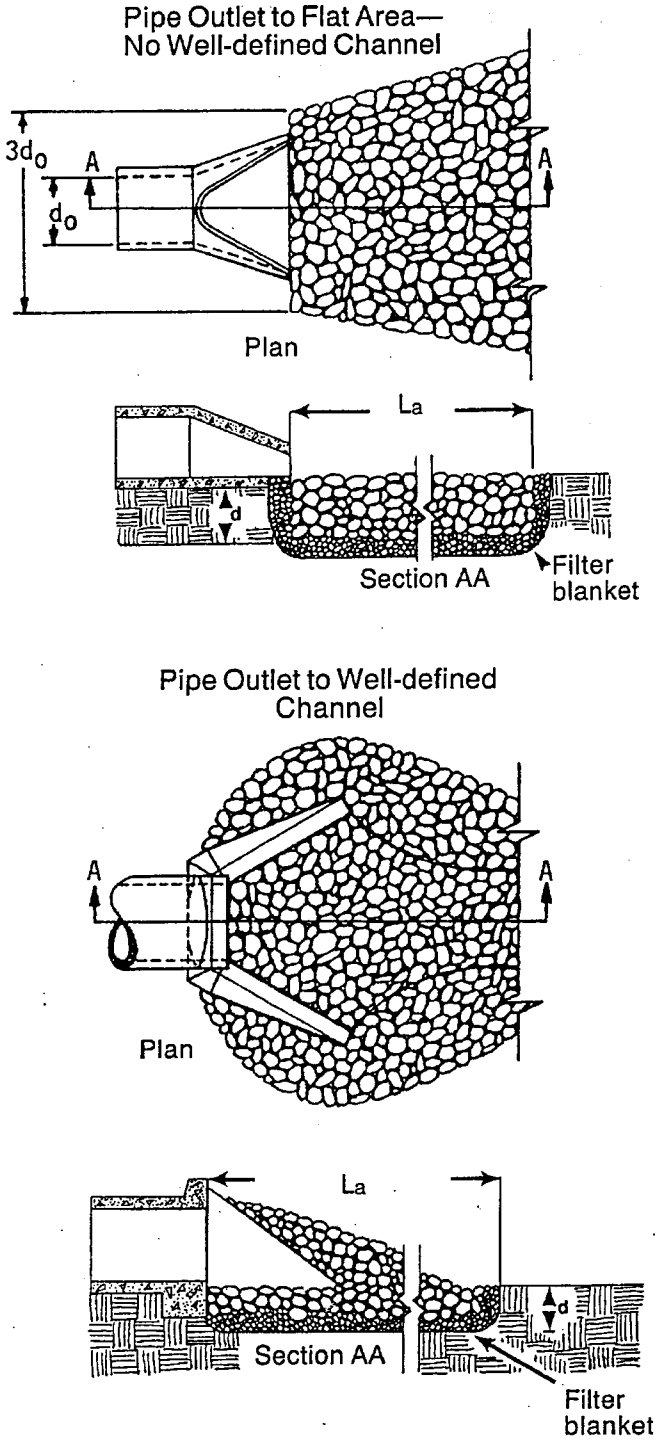
Installation:

Ensure that the subgrade for the fabric and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.

1) The riprap and fabric must conform to the specified grading limits shown on the plans.
2) Filter cloth must be properly protected from punching or tearing during installation. Repair any damage by removing the riprap and placing another piece of filter cloth over the damaged area. All connecting joints should overlap a minimum of 1 ft. If the damage is extensive, replace the entire filter cloth.
3) Riprap may be placed by equipment, but take care to avoid damaging the fabric.
3) The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.
4) Riprap may be field stone or rough quarry stone. It should be hard, angular, highly weather-resistant and well graded.
5) Construct the apron on zero grade with no overfall at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.
6) Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.
7) Immediately after construction, stabilize all disturbed areas with vegetation.

Inspection and Maintenance Guidelines:

Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.



Notes

1. L_a is the length of the riprap apron.
2. d = 1.5 times the maximum stone diameter but not less than 6″.
3. In a well-defined channel extend the apron up the channel banks to an elevation of 6″ above the maximum tailwater depth or to the top of the bank, whichever is less.
4. A filter blanket or filter fabric should be installed between the riprap and soil foundation.

Figure 3-2.5 Riprap Outlet Design (North Carolina, 1993)

3-2.5 Level Spreaders

A level spreader is used as an outlet device for dikes and diversions and consists of an excavated depression constructed at zero grade across a slope. The purpose is to convert concentrated runoff to sheet flow and release it uniformly onto areas stabilized by existing vegetation.

Level spreaders should be used where there is a need to divert storm water away from disturbed areas to avoid overstressing erosion control measures or where sediment free storm runoff can be released in sheet flow down a stabilized slope without causing erosion. A perspective view of a level spreader is shown in Figure 3-2.6. This practice applies only in those situations where the spreader can be constructed on undisturbed soil and the area below the level lip is uniform with a slope of 10 percent or less and is stabilized by natural vegetation. The runoff water should not be allowed to re-concentrate after release unless it occurs during interception by another measure (such as a permanent pond or detention basin) located below the level spreader.

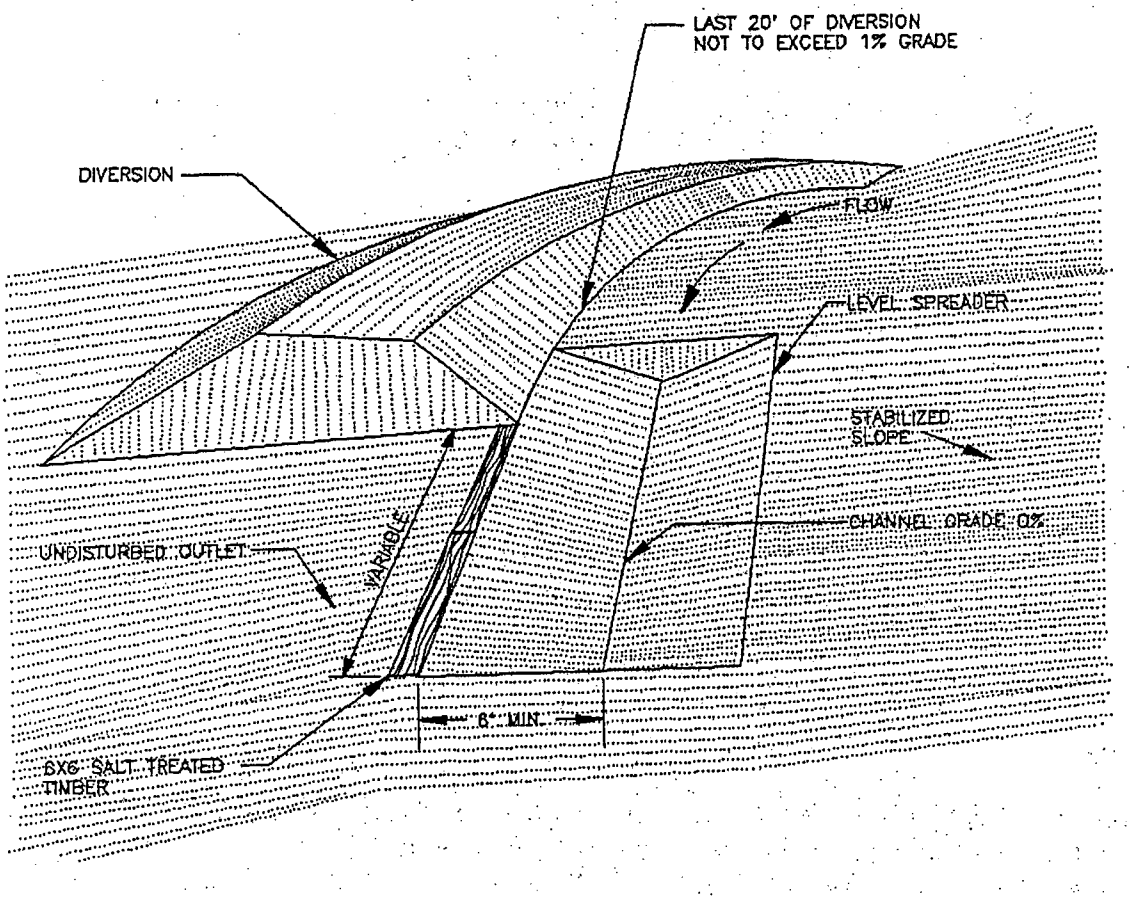


Figure 3-2.6 Perspective View of a Level Spreader (VA Dept of Conservation, 1992)

Particular care should be taken to construct the outlet lip completely level in a stable, undisturbed soil. Any depressions in the lip will concentrate the flow, resulting in erosion. Under higher design flow conditions, a rigid outlet lip design should be used to create the desired sheet flow conditions. Runoff water containing high sediment loads must be treated in a sediment-trapping device before being released to a level spreader.

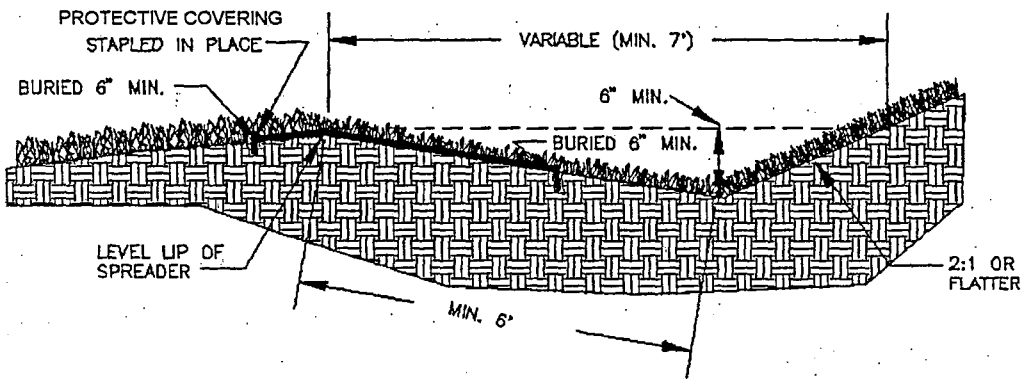
Installation:

1) Level spreaders should be constructed on undisturbed soil (not fill material).
2) The entrance to the spreader should be shaped in such a manner as to ensure that runoff enters directly onto the 0 percent grade channel.
3) Construct a 20-ft transition section from the diversion channel to blend smoothly to the width and depth of the spreader.
4) The level lip should be constructed at 0 percent grade to ensure uniform spreading of storm water runoff.
5) The level lip may be stabilized by vegetation if the flow from the 2-year, 24-hour storm is expected to be less than 4 cfs, otherwise a rigid non-erodible material should be used.
6) Protective covering for vegetated lip should be a minimum of 4 ft wide extending 6 in. over the lip and buried 6 in. deep in a vertical trench on the lower edge. The upper edge should butt against smoothly cut sod and be securely held in place with closely spaced heavy-duty wire staples (see Figure 3-2.7).
8) Rigid level lip should be entrenched at least 2 in. below existing ground and securely anchored to prevent displacement. An apron of coarse aggregate should be placed to top of level lip and extended down slope at least 3 ft. Place filter fabric under stone and use galvanized wire mesh to hold stone securely in place (see Figure 3-2.7).
9) The released runoff must outlet onto undisturbed stabilized areas with slope not exceeding 10 percent. Slope must be sufficiently smooth to preserve sheet flow and prevent flow from concentrating.
10) Immediately after its construction, appropriately seed and mulch the entire disturbed area of the spreader.

Inspection and Maintenance Guidelines:

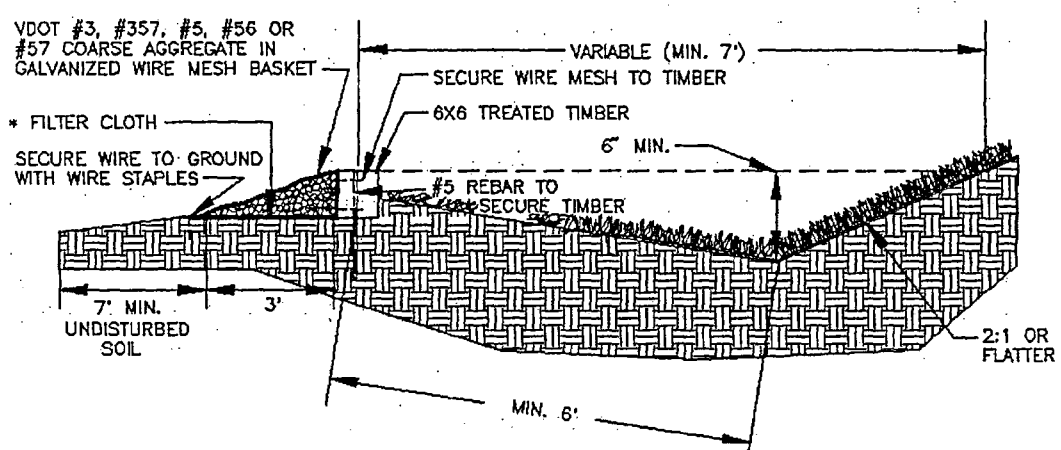
1) The measure should be inspected after every rainfall and repairs made, if required.
2) Level spreader lip should remain at 0 percent slope to allow proper function of measure.
3) The contractor should avoid the placement of any material on and prevent construction traffic across the structure. If the measure is damaged by construction traffic, it should be repaired immediately.

CROSS SECTION



LEVEL SPREADER WITH VEGETATED LIP

CROSS SECTION



LEVEL SPREADER WITH RIGID LIP

Figure 3-2.7 Cross-Section of a Level Spreader (VA Dept of Conservation, 1992)

3-2.6 Vegetative Stabilization

Vegetation is used as a temporary or permanent stabilization technique for areas disturbed by construction, but not covered by pavement, buildings, or other structures. As a temporary control, vegetation should be used to stabilize stockpiles and barren areas that are inactive for long periods of time.

Vegetative techniques can apply to many construction projects. Vegetation effectively reduces erosion in swales, stockpiles, berms, mild to medium slopes, on golf courses and along roadways.

Other techniques may be required to assist in the establishment of vegetation. These other techniques include erosion control matting, mulches, surface roughening, swales and dikes to direct runoff around newly seeded areas, and proper grading to limit runoff velocities during construction. (NCTCOG, 1993b)

3-2.7 Blankets and Matting

Blankets and matting material can be used as an aid to control erosion on critical sites during establishment period of protective vegetation. The most common uses are: in channels where designed flow exceeds 3.5 fps, on interceptor swales and diversion dikes when design flow exceeds 6 fps; on short, steep slopes where erosion hazard is high and planting is likely to be slow to establish adequate protective cover; and on tidal or stream banks where moving water is likely to wash out new vegetative plantings.

Blankets and matting can also be used to create erosion stops on steep, highly erodible watercourses. Erosion stops should be placed approximately 3 ft down channel from point of entry of a concentrated flow such as from culverts, tributary channels or diversions or at points where a change in gradient or course of channel occurs. Spacing of erosion stops on long slopes will vary, depending on the erodibility of the soil and velocity and volume of flow. Erosion stops are placed beneath blankets and matting.

Materials:

New types of blankets and matting materials are continuously being developed. The Texas Department of Transportation (TxDOT) has defined the critical performance factors for these types of products, and has established minimum performance standards which must be met for any product seeking to be approved for use within any of TxDOT's construction or maintenance activities. The products that have been approved by TxDOT are also appropriate for general construction site stabilization. TxDOT maintains a web site at:

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/erosion/contents.htm

which is continually updated as new products are evaluated. Tables 3-2.2 through 3-2.4 list applications and products approved by TxDOT as of February 1999.

Table 3-2.2. Class 1 Slope Protection

Type A – Slopes 1:30 or Flatter – Clay Soils	
Airtrol	Greenstreak Pec-Mat
Anti-wash/Geojute	Landlok 407GT
BioD-Mesh™60	Landlok FRS 3112
BonTerra® EcoNet™ ENS2	Landlok TRM 435
BonTerra® EcoNet™ ENCS2	Miramat TM8
BonTerra S1	North American Green S150
BonTerra S2	North American Green S75
BonTerra SFB12	North American Green® S75 BN
Carthage Mills Veg Net	North American Green SC150
C-Jute	North American Green® S150 BN
Contech Standard	Maccaferri MX287
Contech Standard Plus	Pennzsuppress®
Contech Straw/Coconut Fiber Mat w/Kraft Net	Poplar Erosion Blanket
Contech C-35	Soil Guard
Curlex I	Soil Saver
Curlex™ -LT	SuperGro
EcoAegis™	Tensar Erosion Blanket TB 1000
ECS Excelsior Blanket Standard	Terra-Control®
ECS High Velocity Straw Mat	TerraJute
ECS Straw Blanket Standard	verdyol Ero-Mat
EnviroGuard Plus	verdyol Excelsior High Velocity
Formula 480 Liquid Clay	verdyol Excelsior Standard
Futerra®	Webmat 280
GeoTech TechMat™ SCKN	Xcel Regular
Green Triangle Regular	Xcel Superior
Green Triangle Superior	

Table 3-2.2 (continued)

Type B - 1:3 or Flatter - Sandy Soils:	
BonTerra S1 BonTerra S2 BonTerra CS2 BonTerra® EcoNet™ENCS2™ BonTerra® EcoNet™ENS2 C-Jute Carthage Mills Veg Net Contech Standard Contech Standard Plus Contech Straw/Coconut Fiber Mat w/Kraft Net Contech C-35 Curlex LT ECS Straw Blanket Standard ECS Excelsior Blanket Standard ECS High Velocity Straw Mat EcoAegis™ Futerra® Geojute Plus 1 GeoTech TechMat™ SCKN Green Triangle Regular	Landlok FRS 3112 Landlok 407GT Landlok™ TRM 435 Maccaferri MX287 Miramat 1000 Miramat TM8 North American Green S75 North American Green® S75 BN North American Green S150 North American Green SC150 North American Green® S150 BN Poplar Erosion Blanket Soil Guard Terra-Control® TerraJute verdyol Ero-Mat verdyol Excelsior Standard Xcel Regular Xcel Superior

Type C - Slopes Steeper than 1:3 - Clay Soils:	
Airtrol Anti-Wash/Geojute BonTerra® EcoNet™ ENCS2 BonTerra S2 BonTerra SFB12 Carthage Mills Veg Net C-Jute Contech Standard Plus Contech Straw/Coconut Fiber Mat w/Kraft Net Contech C-35 Curlex I ECS High Velocity Straw Mat Formula 480 Liquid Clay Futerra® Green Triangle Superior GeoTech TechMat™ SCKN Greenstreak Pec-Mat Landlok 407GT Landlok FRS 3112	Landlok™ TRM 435 Maccaferri MX287 Miramat TM8 North American Green S150 North American Green S75 North American Green SC150 North American Green® S150 BN Pennzsuppress® Poplar Erosion Blanket Soil Guard Soil Saver SuperGro Tensar Erosion Blanket TB1000 TerraJute verdyol Excelsior High Velocity Webmat 280 Xcel Superior

Table 3-2.2 (continued)

Type D - Slopes Steeper than 1:3 - Sandy Soils:	
BonTerra S2 BonTerra CS2 BonTerra® EcoNet™ ENCS2™ C-Jute Carthage Mills Veg Net Contech Standard Plus Contech Straw/Coconut Fiber Mat w/Kraft Net Contech C-35 Curlex I ECS High Velocity Straw Mat Futerra® Geojute Plus 1 GeoTech TechMat™ SCKN Green Triangle Superior	Landlok 407GT Landlok FRS 3112 Landlok™ TRM 435 Maccaferri MX287 Miramat 1000 Miramat TM8 North American Green S150 North American Green SC150 North American Green® S150 BN Soil Guard TerraJute Xcel Superior

Table 3-2.3 Class 2
Flexible Channel Lining

Type E - Shear Stress Range 0 - 96 Pascal (0 - 2 lb/ft^2):	
BonTerra® C2 BonTerra® CP2 BonTerra® EcoNet™ ENC2 BonTerra® SFB™ BonTerra SFB12 Contech TRM C-45 Contech C-35 Contech Coconut/Poly Fiber Mat Contech Coconut Mat w/Kraft Net Curlex® Channel Enforcer 1 Curlex® Channel Enforcer II Earth-Lock ECS High Impact Excelsior ECS High Velocity Straw Mat Enkamat 7018 Enkamat 7020	Geotech TechMat™ CP 3-D Geotech TechMat™ CKN Greenstreak Pec-Mat Koirmat™ 700 Landlok™ TRM 435 Landlok TRM 450 Maccaferri MX287 Miramat TM8 North American Green C350 Three Phase North American Green® P350 North American Green S150 Pyramat® Tensar Erosion Mat TM3000 Tensar Erosion Blanket TB1000 Webmat 280

Table 3-2.3 (continued)

Type F - Shear Stress Range 0 - 192 Pascal (0 - 42 lb/ft^2):	
BonTerra□ C2	Geotech TechMat™ CKN
BonTerra® CP2	Greenstreak Pec-Mat
BonTerra® EcoNet™ ENC2	Koirmat™ 700
BonTerra® SFB™	Landlok™ TRM 435
BonTerra SFB12	Landlok TRM 450
Curlex® Channel Enforcer 1	Maccaferri MX287
Curlex® Channel Enforcer II	Miramat TM8
Contech TRM C-45	North American Green C350 Three Phase
Contech C-35	North American Green® P350
Contech Coconut/Poly Fiber Mat	North American Green S150
Contech Coconut Mat w/Kraft Net	Pyramat®
Earth-Lock	Tensar Erosion Blanket TB1000
ECS High Impact Excelsior	Tensar Erosion Blanket TM3000
ECS High Velocity Straw Mat	Webmat 280
Enkamat 7018	
Geotech TechMat™ CP 3-D	

Type G - Shear Stress Range 0 - 287 Pascal (0 - 62 lb/ft^2):	
BonTerra® CP2	Koirmat™700
BonTerra® SFB™	Landlok™ TRM 435
BonTerra SFB12	Landlok TRM 450
Contech TRM C-45	North American Green C350 Three Phase
Contech C-35	North American Green® P350
Contech Coconut/Poly Fiber Mat	Pyramat®
Curlex® Channel Enforcer II	Tensar Erosion Mat TM3000
Earth-Lock	Tensar Erosion Blanket TB1000
Enkamat 7018	Webmat 280
Geotech TechMat™ CP 3-D	
Greenstreak Pec-Mat	

Type H - Shear Stress Range 0 - 383 Pascal (0 - 82 lb/ft^2):	
BonTerra® CP2	Landlok TRM 450
BonTerra SFB12	North American Green C350 Three Phase
Contech TRM C-45	North American Green® P350
Contech C-35	Pyramat®
Contech Coconut/Poly Fiber Mat	Tensar Erosion Blanket TB1000
Geotech TechMat™ CP 3-D	Tensar Erosion Mat TM 3000
Landlok™ TRM 435	

Table 3-2.4

Seeding for Erosion Control

Cellulose Fiber Mulches **Clay or Tight Soils:**
American Fiber Mulch
American Fiber Mulch (with Hydro-Stick)
Conwed Hydro Mulch
Enviro-Gro
Evercycle™ Hydro-Mulch
Excel Fibermulch II (with Exact-Tac)
Lay-Low Mulch
Pennzsuppress®
Pro Mat
Pro Mat (with RMBplus)
Pro Mat XL
Second Nature Regenerated Wood Fiber
Silva Fiber Plus

Sandy or Loose Soils:
American Fiber Mulch
American Fiber Mulch (with Hydro-Stick)
American Fiber Mulch with Stick Plus
Conwed Hydro Mulch
Enviro-Gro
Evercycle™ Hydro-Mulch
Excel Fibermulch II (with Exact-Tac)
Lay-Low Mulch
Pennzsuppress®
Pro Mat
Pro Mat (with RMBplus)
Pro Mat XL
Second Nature Regenerated Wood Fiber

Installation:

Proper installation of blankets and matting is necessary for these materials to function as intended. They should always be installed in accordance with the manufacturer's recommendations. Proper anchoring of the material and preparation of the soil are two of the most important aspects of installation. Typical anchoring methods are shown in Figure 3-2.8 and Figure 3-2.9.

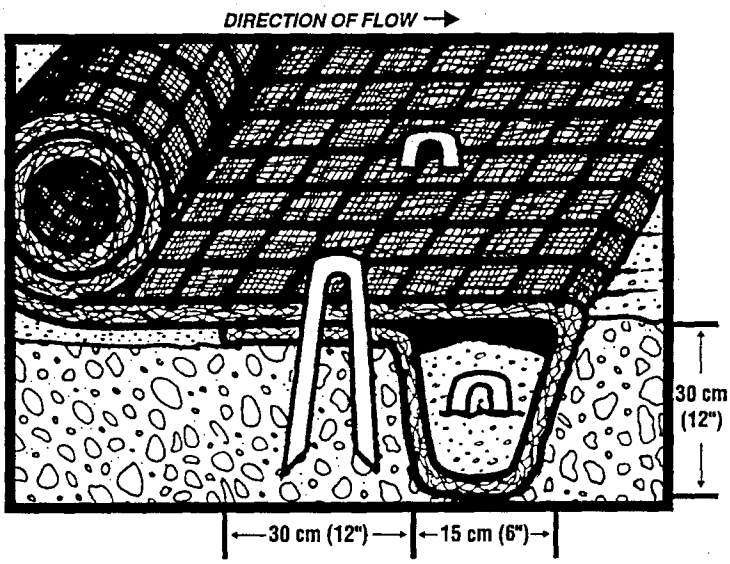


Figure 3-2.8 Initial Anchor Trench

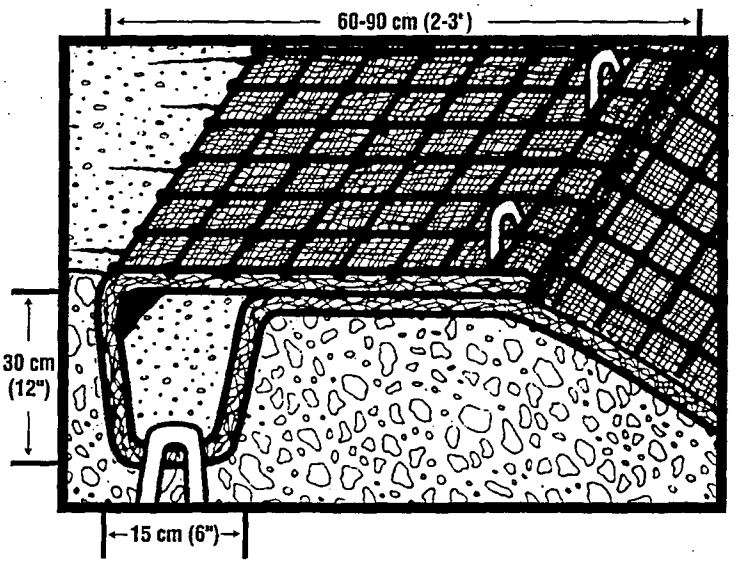


Figure 3-2.9 Terminal Anchor Trench

Soil Preparation:

1) After site has been shaped and graded to approved design, prepare a friable seed bed relatively free from clods and rocks more than 1.5 in. in diameter and any foreign material that will prevent contact of the protective mat with the soil surface.

2) Fertilize and seed in accordance with seeding or other type of planting plan.

3) The protective matting can be laid over sprigged areas where small grass plants have been planted. Where ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Erosion Stops

1) Erosion stops should extend beyond the channel liner to full design cross-section of the channel to check any rills that might form outside the channel lining.

2) The trench may be dug with a spade or a mechanical trencher, making sure that the down slope face of the trench is flat; it should be uniform and perpendicular to line of flow to permit proper placement and stapling of the matting.

3) The erosion stop should be deep enough to penetrate solid material or below level of ruling in sandy soils. In general, erosion stops will vary from 6 to 12 in. in depth.

4) The erosion stop mat should be wide enough to allow a minimum of 2 in. turnover at bottom of trench for stapling, while maintaining the top edge flush with channel surface.

5) Tamp backfill firmly and to a uniform gradient of channel.

Final Check:

- Matting is uniformly in contact with the soil
- All lap joints are secure
- All staples are flush with the ground
- All disturbed areas seeded

3-2.8 Mulch

Mulching is the process of applying a material to the exposed soil surface to protect it from erosive forces and to conserve soil moisture until plants can become established. When mulching, it is important not to introduce new species of grasses into an area where that type of grass does not exist. These exotic species may contribute to unwanted habitat degradation.

When seeding critical sites, sites with adverse soil conditions or seeding on other than optimum seeding dates, mulch material should be applied immediately after seeding. Seeding during optimum seeding dates and with favorable soils and site conditions will not need to be mulched.

Materials:

1) Mulch may be small grain straw applied uniformly at the rate of 1.5 to 2 tons per acre. On slopes 15 percent or greater, a binding chemical must also be applied to the surface.

2) Wood-fiber or paper-fiber mulch at the rate of 1500 lb/acre may be applied by hydroseeding. Use is limited to maximum grades of 3 percent and a maximum length of 150 ft of slope and during optimum seeding periods in spring and fall.

3) Mulch nettings, such as jute or other blanket products may be used. Staple to surface in waterways and on slopes greater than 3:1. Light materials of paper, plastic and cotton mulch nettings may be used where erosion hazard is not severe. If area is to be mowed, do not use metal staples.

4) Wood chips at the rate of approximately 6 tons per acre may be used when available on slopes of 2 percent and less.

Installation:

1) Mulch anchoring should be accomplished immediately after mulch placement to minimize loss by wind or water. This may be done by one of the following methods, depending upon size of area, erosion hazard and cost. On sloping land, the method described under "mulch anchoring tool" below should be used on the contour wherever possible, except on slopes steeper than 3:1, where "tracking" should be done up and down the slope with 1.5 in. cleat marks running across the slope.

2) Peg and Twine - Drive 8 to 10-in. wooden pegs to within 2 to 3 in. of the soil surface every 4 ft in all directions. Stakes may be driven before or after applying mulch. Secure mulch to soil surface by stretching twine between pegs in a crisscross within a square pattern. Secure twine around each peg with two or more round turns.

3) Mulch Netting - Staple lightweight biodegradable paper, plastic or cotton netting over the mulch, according to manufacturer's recommendations. Netting is usually available in rolls 4 ft wide and up to 300 ft long.

4) Mulch Anchoring Tool (not a disc) - A tractor-drawn implement designed to punch and anchor mulch into the top 2 in. of soil. This practice affords maximum erosion control, but is limited to flatter slopes where equipment can operate safely. 'Tracking" is

primarily used on steeper than 3:1 cut and fill slopes to cut the mulch into the soil with cleated bulldozer tracks.

5) Liquid Mulch Binders - Applications of liquid binders should be heavier at edges where wind catches mulch, in valleys and at crests of banks. Remainder of area should be uniform in appearance. Caution should be used with asphalt in residential and similar areas. Binders should be applied in the quantities recommended by the manufacturer.

3-2.9 Sod

Sod is appropriate for disturbed areas which require immediate vegetative covers, or where sodding is preferred to other means of grass establishment. Locations particularly suited to stabilization with sod are waterways carrying intermittent flow, areas around drop inlets or in grassed swales, and residential or commercial lawns where quick use or aesthetics are factors.

The advantages of properly installed sod include:

- Immediate erosion control
- An instant green surface with no dust or mud
- Nearly year-round establishment capability
- Less chance of failure than seed
- Freedom from weeds
- Quick use of the sodded surface
- The option of buying a quality-controlled product with predictable results

It is initially more costly to install sod than to seed. However, this cost is justified in places where sod can perform better than seed in controlling erosion. In swales and waterways where concentrated flow will occur, properly pegged sod is preferable to seed because there is no lag time between installation and the time when the channel is protected by vegetation. Drop inlets, which will be placed in grassed areas, can be kept free of sediment, and the grade immediately around the inlet can be maintained, by framing the inlet with sod strips.

Sod can be laid during times of the year when seeded grass may fail, so long as there is adequate water available for irrigation in the early weeks. Ground preparation and proper maintenance are as important with sod as with seed. Sod is composed of living plants and those plants must receive adequate care in order to provide vegetative stabilization on a disturbed area.

Materials:

1) Sod should be machine cut at a uniform soil thickness of ¾ in. (± ¼ in.) at the time of cutting. This thickness should exclude shoot growth and thatch.

2) Pieces of sod should be cut to the supplier's standard width and length, with a maximum allowable deviation in any dimension of 5 percent. Torn or uneven pads should not be acceptable.

3) Standard size sections of sod should be strong enough to support their own weight and retain their size and shape when suspended from a firm grasp on one end of the section.

Sod should be harvested, delivered, and installed within a period of 36 hr.

Site Preparation:

1) Prior to soil preparation, areas to be sodded should be brought to final grade in accordance with the approved plan.

2) The surface should be cleared of all trash, debris, roots, brush, wire, grade stakes and other objects that would interfere with planting, fertilizing or maintenance operations.

3) Fertilize according to soil tests. Fertilizer needs can be determined by a soil testing laboratory or regional recommendations can be made by county agricultural extension agents. Fertilizer should be worked into the soil to a depth of 3 in. with a disc, springtooth harrow or other suitable equipment. On sloping land, the final harrowing or discing operation should be on the contour.

General Installation (VA Dept of Conservation, 1992):

1) Sod should not be cut or laid in excessively wet or dry weather. Sod also should not be laid on soil surfaces that are frozen.

2) During periods of high temperature, the soil should be lightly irrigated immediately prior to laying the sod, to cool the soil and reduce root burning and dieback.

3) The first row of sod should be laid in a straight line with subsequent rows placed parallel to and butting tightly against each other. Lateral joints should be staggered to promote more uniform growth and strength. Care should be exercised to ensure that sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would cause drying of the roots. (See Figure 3-2.10.)

4) On slopes 3:1 or greater, or wherever erosion may be a problem, sod should be laid with staggered joints and secured by stapling or other approved methods. Sod should be installed with the length perpendicular to the slope (on the contour).

5) As sodding of clearly defined areas is completed, sod should be rolled or tamped to provide firm contact between roots and soil.

6) After rolling, sod should be irrigated to a depth sufficient that the underside of the sod pad and the soil 4 in. below the sod is thoroughly wet.

7) Until such time a good root system becomes developed, in the absence of adequate rainfall, watering should be performed as often as necessary to maintain moist soil to a depth of at least 4 in.

The first mowing should not be attempted until the sod is firmly rooted, usually 2-3 weeks. Not more than one third of the grass leaf should be removed at any one cutting.

Installation in Channels:

1) Sod strips in waterways should be laid perpendicular to the direction of flow. Care should be taken to butt ends of strips tightly (see Figure 3-2.11).

2) After rolling or tamping, sod should be pegged or stapled to resist washout during the establishment period. Mesh or other netting may be pegged over the sod for extra protection in critical areas.

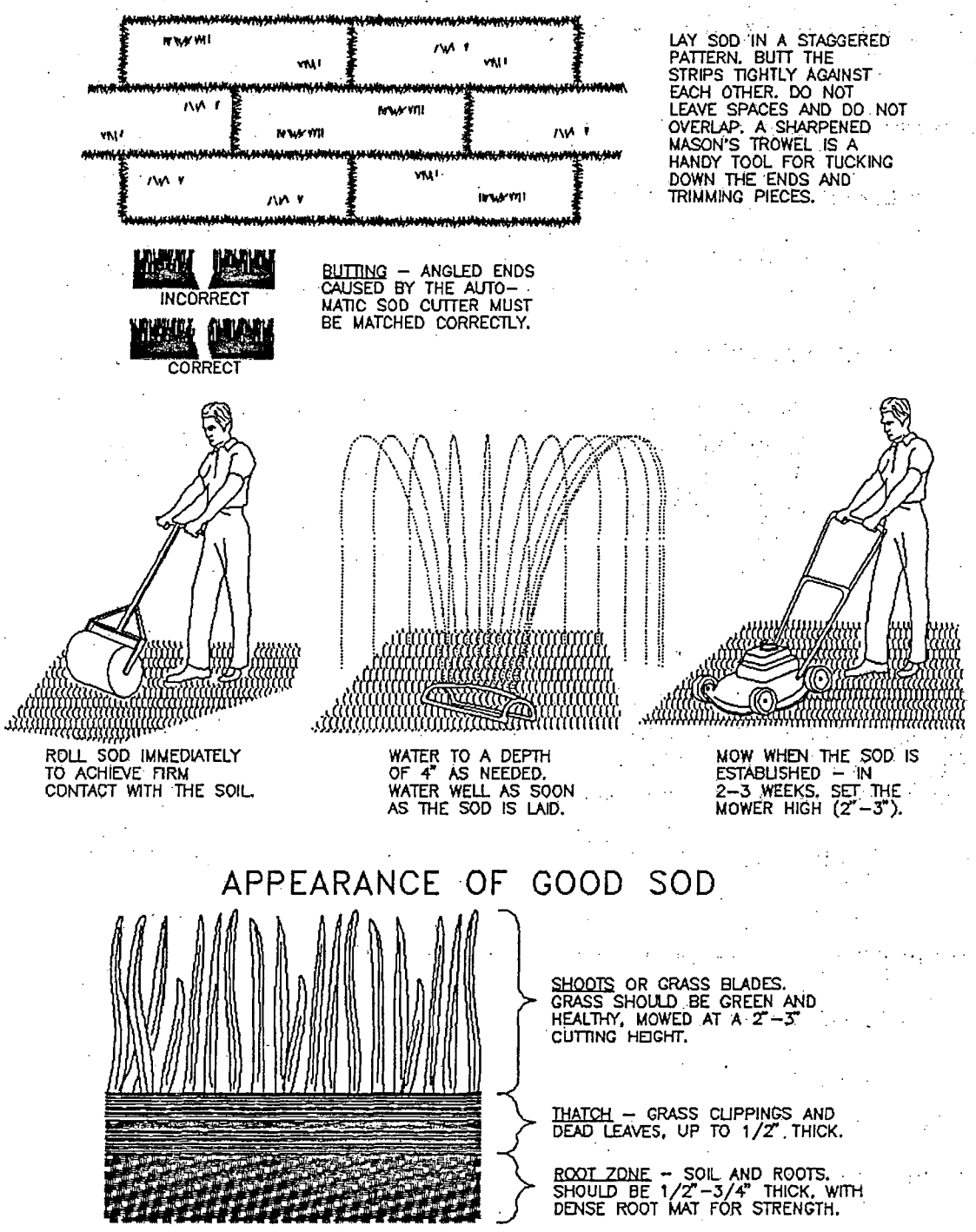


Figure 3-2.10 Proper Sod Installation Techniques (VA Dept. of Conservation, 1992)

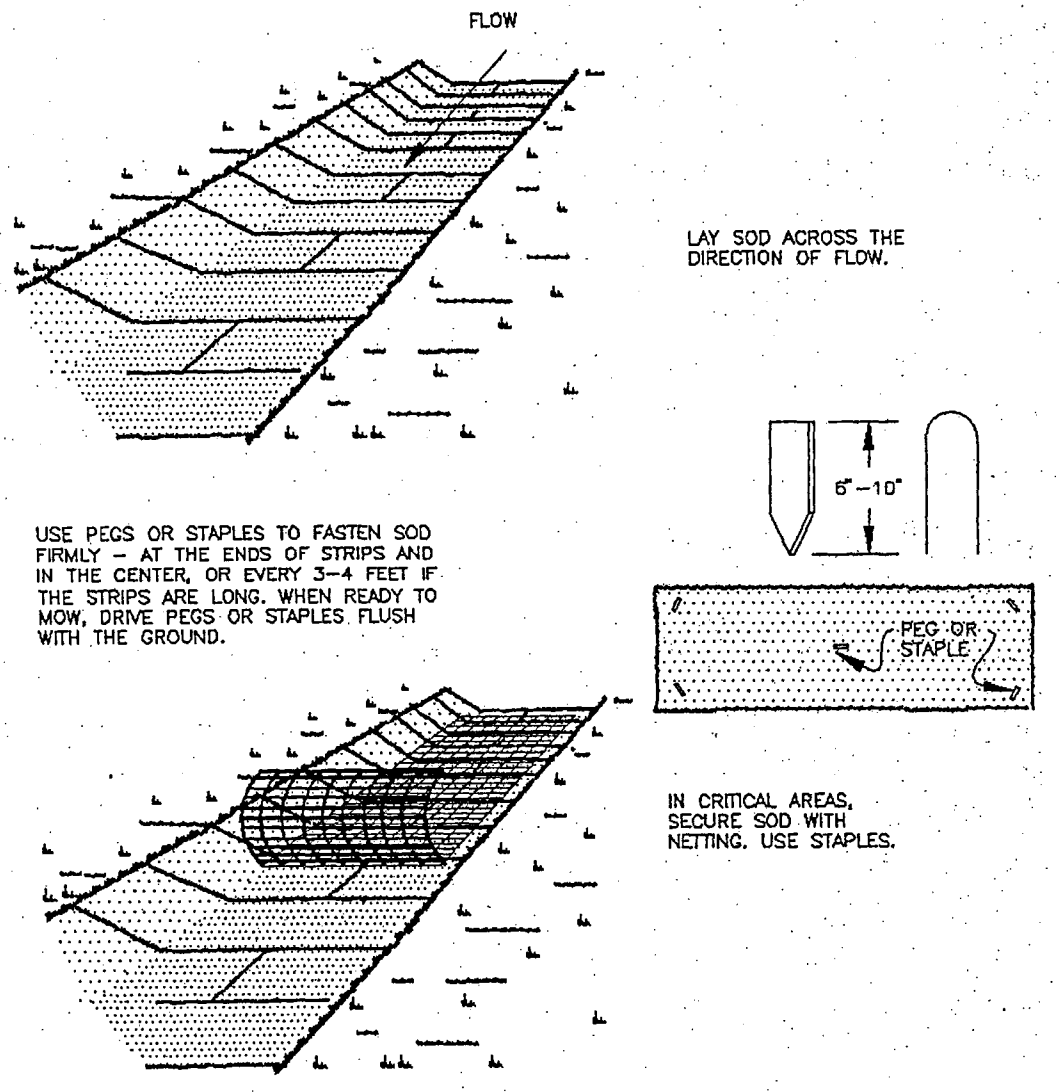


Figure 3-2.11. Installation of Sod in a Channel (VA Dept. of Conservation, 1992)

3-2.10 Soil Stabilizers

Soil stabilizers are applied to reduce the discharge of pollutants to the storm drain system or to watercourses as a result of wind erosion. The purpose of this measure is to prevent blowing and movement of dust from exposed soil surfaces, reduce on and off-site damage, health hazards and improve traffic safety. This practice is applicable to areas subject to dust blowing and movement where on and off-site damage is likely without treatment.

Construction activities inevitably result in the exposure and disturbance of soil. Fugitive dust is emitted both during the activities (i.e., excavation demolition, vehicle traffic, human activity) and as a result of wind erosion over the exposed earth surfaces. Large quantities of dust are typically generated in 'heavy' construction activities, such as road and street construction and subdivision, commercial or industrial development, which involve disturbance of significant areas of the soil surface. Research on construction sites has established an average dust emission rate of 1.2 tons/acre/month for active construction (VA Dept of Conservation, 1992). Earth moving activities comprise the major source of construction dust emissions, but traffic and general disturbance of the soil also generate significant dust emissions. The three main categories of dust control measures are described below.

Chemical Methods

Chemical methods are dust suppressant or binding agents that are used on the soil surface to bind finer particles together. Chemical dust control agents must be environmentally benign, easily applied, easily maintained, economical and not significantly detrimental to traffic ability.

Approximately three-quarters of chemical dust control agents are inorganic compounds that are compatible with soil and biota. After application, the compounds dampen and penetrate into the soil; a hygroscopic reaction pulls moisture from the atmosphere into the surface and adheres fines to aggregate surface particles. The compounds may not penetrate soil surfaces made up primarily of silt and clay, so soil tests are required.

Performance of chemical agents depends on temperature, humidity, and traffic. To be effective, a suppressant must effectively limit visible dust emissions. Examples of chemical control agents are provided in Table 3-2.5.

Structural and Mechanical Methods

Vegetative methods can often be as useful in dust control as chemical means. Surface materials can be used such that dust control is accounted for in the design process rather than as a reaction to site conditions. Some alternatives are shown in Table 3-2.5.

Administrative Methods

Examples of administrative dust control methods are shown in Table 3-2.5. Implementing and enforcing a speed limit and limiting traffic reduces the pulverization of road materials. It is recommended that vehicle speeds be limited to 15 mph on unpaved roads, although this may not be possible in all areas. Restrictions on vehicle weight or number of wheels can be useful practices in dust-prone areas. Traffic can also be reduced by restricting access.

Selection of Measures:

- Soil types and surface materials - both fines and moisture content are key properties of surface materials.
- Properties of the agents - the five most important properties are penetration, evaporation, resistance to leaching, abrasion, and aging.
- Traffic volumes - the effectiveness and life span of dust control agents decreases as traffic increases. For high traffic areas, agents need to have strong penetrating and stabilizing capabilities.
- Climate - some hygroscopic agents lose their moisture-absorbing abilities with lower relative humidity, and some may lose resilience. Under rainy conditions, some agents may become slippery or even leach out of the soil.
- Environmental requirements - the primary environmental concern is the presence and concentration of heavy metals in the agent that may leach into the immediate ecosystem, depending on the soil properties.
- Frequencies of application - rates and frequencies of application are based on the type of agent selected, the degree of dust control required, subgrade conditions, surface type, traffic volumes, types of vehicles and their speeds, climate, and maintenance schedule.

Application Methods

For dust control agents, once all factors have been considered, the untreated soil surface must first contain sufficient moisture to assist the agent in achieving uniform distribution (except when using a highly resinous adhesive agent) The following steps should be followed in general:

- If the surface has minimal natural moisture, the area to be protected must be pre-wetted so that the chemicals can uniformly penetrate the surface.
- In general, cooler and/or more humid periods result in decreased evaporation, increased surface moisture, and thus significant increase in control efficiency. However, chemical and organic agents should not be applied under frozen conditions, rainy conditions, or when the temperature is below 40° F. Tar and bitumen agents should not be applied in fog or in rain or below 55° F.
- More than one treatment with salts or organic compounds per year is often necessary, although the second treatment should probably be diluted.

Maintenance and Inspection:

The primary maintenance requirement is the reapplication of the selected dust control agent at intervals appropriate to the agent type. High traffic areas should be inspected on a daily basis, and lower traffic areas should be inspected on a weekly basis.

Table 3-2.5

Dust Control Agents

Chemicals – Inorganic			
Method	**Selection**	**Preparation**	**Application Rate**
Water	Most commonly used practice Evaporates quickly Lasts less that 1 day	For all liquid agents: Blade a smooth surface. Crown or slope surface to avoid ponding. Compact soils if needed. Uniformly pre-wet at 0.03 – 0.3 gal/yd^2. Apply solution under pressure. Overlap solution 6-12 in. Allow treated areas to cure 0-4 hr. Compact area after curing. Apply second treatment before first treatment becomes ineffective using 50% application rate. In low humidities reactivate chemicals by rewetting at 0.1 – 0.2 gal/yd^2.	0.125 gal/yd^2 every 20 to 30 min
Salts – **Calcium Chloride**	Restricts evaporation Lasts 6-12 months Can be corrosive Less effective in low humidity Can build up in soils and leach by rain		Apply 38% solution at 0.27 gal/yd^2 or as loose, dry granules per manufacturer
Magnesium Chloride	Restrict evaporation Works at higher temperatures and lower humidity than CaCl May be more costly than CaCl		Apply 26-32% solution at 0.5 gal/yd^2
Sodium Chloride	Effective over smaller range of conditions Less expensive		Per manufacturer
Salt Mixes	Reduces cost		Per manufacturer
Silicates	Generally inexpensive Available in small quantities Require second application		
Surfactants	High evaporation rates Effective for short time periods Must apply frequently		

Table 3-2.5 (continued)

Chemicals – Organic			
Method	**Selection**	**Preparation**	**Application Rate**
Copolymers	Form semi-permeable transparent crust Resists ultraviolet radiation and moisture induced breakdown Lasts 1-2 years	Same as inorganic chemicals	80-100 gal/ac
Petroleum Products	Bind soil particles May hinder foliage growth Environmental and aesthetic concerns Higher cost		Use 57-63 % resins as base. Apply at 80-100 gal/ac
Lignin Sulfonate	Paper industry waste product Acts as dispersing agent Best in dry climates Can be slippery		Loosen surface 1-2 in. Need 4-8% fines.
Vegetable Oils	Coat grains of soil, so limited binding ability May become brittle Limited availability		Per manufacturer
Spray-on Adhesives	Available as organic or synthetic Effective on dry, hard soils Form a Crust Can last 3-4 years		Per manufacturer

Table 3-2.5 (continued)

Structural/Mechanical			
Method	**Selection**	**Preparation**	**Application Rate**
Vegetative	Effective where no construction traffic	Seed incrementally during project. Seed at appropriate time of year	As appropriate for vegetation selected
Mulch	Not appropriate for heavily-trafficked areas	See Mulching	See Mulching
Tillage	Roughens soil to reduce wind erosion	Begin on windward side Use spring-toothed harrows or chisel-type plows spaced 12 in apart	NA
Stone	Can stabilize roads or other disturbed areas Low-cost, stable, effective for highly used roads	Blade a smooth surface Crown or slope to avoid ponding Compact soils, if needed	Apply 1-3 in. stone in uniform layer
Road Fabrics	Separate subgrade and base courses Flexible, durable, permeable	Same as above	Install per manufacturer
Barriers	Can be used to interrupt airflow. Can use board fence, wind fence, silt fence, burlap fence or similar	Place barrier perpendicular to prevailing air currents Place at intervals on 15 times the barrier height.	Install per manufacturer

Table 3-2.5 (continued)

Administrative		
Method	**Selection**	**Measure**
Speed Limits	Reduces dust generation and pulverization of road materials	Limit speeds to 15 mph
Weight/Wheel Restrictions	Reduces dust generation	Use signage and barriers in dust-prone areas
Carpooling	Reduces number of vehicles at site	Require or encourage employees to ride share
Restrict Access	Reduces number of vehicles in dust-prone areas.	Use signage and barriers

Appendix 3-3

Temporary Sediment Control BMPs

APPENDIX 3-3
TEMPORARY SEDIMENT CONTROL BMPs

3-3.1 General Guidelines

Construction activities normally result in disturbance of the site due to grading operations, clearing and other activities. Erosion will occur in the disturbed areas, and BMPs should be used to contain the sediment transported by storm water runoff. Although the names of many controls suggest that filtration is an important component of sediment removal, almost all reduction in sediment load is the result of particle settling under relatively quiescent conditions. Consequently, sediment barriers, such as silt fences and rock berms, should be designed and installed as temporary (although leaky) dams.

When these devices are viewed as temporary dams, it is easier to see the importance of installing them along the contour or with a constant top elevation to prevent concentrating the runoff at the lowest spot in the barrier. Such concentration can result in more erosion than would occur if no barrier was installed at all. Therefore, great care should be taken in the placement and installation of these types of controls.

For larger areas or where effective installation of sediment barriers is not an option, sediment traps and sediment basins should be used to control sediment in runoff. These devices are essentially larger, more permanent dams that temporarily detain storm water runoff.

All of the sediment control BMPs are potentially quite effective in removing sediment from storm water runoff when they are properly maintained and installed. However, this potential is often squandered: casual observation of many active construction sites reveals silt fences that are torn or damaged by equipment, evidence of storm water bypass, or controls installed in inappropriate locations (i.e., silt fences used in channels). In these cases, significant funds are expended in return for little in the way of water quality protection. Consequently, proper installation and maintenance should be key components of any temporary sediment control plan.

A list of the temporary sediment controls and their appropriate siting criteria are contained in Table 3-3.1. More detailed guidance on siting and maintenance are contained in the subsequent paragraphs within this section.

Table 3-3.1 Guidelines for Selection of Sediment Control BMPs

Control Type	Applications	Drainage Area	Slope
Construction Exit	Must be used at all designated access points	NA	NA
Silt Fence (interior)	Areas of minor sheet flow	< ¼ acre/100 ft of fence	< 20%
Silt Fence (exterior)	Down slope borders of site; up slope border is necessary to divert offsite drainage. For larger areas use diversion swale or berm	< ¼ acre/100 ft of fence	< 20%
Triangular Filter Dike	Areas within site requiring frequent access	< 1 acre	< 10%
Rock Berm	Drainage swales and ditches with and below site	< 5 acres	< 30%
High Service Rock Berm	Around sensitive features, high flow areas within and below site	< 5 acres	< 30%
Sand Bag Berm	For construction activities in streambeds	5-10 acres	<15%
Buffer Strips	On floodplains, next to wetlands, along stream banks, and on steep slopes	NA	NA
Inlet Protection	Prevent sediment from entering storm drain system	< 1 acre	NA
Sediment Trap	Used where flows concentrated in a swale or channel	1-5 acres	NA
Sediment Basin	Appropriate for large disturbed areas	5 – 100 acres	NA

3-3.2 Temporary Construction Entrance/Exit

The purpose of a temporary gravel construction entrance is to provide a stable entrance/exit condition from the construction site and keep mud and sediment off public roads. A stabilized construction entrance is a stabilized pad of crushed stone located at any point traffic will be entering or leaving the construction site from a public right-of-way, street, alley, sidewalk or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. This practice must be used at all points of construction ingress and egress. Schematic diagrams of a construction entrance/exit are shown in Figure 3-3.1 and Figure 3-3.2.

Excessive amounts of mud can also present a safety hazard to roadway users. To minimize the amount of sediment loss to nearby roads, access to the construction site should be limited to as few points as possible and vegetation around the perimeter should be protected were access is not necessary. A rock stabilized construction entrance must be used at all designated access points. Other materials may also be used at construction entrances in lieu of rock such as steel traction mats.

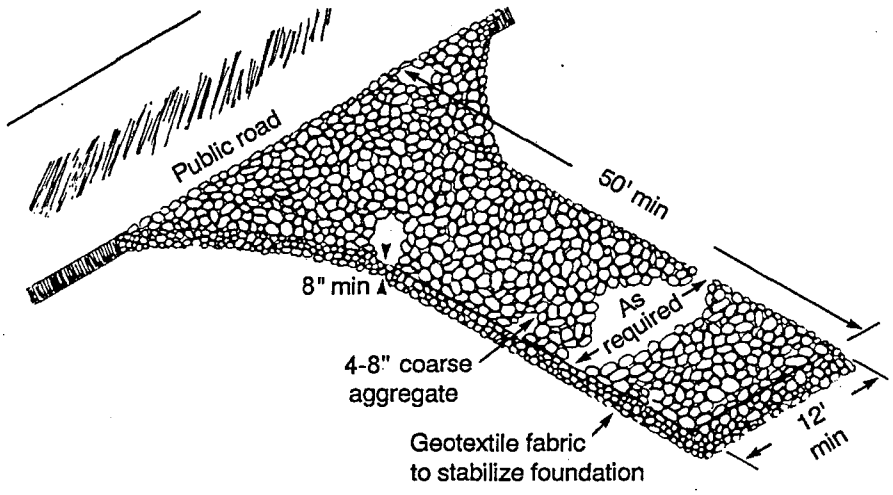


Figure 3-3.1 Schematic of Temporary Construction Entrance/Exit (after NC, 1993)

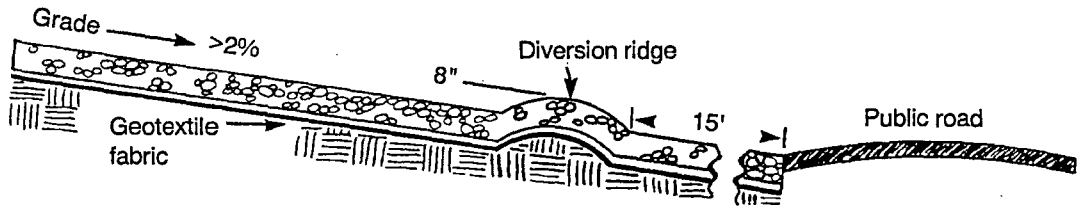


Figure 3-3.2 Cross-section of a Construction Entrance/Exit (NC, 1993)

Materials:

Aggregate	4- to 8-in. nominal diameter washed stone over a stable foundation, as specified in the plan or alternate as noted above, placed with a minimum thickness of 8 in.
Geotextile fabric	Designed specifically for use as a soil filtration media with an approximate weight of 6 oz/yd^2, a Mullen burst rating of 140 lb/in.^{2}, and an equivalent opening size greater than a number 50 sieve
Vehicle washing area (if required)	A level area with a minimum of 4 in. washed stone or commercial rack; wastewater should be diverted to a sediment trap or basin.

Installation: (North Carolina, 1993)

1) The minimum width of the entrance/exit should be 12 ft or the full width of exit roadway, whichever is greater.

2) The construction entrance should be at least 50 ft long.

3) Avoid curves on public roads and steep slopes. Remove vegetation and other objectionable material from the foundation area. Grade crown foundation for positive drainage.

4) If the slope toward the road exceeds 2%, construct a ridge, 6 to 8 in. high with 3:1 (H:V) side slopes, across the foundation approximately 15 ft from the entrance to divert runoff away from the public road.

5) Place geotextile fabric and grade foundation to improve stability, especially where wet conditions are anticipated.

6) Place stone to dimensions and grade shown on plans. Leave surface smooth and slope for drainage.

7) Divert all surface runoff and drainage from the stone pad to a sediment trap or basin.

8) Install pipe under pad as needed to maintain proper public road drainage.

Common trouble points:

1) Inadequate runoff control – sediment washes onto public road.

2) Stone too small or geotextile fabric absent; results in muddy condition as stone is pressed into soil.

3) Pad too short for heavy construction traffic – extend pad beyond the minimum 50-ft length as necessary.

4) Pad not flared sufficiently at road surface; results in mud being tracked on to road and possible damage to road edge.

5) Unstable foundation – use geotextile fabric under pad and/or improve foundation drainage.

Inspection and Maintenance Guidelines:

1) Maintain the entrance in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment.

2) Immediately remove all sediment spilled, dropped, washed or tracked on to public rights-of-way.

3) When necessary, clean wheels of construction vehicles to remove sediment prior to entering a public right-of-way.

4) Wash vehicles only in an area that has been stabilized with crushed stone that drains into an approved sediment trap or sediment basin.

5) Prevent sediment from entering any storm drain, ditch or water course by using approved methods.

3-3.3 Silt Fence

A silt fence is a barrier consisting of geotextile fabric supported by metal posts to prevent soil and sediment loss from a site. When properly used, silt fences can be highly effective in controlling sediment from disturbed areas. They cause runoff to pond, allowing heavier solids to settle out. If these silt fences are not properly installed or are used in improper locations (where flow is concentrated), they will not be effective. A schematic of a silt fence is shown in Figure 3-3.3.

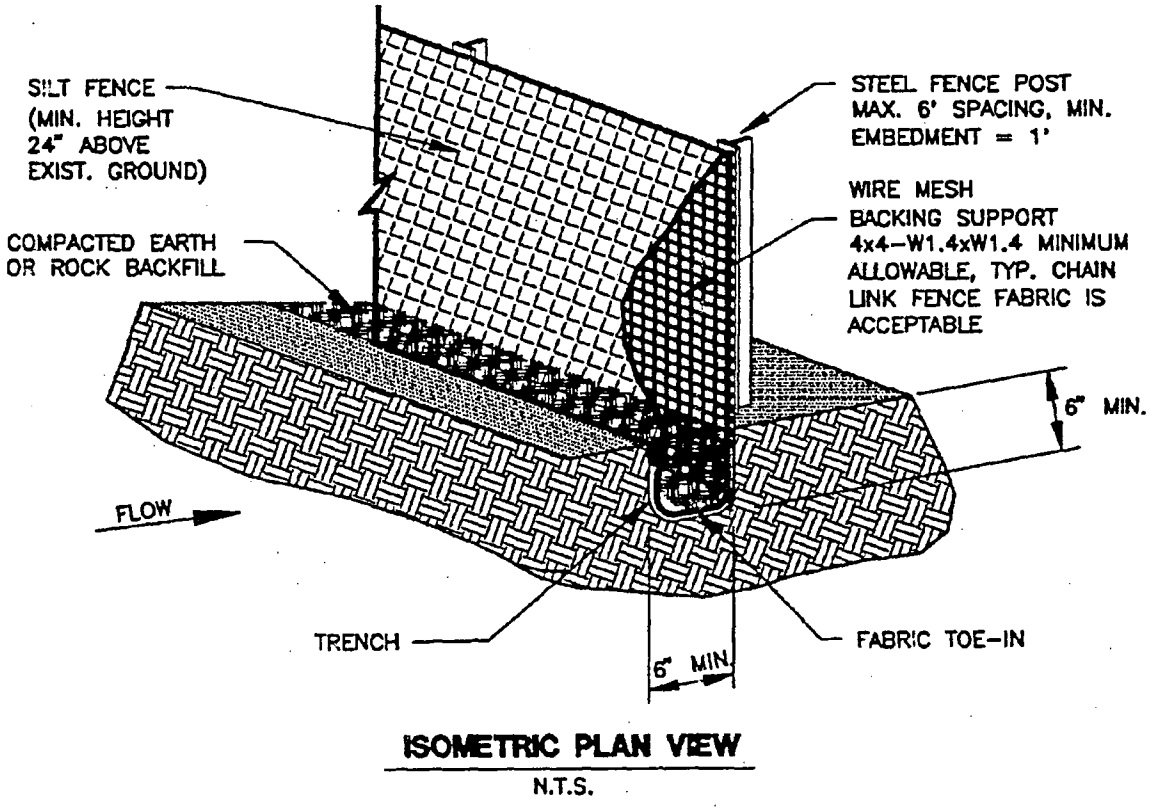


Figure 3-3.3 Schematic of a Silt Fence Installation (NCTCOG, 1993b)

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas of a limited extent. A silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence should remain in place until the disturbed area is permanently stabilized. Silt fences should not be used where there is a concentration of water in a channel or drainage way. If concentrated flow occurs after installation, corrective action must be taken such as placing a rock berm in the areas of concentrated flow.

Silt fencing within the site may be temporarily moved during the day to allow construction activity provided it is replaced and properly anchored to the ground at the end of the day. Silt fences on the perimeter of the site or around drainage ways should not be moved at any time.

Materials:

Silt fence	Polypropylene, polyethylene or polyamide woven or nonwoven fabric 36 in. wide with a minimum unit weight of 4.5 oz/yd, Mullen burst strength exceeding 190 lb/in.^{2}, ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.
Fence posts	Made of hot rolled steel, at least 4 ft long with Tee or Y-bar cross section, surface painted or galvanized, minimum nominal weight 1.25 lb/ft^2, and Brindell hardness exceeding 140
Woven wire backing to support the fabric	Galvanized 2 x 4 in. welded wire, 12-gauge minimum.

Installation:

1) Install steel posts that support the silt fence on a slight angle toward the anticipated runoff source. Post must be embedded a minimum of 1 ft deep and spaced not more than 8 ft on center. Where water concentrates, the maximum spacing should be 6 ft.

2) Lay out fencing down-slope of disturbed area, following the contour as closely as possible. The fence should be sited so that the maximum drainage area is ¼ acre/100 ft of fence.

3) Trench in the toe of the silt fence with a spade or mechanical trencher so that the down-slope face of the trench is flat and perpendicular to the line of flow. Where the fence cannot be trenched in (e.g., pavement or rock outcrop), weight the fabric flap with 3 in. of pea gravel on the uphill side to prevent flow from seeping under fence.

4) The trench must be a minimum of 6 in. deep and 6 in. wide to allow for the silt fence fabric to be laid in the ground and backfilled with compacted material.

5) Securely fasten the silt fence to each steel support post or to woven wire, which is, in turn, attached to the steel fence post. There should be a 3-ft overlap, securely fastened where the ends of the fabric meet.

6) Remove the silt fence when the site is completely stabilized in order not to block or impede storm flow or drainage.

Common Trouble Points:

1) Fence not installed along the contour causing water to concentrate and flow over the fence.

2) Fabric not seated securely to ground (runoff passing under fence)

3) Fence not installed perpendicular to flow line (runoff escaping around sides)

4) Fence treating too large an area, or excessive channel flow (runoff overtops or collapses fence)

Inspection and Maintenance Guidelines:

1) Inspect all fencing monthly, and after any rainfall.

2) Remove sediment when buildup reaches 6 in., or install a second line of fencing parallel to the old fence.

3) Replace any torn fabric or install a second line of fencing parallel to the torn section.

4) Replace or repair any sections crushed or collapsed in the course of construction activity. If a section of fence is obstructing vehicular access, consider relocating it to a spot where it will provide equal protection, but will not obstruct vehicles. A triangular filter dike may be preferable to a silt fence at common vehicle access points.

3-3.4 Triangular Sediment Filter Dikes

The purpose of a triangular sediment filter dike (Figure 3-3.4) is to intercept and detain water-borne sediment from unprotected areas of limited extent. The triangular sediment filter dike is used where there is no concentration of water in a channel or other drainage way above the barrier and the contributing drainage area is less than one acre. If the uphill slope above the dike exceeds 10 percent, the length of the slope above the dike should be less than 50 ft. If concentrated flow occurs after installation, corrective action should be taken such as placing rock berm in the areas of concentrated flow.

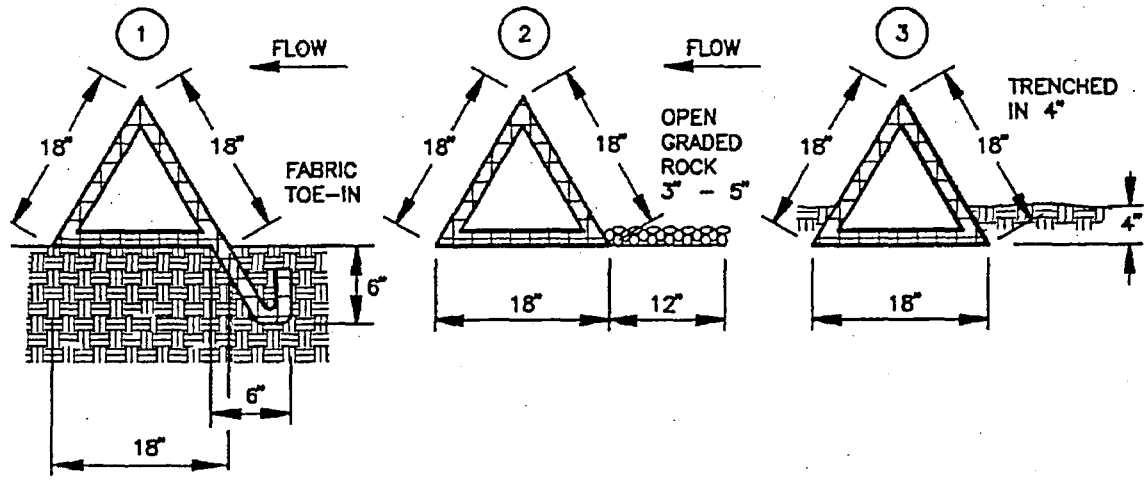
This measure is effective on paved areas where installation of a silt fence is not possible or where vehicle access must be maintained. The advantage of these controls is the ease with which they can be moved to allow vehicle traffic, then reinstalled to maintain sediment control.

Materials:

Silt fence material	Polypropylene, polyethylene or polyamide woven or nonwoven fabric. The fabric width should be 36 in. with a minimum unit weight of 4.5 oz/yd, Mullen burst strength exceeding 190 lb/in.^{2}, ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.
Dike structure	6 gauge 6 x 6 in. wire mesh folded into triangular form 18 in. on each side.

Installation:

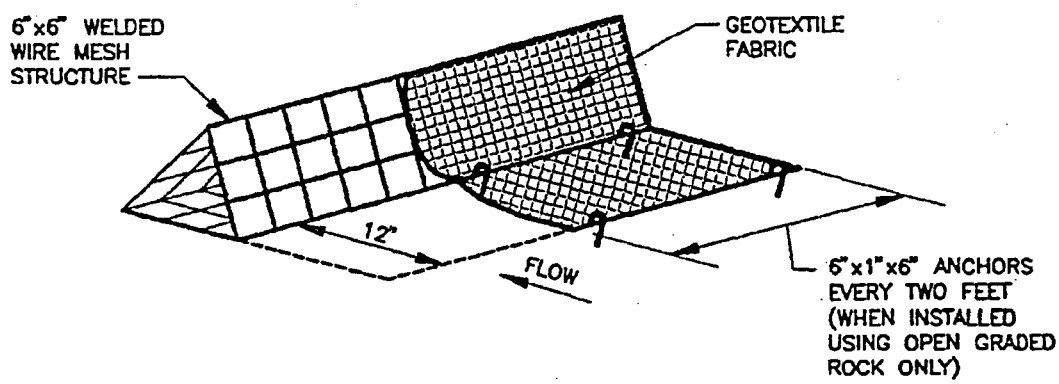
1) As shown in the diagram (Figure 3-3.4), the frame should be constructed of 6" x 6", 6 gauge welded wire mesh, 18 in. per side, and wrapped with geotextile fabric of the same composition as that used for silt fences.
2) Position the filter material so that it laps over ends 6 in. to cover dike-to-dike junction; secure each junction with shoat rings.
3) Position dike parallel to the contours, with the end of each section closely abutting the adjacent sections.
4) Fasten the filter dike to the ground. There are several options for fastening the filter dike to the ground (Figure 3-3.4). The fabric skirt may be toed-in with 6 in. of compacted material, or 12 in. of the fabric skirt should extend uphill and be secured with a minimum of 3 in. of open graded rock, or with staples or nails. If these two options are not feasible, the dike structure may be trenched in 4 in.
5) Install triangular sediment filter dikes across exposed slopes during construction with ends of the dike tied into existing grades to prevent failure and should intercept no more than one acre of runoff.
6) When the dikes are moved to allow vehicular access, reinstall them as soon as soon as possible, but always at the end of the workday.



CROSS SECTION OF INSTALLATION OPTIONS

N.T.S.

1. TOE-IN 6" MIN
2. WEIGHTED W/ 3" - 5" OPEN GRADED ROCK
3. TRENCHED IN 4"



ISOMETRIC PLAN VIEW

N.T.S.

Figure 3-3.4 Schematic of a Triangular Filter Dike (NCTCOG, 1993)

Common Trouble Points:

1) Fabric skirt missing, too short, or not securely anchored (flows passing under dike).

2) Gap between adjacent dikes (runoff passing between dikes).

3) Dike not placed parallel to contour (runoff flowing around dike).

Inspection and Maintenance Guidelines:

1) Inspect monthly or after each rainfall event. Repair or replace promptly as needed by the contractor.

2) Inspect and realign berms as needed to prevent gaps between sections.

3) Remove accumulated silt after each rainfall, and dispose of it in a manner that will not cause additional siltation.

4) After the site is completely stabilized, remove the dikes and any remaining silt. Remove and dispose of the silt in a manner that will not cause additional siltation.

3-3.5 Rock Berms

The purpose of a rock berm is to serve as a check dam in areas of concentrated flow, to intercept sediment-laden runoff, detain the sediment and release the water in sheet flow. The rock berm should be used when the contributing drainage area is less than 5 acres. Rock berms are used in areas where the volume of runoff is too great for a silt fence to contain. They are less effective for sediment removal than silt fences, particularly for fine particles, but are able to withstand higher flows than a silt fence. As such, rock berms are often used in areas of channel flows (ditches, gullies, etc.). Rock berms are most effective at reducing bed load in channels and should not be substituted for other erosion and sediment control measures further up the watershed.

Materials:

Woven wire sheathing	Maximum opening of 1 in. and minimum wire diameter of 20 gauge galvanized; secured with shoat rings
Rock for berm construction	Clean, open graded 3- to 5-in. diameter rock should be used, except in areas where high velocities or large volumes of flow are expected, where 5- to 8-in. diameter rocks may be used.

Installation:

1) Lay out the woven wire sheathing perpendicular to the flow line.

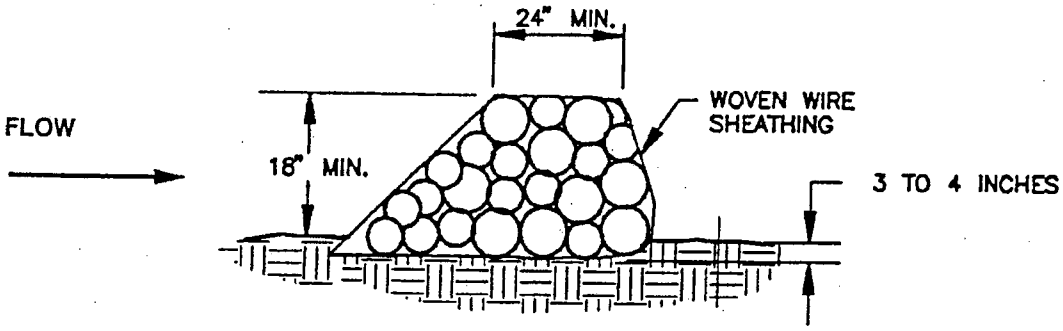
2) Berm should have a top width of 2 ft minimum with side slopes being 2:1 (H:V) or flatter.

3) Place the rock along the sheathing as shown in the diagram (Figure 3-3.5), to a minimum height of 18 in.

4) Wrap the wire sheathing around the rock and secure with tie wire so that the ends of the sheathing overlap at least 2 in. and the berm retains its shape when walked upon.

5) Build the berm along the contour at zero percent grade or as near as possible.

6) Tie the ends of the berm into existing up-slope grade and bury the berm in a trench approximately 3 to 4 in. deep to prevent failure of the control.



CROSS SECTION

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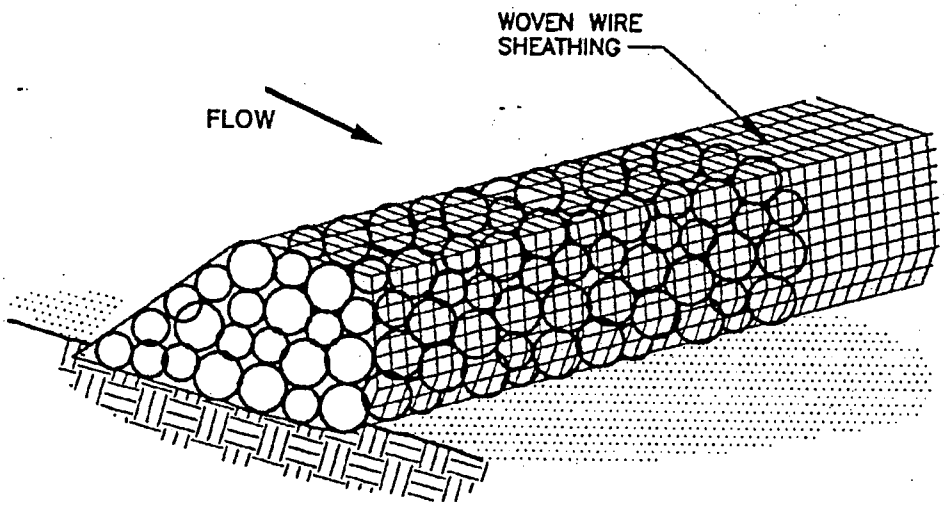


ISOMETRIC PLAN VIEW

N.T.S.

Figure 3-3.5 Schematic Diagram of a Rock Berm (NCTCOG, 1993)

Common Trouble Points:

1) Insufficient berm height or length (runoff quickly escapes over top or around sides of berm)

2) Berm not installed perpendicular to flow line (runoff escaping around one side)

Inspection and Maintenance Guidelines:

1) Inspect monthly and after each rainfall. Daily inspections are necessary for installations in streambeds.

2) Remove sediment and other debris when buildup reaches 6 in. and dispose of the accumulated silt in an approved manner.

3) Repair any loose wire sheathing.

4) Reshape the berm as needed during inspection.

5) Replace the berm when the structure ceases to function as intended due to silt accumulation among the rocks, washout, construction traffic damage, etc.

6) Leave the rock berm in place until all upstream areas are stabilized and accumulated silt is removed.

3-3.6 High Service Rock Berms

A high service rock berm should be designated in areas of important environmental significance such as in steep canyons or above permanent springs, pools, recharge features, or other environmentally sensitive areas that may require a higher level of protection. This type of sediment barrier combines the characteristics of a silt fence and a rock berm to provide a substantial level of sediment reduction and a sturdy enough barrier to withstand higher flows (Figure 3-3.6). The drainage area to this device should not exceed 5 acres and the slope should be less than 30 percent.

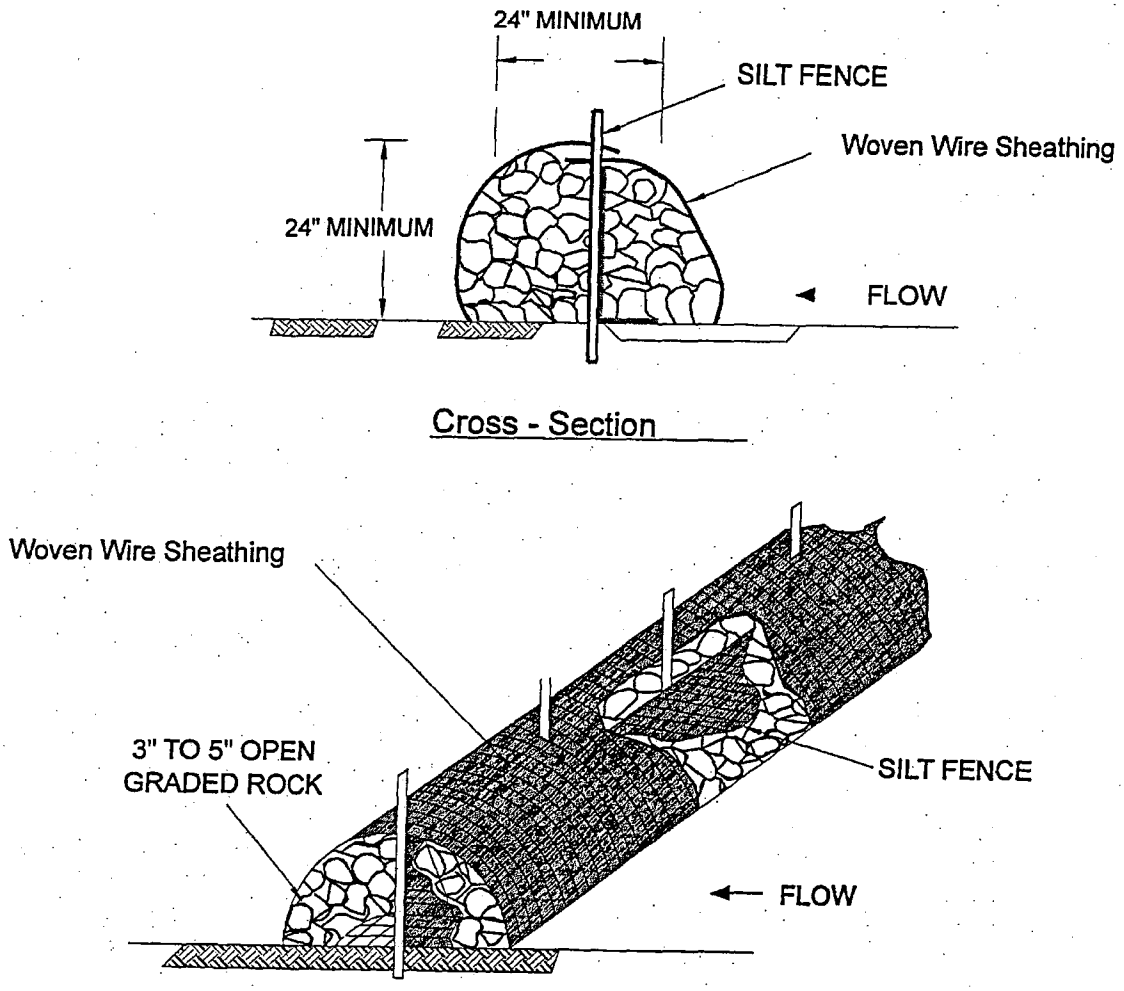


Figure 3-3.6 Schematic Diagram of High Service Rock Berm (LCRA, 1998)

Materials:

Silt fence	Polypropylene, polyethylene or polyamide woven or nonwoven fabric 36 in. wide , with a minimum unit weight of 4.5 oz/yd, Mullen burst strength exceeding 190 lb/in.^{2}, ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30
Fence posts	Hot rolled steel, at least 4 ft long with Tee or Y-bar cross section, surface painted or galvanized, minimum nominal weight 1.25 lb/ft^2, and Brindell hardness exceeding 140. Rebar (either #5 or #6) may also be used to anchor the berm.
Woven wire backing to support the fabric	Galvanized 2 x 4 in. welded wire, 12 gauge minimum
Berm structure	Secured with a woven wire sheathing having maximum opening of 1 in. and a minimum wire diameter of 20 gauge galvanized and secured with shoat rings.
Rock for berm construction	Clean, open-graded 3- to 5-in. diameter rock except in areas where high velocities or large volumes of flow are expected, where 5- to 8-in. diameter rocks may be used

Installation

1) Lay out the woven wire sheathing perpendicular to the flow line. The sheathing should be 20 gauge woven wire mesh with 1-in. openings.

2) Install the silt fence along the center of the proposed berm placement, as with a normal silt fence described in Section 3-3.3.2.

3) Place the rock along the sheathing on both sides of the silt fence as shown in the diagram (Figure 3-3.6), to a height not less than 24 in. Clean, open graded 3-5-in. diameter rock should be used, except in areas where high velocities or large volumes of flow are expected, where 5- to 8-in. diameter rock may be used.

4) Wrap the wire sheathing around the rock and secure with tie wire so that the ends of the sheathing overlap at least 2 in., and the berm retains its shape when walked on.

5) Remove the high service rock berm when the site is revegetated or otherwise stabilized or leave it in place as a permanent BMP if drainage is adequate.

Common Trouble Points:

1) Insufficient berm height or length (runoff quickly escapes over top or around sides of berm).

2) Berm not installed perpendicular to flow line (runoff escapes around one side).

3) Internal silt fence not anchored securely to ground (high flows displaces berm).

NOTE: When berms are installed in streambeds, they often result in diversion scour. Their use in this setting is not recommended.

Inspection and Maintenance Guidelines:

1) Inspect monthly and after each rainfall. Inspect daily if rock berm installations are in streambeds.

2) Remove sediment and other debris when buildup reaches 6 in. and dispose of the accumulated silt in an approved manner.

3) Repair any loose wire sheathing.

4) Reshape the berm as needed during inspection.

5) Replace the berm when the structure ceases to function as intended due to silt accumulation among the rocks, washout, construction traffic damage, etc.

6) Leave the rock berm in place until all upstream areas are stabilized and accumulated silt is removed.

3-3.7 Check Dams

Check dams are small barriers consisting of straw bales, rock, or earth berms placed across a drainage swale or ditch. They reduce the velocity of small concentrated flows, provide a limited barrier for sediment and help disperse concentrated flows, reducing potential erosion.

They are used primarily in long drainage swales or ditches in which permanent vegetation may not be established and erosive velocities are present. They are typically used in conjunction with other techniques such as inlet protection, riprap or other sediment reduction techniques. Check dams provide limited treatment. They are more useful in reducing flow to acceptable levels for other techniques (NCTCOG, 1993b).

Although check dams are effective in reducing flow velocity and thereby the potential for channel erosion, it is usually better to establish a protective vegetative lining before flow is confined or to install a structural channel lining than to install check dams. However, under circumstances where this is not feasible, check dams are useful.

Materials:

Although many different types of material can be used to create check dams, aggregate and riprap produce a more stable structure.

For drainage area less than 2 acres	Coarse aggregate alone can be used for the dam
For drainage areas between 2 and 10 acres	A combination of coarse aggregate and riprap as shown in Figure 3-3.7 should be used.

Guidelines for installation:

1) The dam height should be between 18 and 36 in.

2) The center of the check dam should be at least 6 in. lower than the outer edges. Field experience has shown that many dams are not constructed to promote this "weir" effect. Stormwater flows are then forced to the stone-soil interface, thereby promoting scour at that point and subsequent failure of the structure to perform its intended function.

3) The dam should be designed so that the 2-year, 24-hr storm can pass the dam without causing excessive upstream flooding.

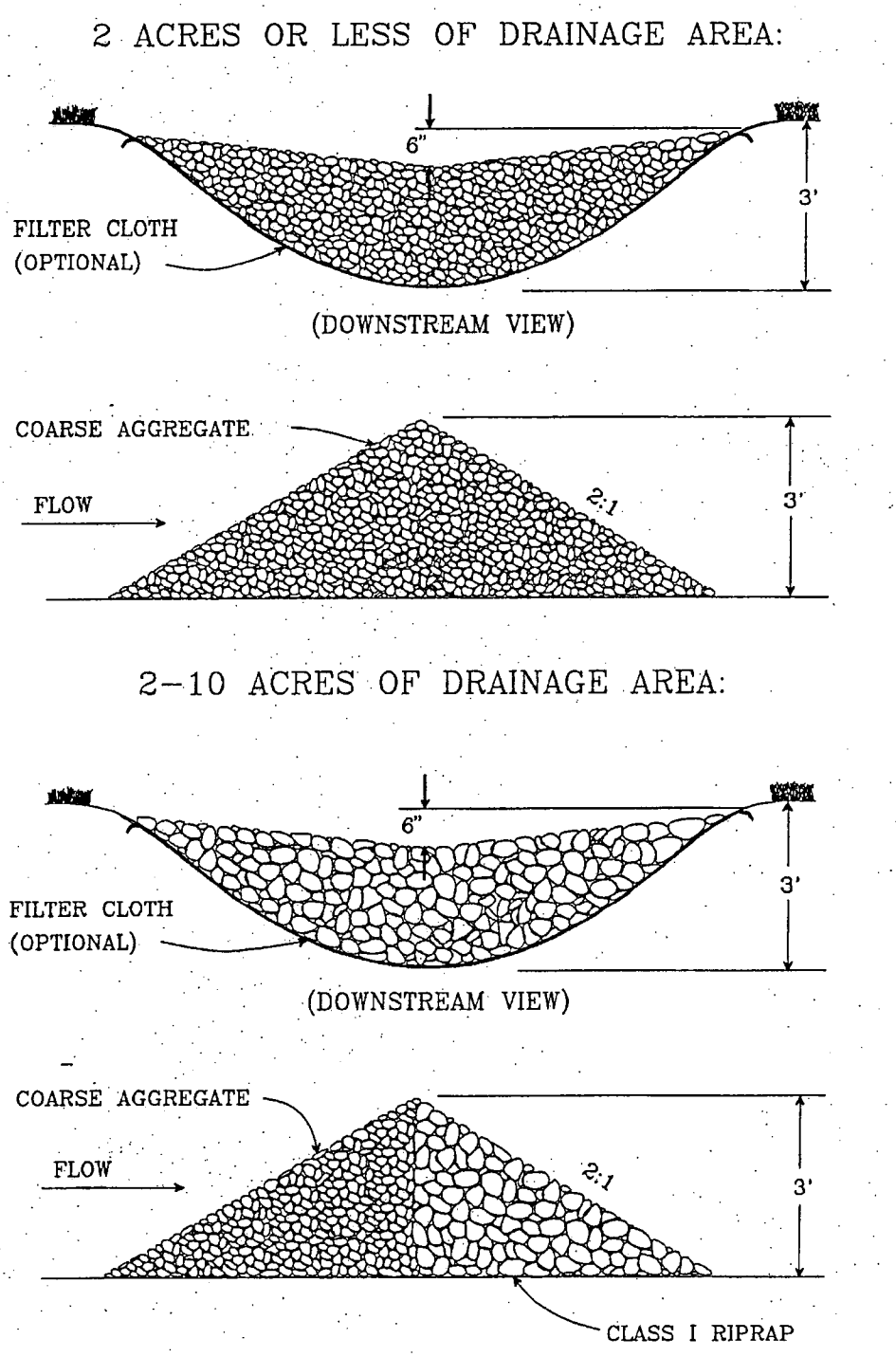


Figure 3-3.7 Diagram of a Rock Check Dam (VA Dept. of Conservation, 1992)

4) For added stability, the base of the check dam can be keyed into the soil approximately 6 in.

5) The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

6) Stone should be placed according to the configuration in Figure 3-3.7. Hand or mechanical placement will be necessary to achieve complete coverage of the ditch or swale and to insure that the center of the dam is lower than the edges.

7) Filter cloth may be used under the stone to provide a stable foundation and to facilitate removal of the stone.

Common Trouble Points:

1) Check dams installed in grass-lined channels may kill the vegetative lining if submergence after rains is too long and/or silting is excessive.

2) If check dams are used in grass-lined channels that will be mowed, care should be taken to remove all the stone when the dam is removed. Stones often wash downstream and can damage mowing equipment and present a safety hazard.

Inspection and Maintenance Guidelines:

1) Inspect and check dams for sediment accumulation after each runoff-producing storm event.

2) Remove sediment when it reaches one half of the original height of the measure.

3) Inspect regularly to ensure that the center of the dam is lower than the edges. Immediately correct erosion caused by high flows around the edges of the dam.

3-3.8 Sand Bag Berm

The purpose of a sandbag berm (Figure 3-3.8) is to intercept sediment-laden water from disturbed areas such as construction in steam beds, create a retention pond, detain sediment and release water in sheet flow. Sand bag berms are used only during construction activities in stream beds when the contributing drainage area is between 5 and 10 acres and the slope is less than 15 percent, i.e., utility construction in channels, temporary channel crossing for construction equipment, etc.

An additional option for use in streambeds is a rock berm, appropriately sized for the channel. Plastic facing should be installed on the upstream side and the berm anchored to be streambed by drilling into the rock and driving in "T" posts or rebar (#5 or #6) spaced appropriately.

Materials:

Sand bag material	Polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight 4 oz/yd^2, Mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70 %
Sand bag dimensions	24 to 30 in. long, 16 to 18 in. wide, 6 to 8 in. thick
Sandbag filler	Filled with coarse grade sand, free from deleterious material. All sand should pass through a No. 10 sieve. The filled bag should weigh approximately 40 lb.
Outlet pipe	Schedule 40 or stronger polyvinyl chloride (PVC) with a nominal internal diameter of 4 in.

Guidelines for installation:

1) The berm should be a minimum of 18 in. high measured from the top of the existing ground at the up-slope toe to the top of the berm.

2) The berm should be sized as shown in the plans but should be no less than 48 in. wide measured at the bottom of the berm and 16 in. wide measured at the top of the berm.

3) Runoff water should flow over the tops of the sandbags or through 4-in. diameter PVC pipes embedded below the top layer of bags as shown in Figure 3-3.8.

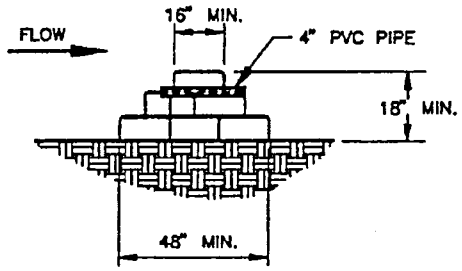
4) When a sandbag is filled with material, the open end of the sandbag should be stapled or tied with nylon or poly cord.

5) Sandbags should be stacked in at least three rows abutting each other, and in staggered arrangement.

6) The base of the berm should have at least three sandbags, with two and one bags in the second and third rows up, respectively.

7) For each additional 6 in. of height, an additional sandbag must be added to each row width.

8) A bypass pump-around system, or similar alternative, should be used on conjunction with the berm for effective dewatering the work area.



CROSS SECTION
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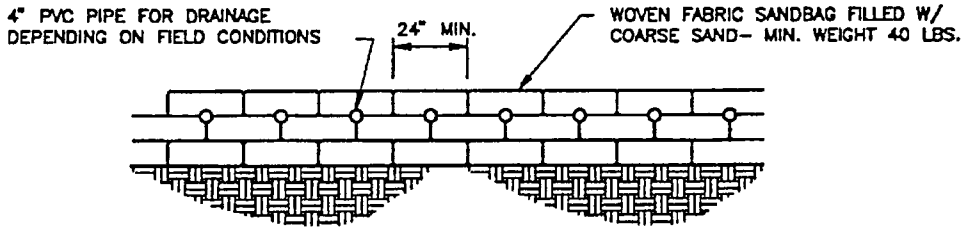


PROFILE VIEW
N.T.S.

Figure 3-3.8 Schematic of a Sand Bag Berm (NCTCOG, 1993)

Common Trouble Points:

1) Ponding will occur directly upstream from the berm creating the possibility of flooding, which should be considered prior to its placement.

2) Berms are often damaged during periods of high flow, which increases the maintenance requirements.

Inspection and Maintenance Guidelines:

1) Inspect the sand bag berm monthly and after each rain.

2) Reshape or replace the sandbags as needed during inspection.

3) Remove the accumulated silt when it reaches 6 in. and dispose of it at an approved site in a manner that will not cause additional siltation.

Leave the sandbag berm in place until all upstream areas are stabilized and accumulated silt is removed. Remove silt by hand.

3-3.9 Vegetative Buffers

Buffer zones are undisturbed strips of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and runoff velocities. Natural buffer zones are used along streams and other bodies of water that need protection from erosion and sedimentation. Vegetative buffers can be used to protect natural swales and can be incorporated into an area's natural landscaping. They can provide critical habitat adjacent to streams and wetlands, as well as assisting in controlling erosion, especially on unstable steep slopes.

The buffer zone can be an area of vegetation that is left undisturbed during construction, or it can be newly planted. If buffer zones are preserved, existing vegetation, good planning, and site management are needed to prevent disturbances such as grade changes, excavation, damage from equipment, and other activities. The creation of new buffer strips requires the establishment of good dense turf, trees, and shrubs.

Guidelines for installation:

1) Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.

2) All unstable steep slopes should be left with their natural vegetation intact.

3) Fence or flag the limits of the clearing and keep all equipment and construction debris out of the natural areas.

4) Keep all excavations outside the dripline of trees and shrubs.

5) Do not push debris or extra soil into the buffer zone area, since this will damage the landscape through burying and smothering.

6) The minimum width of a vegetative buffer used for sediment control should be 50 ft.

Inspection and Maintenance Guidelines:

Inspection and careful maintenance are important to ensure healthy vegetation. The need for routine maintenance such as mowing, fertilizing, irrigating, and weed and pest control will depend on the species of plants and trees, soil types, location and climatic conditions.

3-3.10 Inlet Protection

Storm drains that are made operational prior to stabilization of the associated drainage areas can convey large amounts of sediment to natural drainage ways. In case of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets. The following guidelines for inlet protection are based primarily on recommendations by the Virginia Dept. of Conservation and Recreation (1992) and the North Central Texas Council of Governments (NCTCOG, 1993b).

In developments for which drainage is to be conveyed by underground storm sewers (i.e., streets with curbs and gutters), all inlets that may receive storm runoff from disturbed areas should be protected. Temporary inlet protection is a series of different measures that provide protection against silt transport or accumulation in storm sewer systems. This clogging can greatly reduce or completely stop the flow in the pipes. The different measures are used for different site conditions and inlet types.

Care should be taken when choosing a specific type of inlet protection. Field experience has shown that inlet protection that causes excessive ponding in an area of high construction activity may become so inconvenient that it is removed or bypassed, thus transmitting sediment-laden flows unchecked. In such situations, a structure with an adequate overflow mechanism should be utilized.

It should also be noted that inlet protection devices are designed to be installed on construction sites and not on streets and roads open to the public. When used on public streets these devices will cause ponding of runoff, which can cause minor flooding and can present a traffic hazard. An example of appropriate siting would be a new subdivision where the storm drain system is installed before the area is stabilized and the streets are opened to the general public. When construction occurs adjacent to active streets, the sediment should be controlled on site and not on public thoroughfares. Occasionally, roadwork or utility installation will occur on public roads. In these cases, inlet protection is an appropriate temporary BMP.

The following inlet protection devices are for drainage areas of one acre or less. Runoff from larger disturbed areas should be routed to a temporary sediment trap or basin.

Filter barrier protection using a silt fence is appropriate when the drainage area is less than one acre and the basin slope is less than 5 percent. This type of protection is not applicable in paved areas. A variation of this measure uses straw bales in lieu of filter fabric. This variation is only good for very short-term protection and is not to be used when flows exceed 0.25 cfs to the inlet.

Block and gravel protection is used when flows exceed 0.5 cfs and it is necessary to allow for overtopping to prevent flooding. This form of protection is also useful for curb type inlets as it works well in paved areas.

Wire mesh and gravel protection is used when flows exceed 0.5 cfs and construction traffic may occur over the inlet. This form of protection may be used with both curb and drop inlets.

Excavated impoundment protection around a drop inlet may be used for protection against sediment entering a storm drain inlet. With this method, it is necessary to install weep holes to allow the

impoundment to drain completely. If this measure is implemented, the impoundment should be sized such that the volume of excavation is 3,600 cu ft/acre of disturbed area entering the inlet.

Materials:

Filter fabric	Nylon reinforced polypropylene fabric which meets the following minimum criteria: Tensile Strength, 90 lbs.; Puncture Rating, 60 lb.; Mullen Burst Rating, 280 psi; Apparent Opening Size, U.S. Sieve No. 70.
Posts for fabric	2 in. x 4 in. pressure-treated wood stakes or galvanized steel, tubular in cross-section or they may be standard fence "T" posts
Concrete blocks	Standard 8 in. x 8 in. x 16 in. concrete masonry unit
Wire mesh	Standard hardware cloth or comparable wire mesh with an opening size not to exceed 1/2 in.

Guidelines for installation:

Silt Fence Drop Inlet Protection

1) Silt fence should conform to the specifications listed above and should be cut from a continuous roll to avoid joints.

2) For stakes, use 2 x 4-in. wood or equivalent metal with a minimum length of 3 ft.

3) Space stakes evenly around the perimeter of the inlet a maximum of 3-ft apart, and securely drive them into the ground, approximately 18-in. deep (Figure 3-3.9).

4) To provide needed stability to the installation, a frame with 2 x 4-in. wood strips around the crest of the overflow area at a maximum of 1½ ft above the drop inlet crest should be provided.

5) Place the bottom 12 in. of the fabric in a trench and backfill the trench with 12 in. of compacted soil.

6) Fasten fabric securely by staples or wire to the stakes and frame. Joints must be overlapped to the next stake.

7) It may be necessary to build a temporary dike on the down slope side of the structure to prevent bypass flow.

If the drop inlet is above the finished grade, the grate may be completely covered with filter fabric. The fabric should be securely attached to the entire perimeter of the inlet using 1"x 2" wood strips and appropriate fasteners.

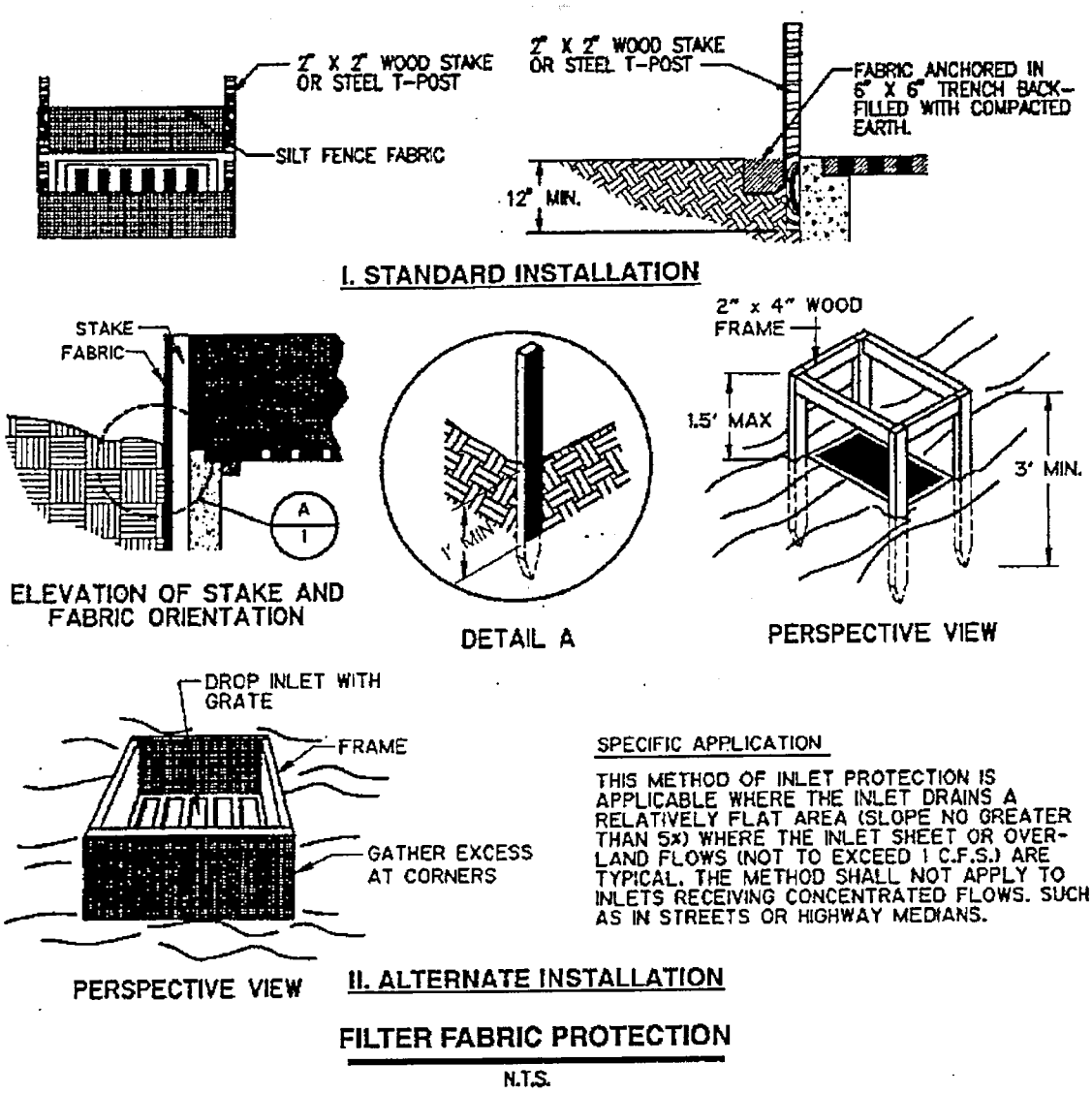


Figure 3-3.9 Filter Fabric Inlet Protection (NCTCOG, 1993)

Gravel and Wire Mesh Drop Inlet Sediment Filter

1) Wire mesh should be laid over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. Wire mesh with 1/2-in. openings should be used. If more than one strip of mesh is necessary, the strips should be overlapped (see **Error! Reference source not found.**).

2) Coarse aggregate should be placed over the wire mesh as indicated in Figure 3-3.10. The depth of stone should be at least 12 in. over the entire inlet opening. The stone should extend beyond the inlet opening at least 18 in. on all sides.

3) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stones must be pulled away from the inlet, cleaned and/or replaced.

Note: This filtering device has no overflow mechanism; therefore, ponding is likely especially if sediment is not removed regularly. This type of device should never be used where overflow may endanger an exposed fill slope. Consideration should also be given to the possible effects of ponding on traffic movement, nearby structures, working areas, adjacent property, etc.

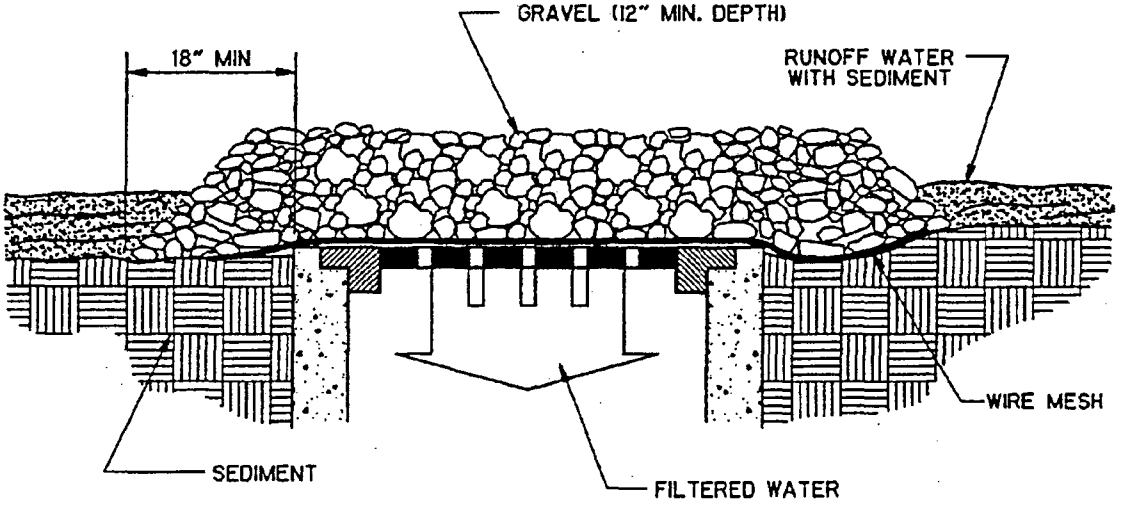


Figure 3-3.10. Wire Mesh and Gravel Inlet Protection (NCTCOG, 1993)

Block and Gravel Drop Inlet Sediment Filter

1) Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending on design needs, by stacking combinations of 4-in., 8-in. and 12-in. wide blocks. The barrier of blocks should be at least 12-in. high and no greater than 24 in. high.

2) Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Wire mesh with 1/2-in. openings should be used.

3) Stone should be piled against the wire to the top of the block barrier, as shown in **Error! Reference source not found.**.

4) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and replaced.

Block and Gravel Curb Inlet Sediment Filter

1) Two concrete blocks should be placed on their sides abutting the curb at either side of the inlet opening.

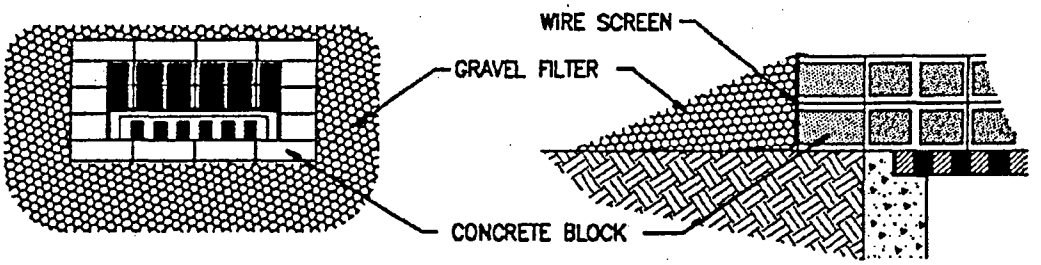
2) A 2-in. x 4-in. stud should be cut and placed through the outer holes of each spacer block to help keep the front blocks in place.

3) Concrete blocks should be placed on their sides across the front of the inlet and abutting the spacer blocks as depicted in Figure 3-3.11.

4) Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Wire mesh with 1/2-in. openings should be used.

5) Coarse aggregate should be piled against the wire to the top of the barrier as shown in **Error! Reference source not found.**.

6) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and/or replaced.



DROP INLET PROTECTION

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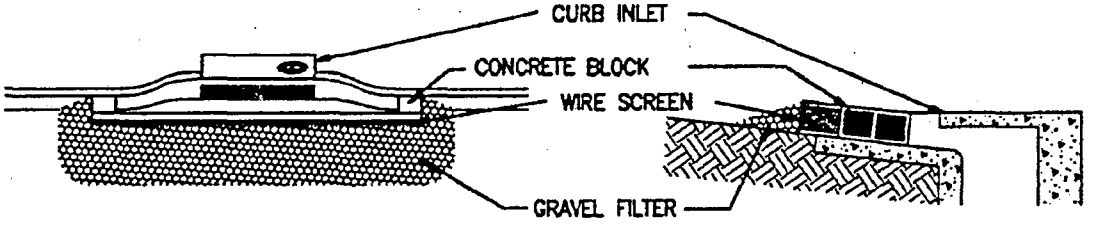


CURB INLET PROTECTION

N.T.S.

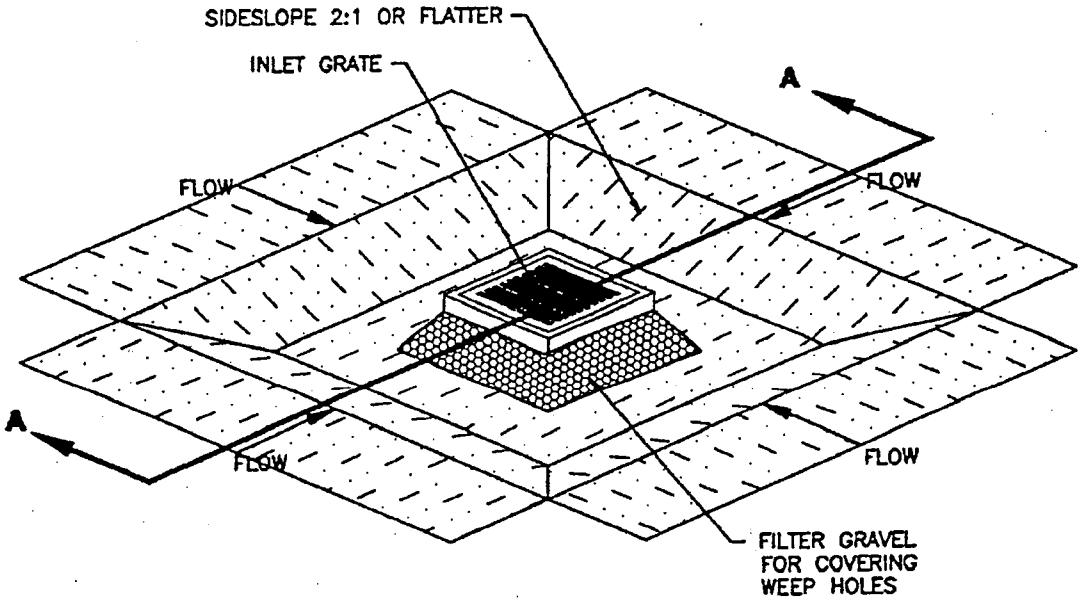
Figure 3-3.11. Block and Gravel Inlet Protection (NCTCOG, 1993)

Excavated Drop Inlet Sediment Trap

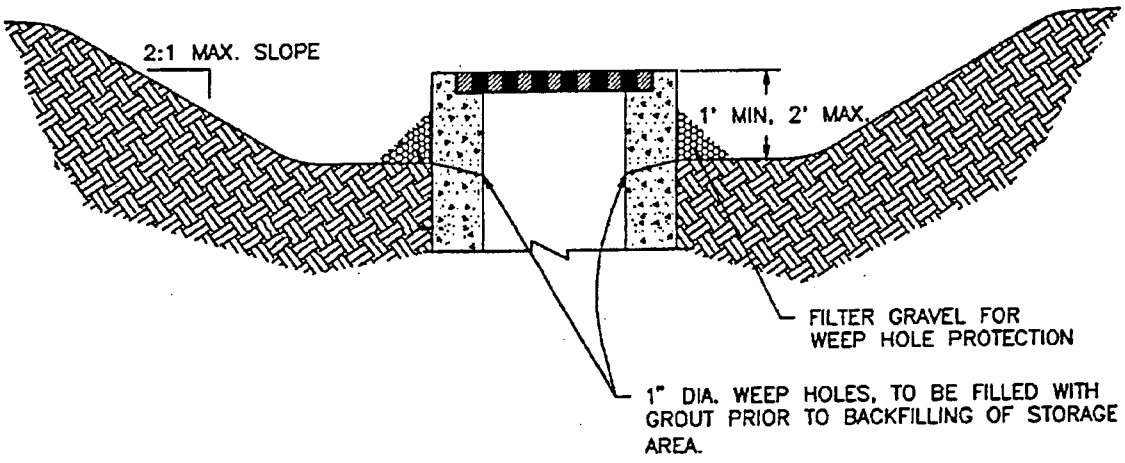
1) The excavated trap should be sized to provide a minimum storage capacity calculated at 3,600 ft^3/acre of drainage area. A trap should be no less than 1-ft nor more than 2-ft deep measured from the top of the inlet structure. Side slopes should not be steeper than 2:1.

2) The slope of the basin may vary to fit the drainage area and terrain. Observations must be made to check trap efficiency and modifications should be made as necessary to ensure satisfactory trapping of sediment. Where an inlet is located so as to receive concentrated flows, such as in a highway median, it is recommended that the basin have a rectangular shape in a 2:1 (length/width) ratio, with the length oriented in the direction of the flow.

3) Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Removed sediment should be deposited in a suitable area and in a manner such that it will not erode.



ISOMETRIC PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.

Figure 3-3.12. Excavated Inlet Protection (NCTCOG, 1993)

Curb Inlet Protection with 2-in. x 4-in. Wooden Weir

1) Attach a continuous piece of wire mesh (30-in. minimum width x inlet throat length plus 4 ft) to the 2-in. x 4-in. wooden weir (with a total length of throat length plus 2 ft) as shown in Figure 3-3.13. Wood should be "construction grade" lumber.

2) Place a piece of approved filter cloth of the same dimensions as the wire mesh over the wire mesh and securely attach to the 2-in. x 4-in. weir.

3) Securely nail the 2-in. x 4-in. weir to the 9-in. long vertical spacers which are to be located between the weir and inlet face at a maximum 6-ft spacing.

4) Place the assembly against the inlet throat and nail 2-ft (minimum) lengths of 2-in. x 4-in. board to the top of the weir at spacer locations. These 2-in. x 4-in. anchors should extend across the inlet tops and be held in place by sandbags or alternate weight.

5) The assembly should be placed so that the end spacers are a minimum 1 ft beyond both ends of the throat opening.

6) Form the wire mesh and filter cloth to the concrete gutter and against the face of curb on both sides of the inlet. Place coarse aggregate over the wire mesh and filter fabric in such a manner as to prevent water from entering the inlet under or around the filter cloth.

7) This type of protection should be inspected frequently and the filter cloth and stone replaced when clogged with sediment.

8) Assure that storm flow does not bypass inlet by installing temporary earth or asphalt dikes directing flow into inlet.

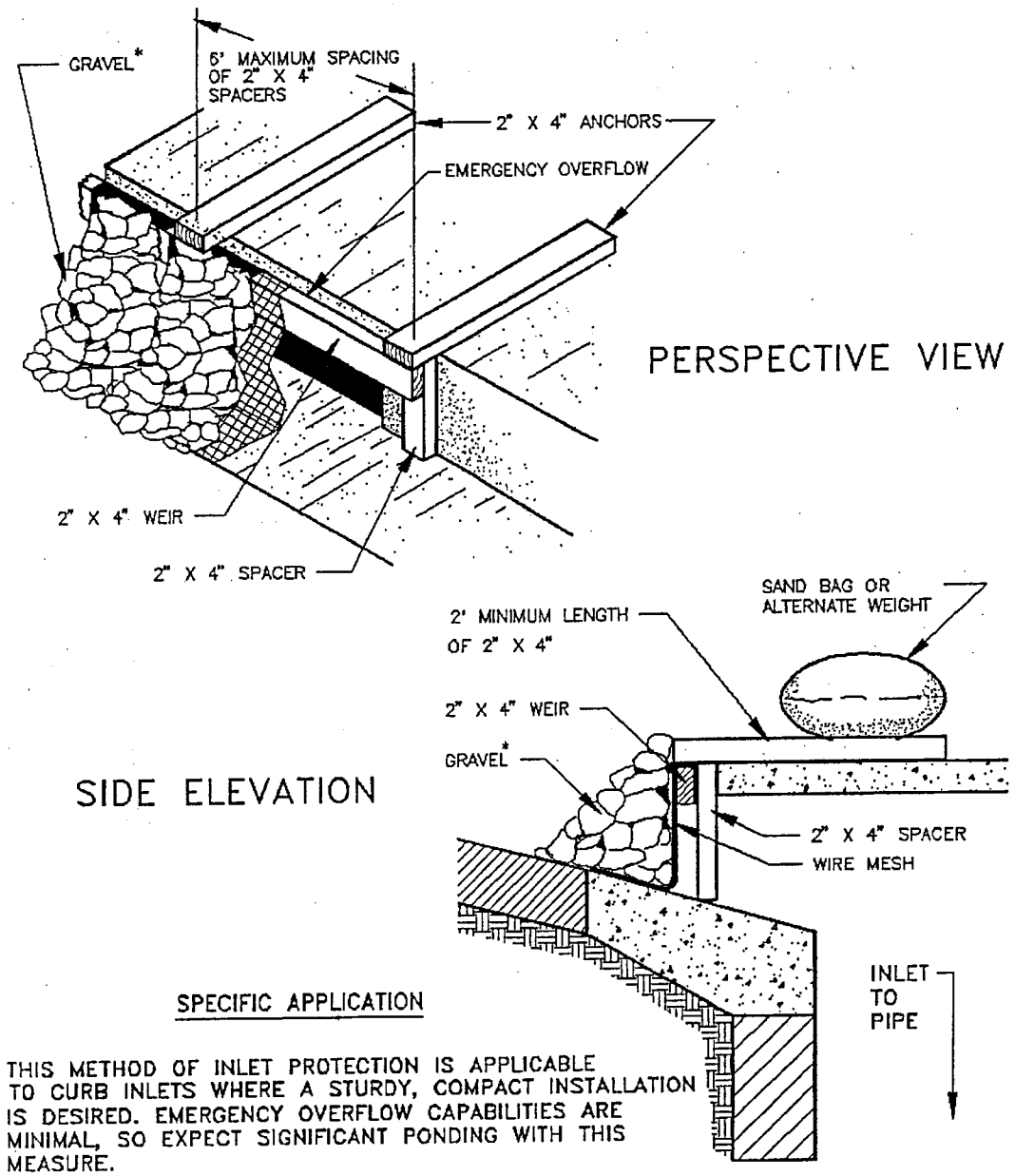


Figure 3-3.13. Wooden Weir Curb Inlet Protection (VA Dept of Conservation, 1992)

3.3.11 Bagged Gravel Inlet Filter

Sandbags filled with pea gravel can also be used to construct a sediment barrier around curb and drain inlets. The sandbags should be filled with washed pea gravel and stacked to form a continuous barrier about 1 ft high around the inlets. The bags should be tightly abutted against each other to prevent runoff from flowing between the bags. This measure should be installed as shown in Figures 3-3.14 and 3-3.15.

Common Trouble Points:

1) Gaps between the inlet protection and the curb (flows bypass around side of filter).

2) Filter fabric skirt not anchored to pavement (flows pass under filter).

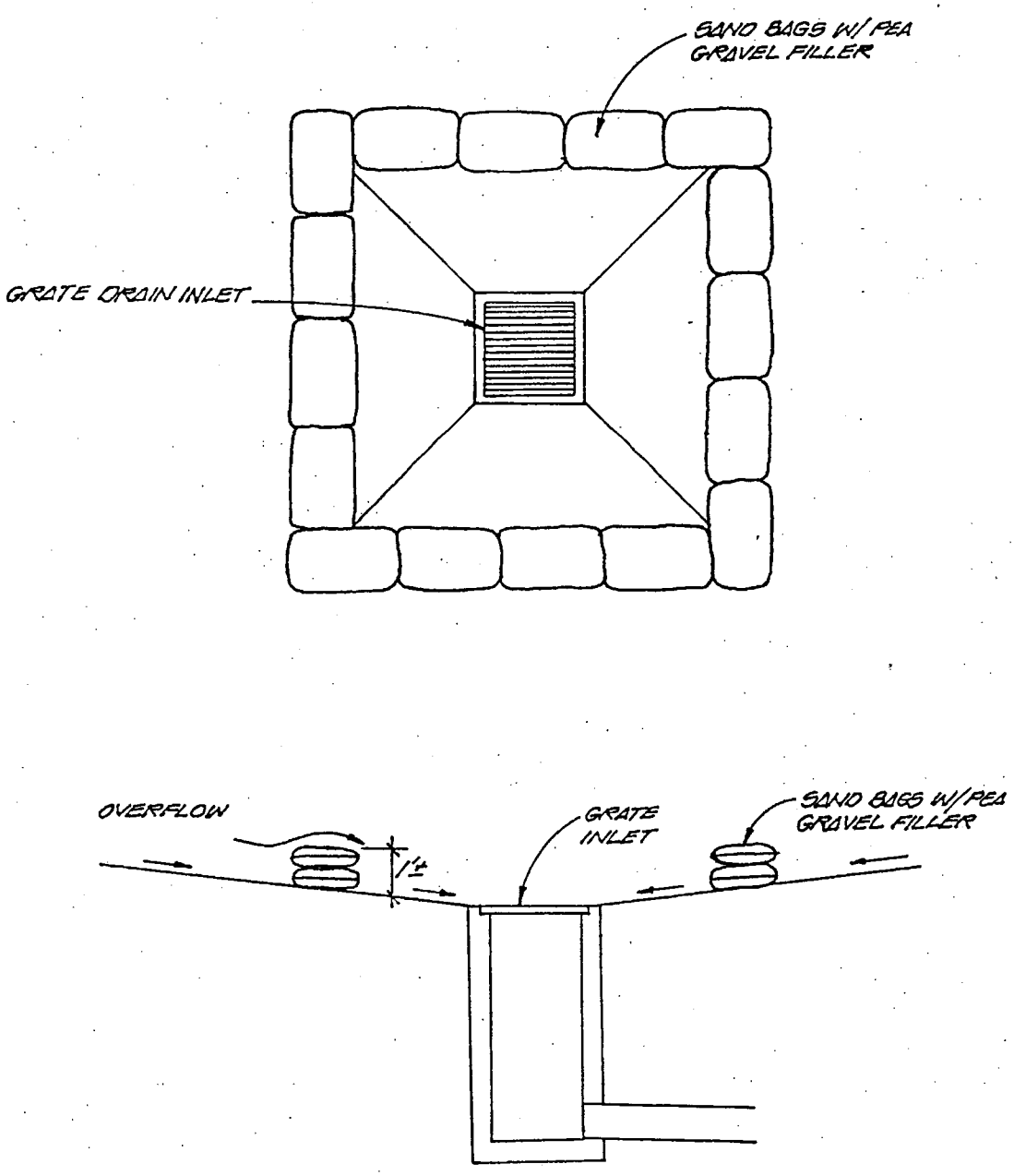


Figure 3-3.14. Diagram of Bagged Gravel Grate Inlet Protection (Pape-Dawson)

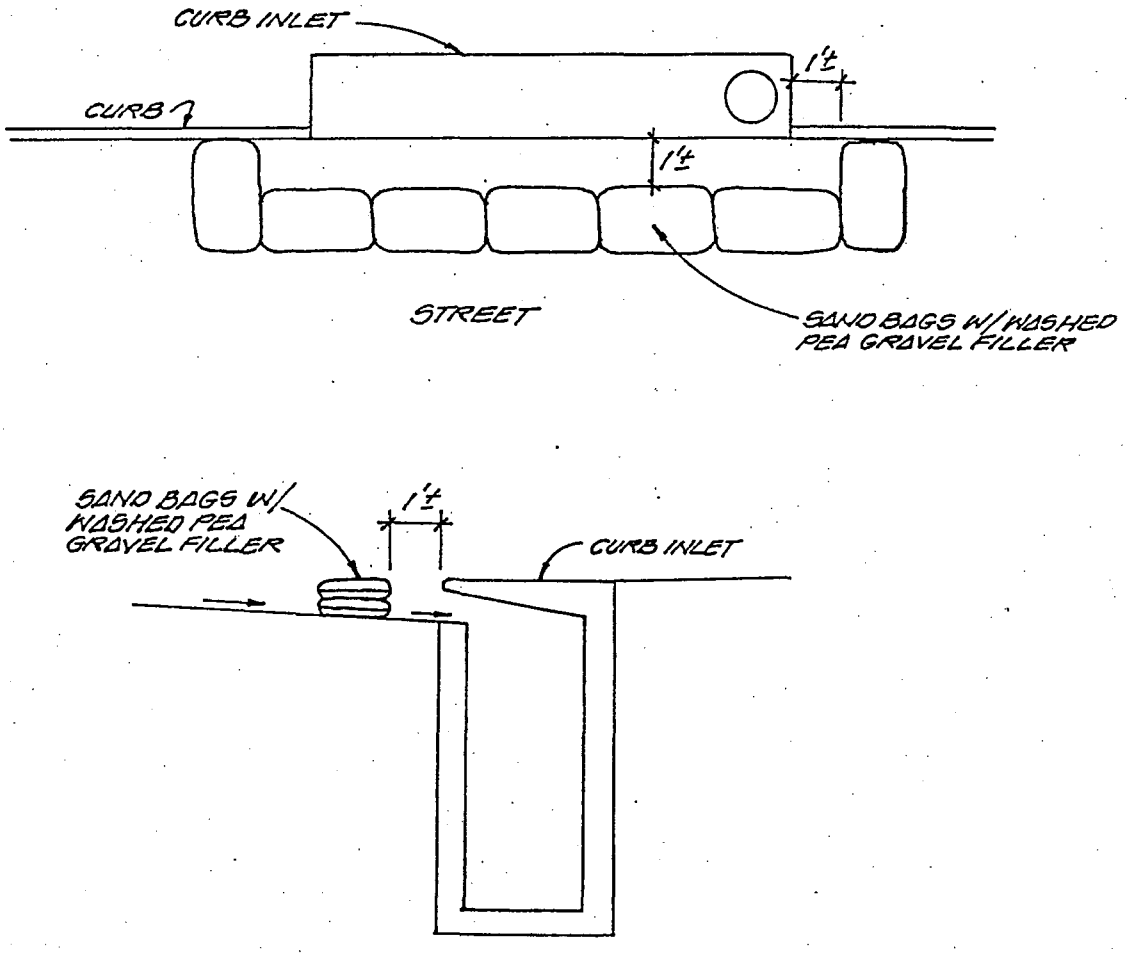


Figure 3-3.15. Diagram of Bagged Gravel Curb Inlet Protection (Pape-Dawson)

Inspection and Maintenance Guidelines:

1) Inspection should be made monthly and after each rainfall. Repair or replacement should be made promptly as needed by the contractor.

2) Remove sediment when buildup reaches a depth of 3 in. Removed sediment should be deposited in a suitable area and in such a manner that it will not erode.

3) Check placement of device to prevent gaps between device and curb.

4) Inspect filter fabric and patch or replace if torn or missing.

5) Structures should be removed and the area stabilized only after the remaining drainage area has been properly stabilized.

3-3.12 Stone Outlet Sediment Trap

A stone outlet sediment trap is an impoundment created by the placement of an earthen and stone embankment to prevent soil and sediment loss from a site. The purpose of a sediment trap is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights of way below the sediment trap from sedimentation. A sediment trap is usually installed at points of discharge from disturbed areas. The drainage area for a sediment trap is recommended to be less than 5 acres. Larger areas should be treated using a sediment basin. A sediment trap differs from a sediment basin mainly in the type of discharge structure. A schematic of a sediment trap is shown in Figure 3-3.16.

The trap should be located to obtain the maximum storage benefit from the terrain, for ease of cleanout and disposal of the trapped sediment and to minimize interference with construction activities. The volume of the trap should be at least 3600 ft^3/acre of drainage area.

Materials:

Aggregate	All aggregate should be at least 3 in. diameter and no more than should a volume of 0.5ft^3.
Geotextile fabric	Woven polypropylene, polyethylene or polyamide geotextile, minimum unit weight of 4.5 oz/yd^2, Mullen burst strength at least 250 lb/$in.^2$, ultraviolet stability exceeding 70%, and equivalent opening size exceeding 40

Installation:

1) Earth Embankment: Place fill material in layers not more than 8 in. in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the material. Compact each layer to 95 percent standard proctor density. Do not place material on surfaces that are muddy or frozen. Side slopes for the embankment are to be 3:1. The minimum width of the embankment should be 3 ft.

2) A gap is to be left in the embankment in the location where the natural confluence of runoff crosses the embankment line. The gap is to have a width in feet equal to six times the drainage area in acres.

3) Geotextile Covered Rock Core: A core of filter stone having a minimum height of 1.5 ft and a minimum width at the base of 3 ft should be placed across the opening of the earth embankment and should be covered by geotextile fabric which should extend a minimum distance of 2 ft in either direction from the base of the filter stone core.

4) Filter Stone Embankment: Filter stone should be placed over the geotextile and is to have a side slope which matches that of the earth embankment of 3:1 and should cover the geotextile/rock core a minimum of 6 in. when installation is complete. The crest of the outlet should be at least 1 ft below the top of the embankment.

Common Trouble Points:

1) Can cause minor flooding upstream of dam, impacting construction operations.

2) The cost of construction, availability of materials, and the amount of land required limit the application of this measure.

Inspection and Maintenance Guidelines:

1) Inspection should be made monthly and after each rainfall. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Repair should be made promptly as needed by the contractor.

2) Trash and other debris should be removed after each rainfall to prevent clogging of the outlet structure.

3) Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to half of the design depth of the trap.

4) Sediment removed from the trap should be deposited in an approved spoils area and in such a manner that it will not cause additional siltation.

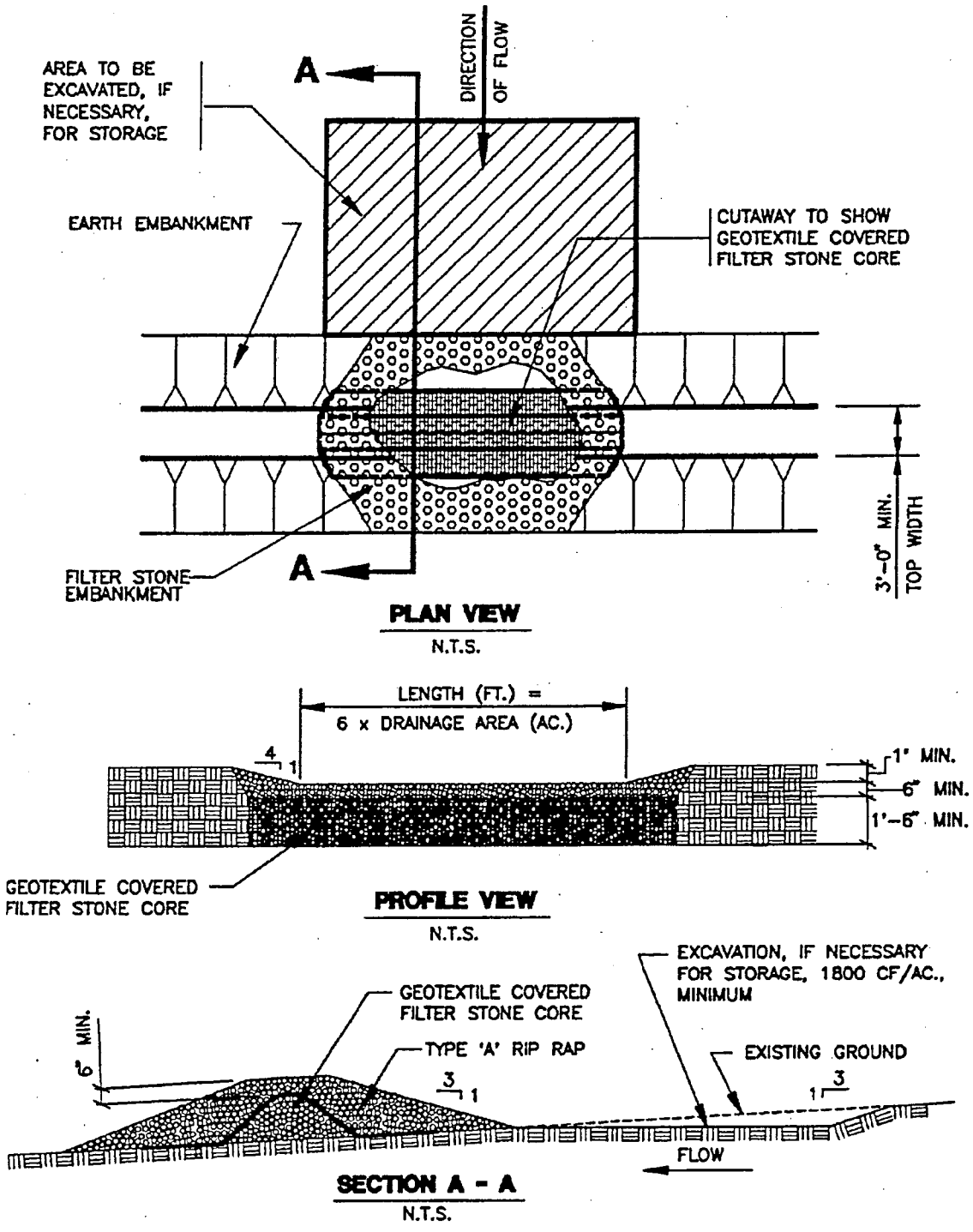


Figure 3-3.16. Schematic Diagram of a Sediment Trap (NCTCOG, 1993)

3-3.13 Sediment Basins

The purpose of a sediment basin is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights of way below the sediment basin from sedimentation. A sediment basin is usually installed at points of discharge from disturbed areas. The drainage area for a sediment basin is recommended to be less than 100 acres.

Sediment basins are effective for capturing and slowly releasing the runoff from larger disturbed areas thereby allowing sedimentation to take place. A sediment basin can be created where a permanent pond BMP is being constructed. Guidelines for construction of the permanent BMP should be followed, but revegetation, placement of underdrain piping, and installation of sand or other filter media should not be carried out until the site construction phase is complete. A schematic of a sediment basin is shown in Figure 3-3.17.

Materials:

Riser	Corrugated metal or reinforced concrete pipe or box and should have watertight fittings or end-to-end connections of sections.
Outlet pipe	An outlet pipe of corrugated metal or reinforced concrete should be attached to the riser and should have positive flow to a stabilized outlet on the downstream side of the embankment.
Anti-vortex device and rubbish screen	An anti-vortex device and rubbish screen should be attached to the top of the riser and should be made of polyvinyl chloride or corrugated metal.

Basin Design and Construction:

1) For common drainage locations that serve an area with 10 or more acres disturbed at one time, a sediment basin should provide storage for a volume of runoff from a 2-year, 24-hr storm from each disturbed acre drained. See City of Scottsdale (1996) for design storm rainfall depth and runoff calculation methodology. Where no such calculation has been performed, and where site conditions permit, a sediment basin providing 3,600 ft^3 of storage per acre drained should be provided.

2) The basin length to width ratio should be at least 2:1 to improve trapping efficiency. The shape may be attained by excavation or the use of baffles. The lengths should be measured at the elevation of the riser de-watering hole.

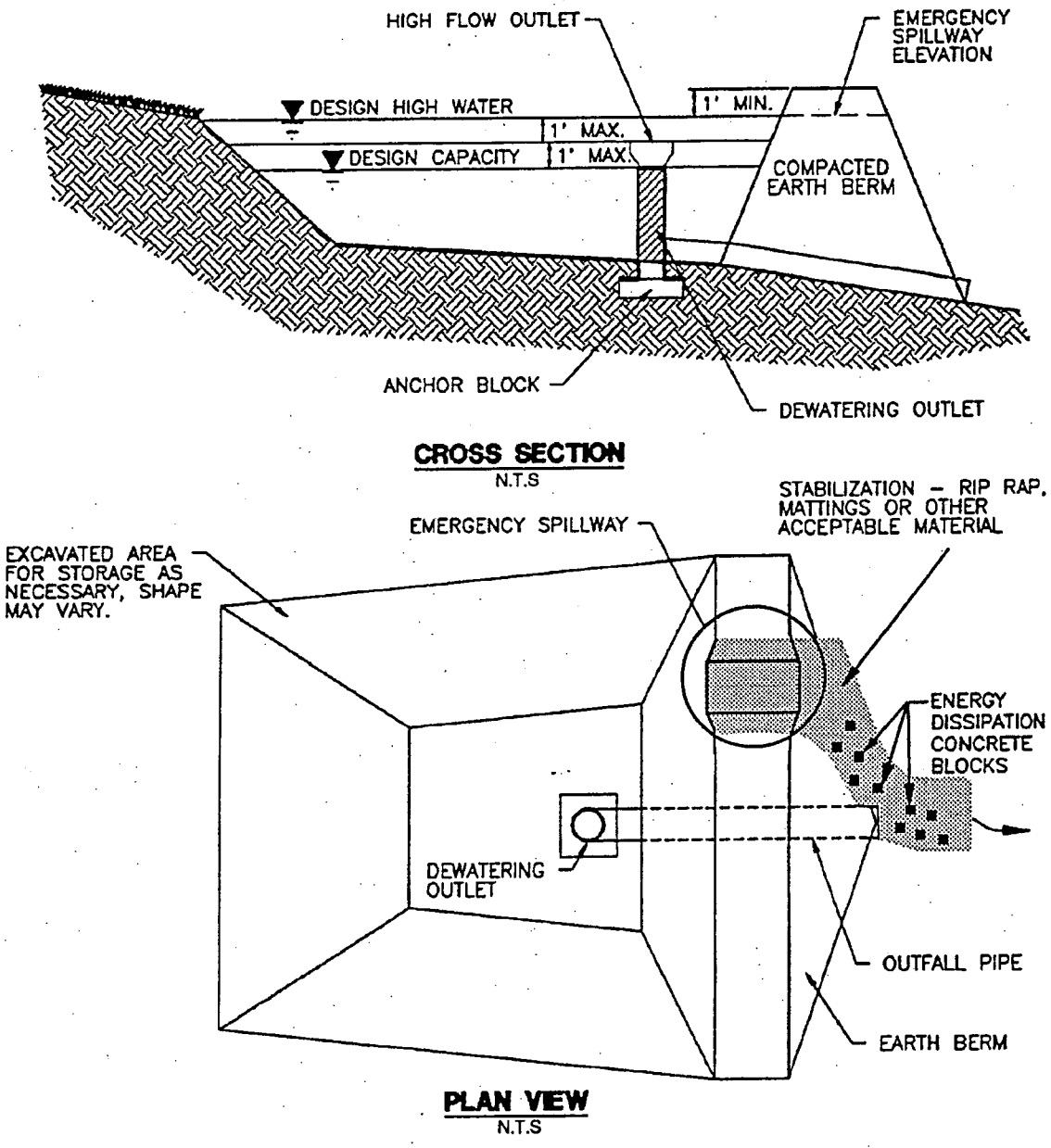


Figure 3-3.17. Schematic of a Sediment Basin (NCTCOG, 1993)

3) Place fill material in layers not more than 8 in. in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the material. Compact each layer to 95 percent standard proctor density. Do not place material on surfaces that are muddy or frozen. Side slopes for the embankment should be 3:1 (H:V).

4) An emergency spillway should be installed adjacent to the embankment on undisturbed soil and should be sized to carry the full amount of flow generated by a 10-year, 3-hr storm with 1 ft of freeboard less the amount which can be carried by the principal outlet control device.

5) The emergency spillway should be lined with riprap as should the swale leading from the spillway to the normal watercourse at the base of the embankment.

6) The principal outlet control device should consist of a rigid vertically oriented pipe or box of corrugated metal or reinforced concrete. Attached to this structure should be a horizontal pipe, which should extend through the embankment to the toe of fill to provide a de-watering outlet for the basin.

7) An anti-vortex device should be attached to the inlet portion of the principal outlet control device to serve as a rubbish screen.

8) A concrete base should be used to anchor the principal outlet control device and should be sized to provide a safety factor of 1.5 (downward forces = 1.5 buoyant forces).

9) The basin should include a permanent stake to indicate the sediment level in the pool and marked to indicate when the sediment occupies 50 percent of the basin volume (not the top of the stake).

10) The top of the riser pipe should remain open and be guarded with a trash rack and anti-vortex device. The top of the riser should be 12 in. below the elevation of the emergency spillway. The riser should be sized to convey the runoff from the 2-year, 3-hr storm when the water surface is at the emergency spillway elevation. For basins with no spillway the riser must be sized to convey the runoff from the 10-yr, 3-hr storm.

11) The outlet pipe must include anti-seep collars placed along the pipe at intervals not less than 10 ft. A minimum of two seep collars should be used. Anti-seep collars must extend a minimum of 1 ft outward from the pipe wall, and join the pipe wall with a snug fit.

12) The 48-hr drawdown time will be achieved by using a riser pipe perforated at the point measured from the bottom of the riser pipe equal to ½ the volume of the basin. This is the maximum sediment storage elevation. The size of the perforation may be calculated as follows:

$$A_o = \frac{A_s \times \sqrt{2h}}{C_d \times 980{,}000}$$

Where:

A_o = Area of the dewatering hole, ft^2

A_s = Surface area of the basin, ft^2

C_d = Coefficient of contraction, approximately 0.6

h = head of water above the hole, ft

Perforating the riser with multiple holes with a combined surface area equal to A_o is acceptable.

Common Trouble Points:

1) Storm events that exceed the design storm event can cause damage to the spillway structure of the basin and may cause adverse impacts downstream.

2) Piping around outlet pipe can cause failure of the embankment – anti-seep collars are required for all installations.

Inspection and Maintenance Guidelines:

1) Inspection should be made monthly and after each rainfall. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Repair should be made promptly as needed by the contractor.

2) Trash and other debris should be removed after each rainfall to prevent clogging of the outlet structure.

3) Accumulated silt should be removed and the basin should be re-graded to its original dimensions at such point that the capacity of the impoundment has been reduced to ½ of its original storage capacity.

4) The removed sediment should be stockpiled or redistributed in areas that are protected from erosion.

Appendix 3-4

Construction SWPPP Checklist

APPENDIX 3-4
CONSTRUCTION SWPPP CHECKLIST

This form is intended to assist the applicant in the preparation of the Storm Water Pollution Prevention Plan (SWPPP). The "Federal Citation" column indicates where the particular requirement can be found in the construction general permit Federal Register. Use the "Location" column to note where the requirement can be found in the SWPPP. In the "OK?" column, indicate whether you think the SWPPP adequately addresses the corresponding rule. Once this form has been filled out, your SWPPP should meet the minimum requirements. Although this checklist is intended to reflect all the requirements for an acceptable SWPPP, the permittee is solely responsible for a complete SWPPP. The shaded blocks are subject headers and are not intended to be filled out.

SW = Stormwater. ID =Identification. Ac = acres.

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
GENERAL INFORMATION			
Part IV.D.1.a.	Description of the nature of the construction activity		
Part IV.D.1.b.	Description of the sequence of disturbance activities		
Part IV.D.1.c.	Estimates of total area & area to be disturbed including off site borrow and fill areas		
Part IV.D.1.d.	Pre- and post-construction runoff coefficient estimate; soil data or quality of any discharge		
GENERAL LOCATION AND SITE MAP WITH:			
Part IV.D.1.e.	General location map; Site map with:		
	Drainage patterns		
	Estimated slope after grading		
	Area of soil disturbance		
	Areas not disturbed		
	Location of major structural and nonstructural controls identified in the plan		
	Locations where stabilization practices are expected to occur		
	Locations of off-site material		
	Waste, borrow or equipment storage areas		
	Surface waters (with wetlands)		
	Location where SW is discharged to a surface water		

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
NARRATIVE SITE DESCRIPTION			
Part IV.D.1.f.	Location and description of any discharge associated with non-construction industrial activity		
	Location and description of any SW discharges from dedicated asphalt or concrete plants covered by the SW permit		
Part IV.D.1.g.	The name of receiving waters, and areal extent and description of wetlands or other special aquatic sites		
Part IV.D.1.h.	A copy of the permit requirements		
Part IV.D.1.i.	Information on whether listed endangered or threatened species, or critical habitat, are found in proximity and if such species may be affected by the SW discharge or discharge-related activities		
CONTROL DESCRIPTION			
Part IV.D.2.	For each activity identified in Part IV.D.1.b: Appropriate control measures and general timing that the measures will be implemented; and, which permittee is responsible for implementation		
GOALS AND CRITERIA STATEMENTS THAT:			
Part IV.D.2.a.(1)(a)	Erosion and sediment controls are designed to retain sediment on site to the extent practicable		
Part IV.D.2.a.(1)(b)	All control measures must be selected, installed, and maintained with manufacturers specifications and good engineering practices		

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
Part IV.D.2.a.(1)(c)	Off-site accumulations of sediment must be removed		
Part IV.D.2.a.(1)(d)	Sediment must be removed when from ponds and traps when design capacity has been reduced by 50%		
Part IV.D.2.a.(1)(e)	Litter, construction debris, and construction chemicals shall be prevented from becoming pollutant sources		
Part IV.D.2.a.(1)(f)	Offsite storage areas used solely by the permittee shall be addressed		
STABILIZATION PRACTICES			
Part IV.D.2.a.(2)	Interim and permanent stabilization practices		
	Site-specific scheduling of implementation		
	Ensure that existing vegetation is preserved where attainable		
	Ensure that disturbed portions are stabilized		
	Dates when major grading activities occur		
	Dates when construction activities temporarily or permanently cease on a portion of the site		
	Dates stabilization measures are initiated		
STRUCTURAL PRACTICES			
Part IV.D.2.a.(3)	Description of structural practices to divert flows, store flows, or limit runoff to the degree attainable		
	Structural practices should not be placed in the floodplain to the degree attainable		

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
Part IV.D.2.a(3)(a)	Disturbed drainage area 10 ac, a basin with storage for a 2-yr, 24-hr storm from each disturbed acre drained, or equivalent measures— *OR*		
	A basin with 3600 ft of 3 storage per acre; or equivalent measures— *OR*		
	If detention is not attainable, sediment controls on all side-slope & down-slope boundaries as appropriate		
Part IV.D.2.a(3)(b)	Disturbed drainage area <10 ac, smaller sediment basins and/or traps on down slope boundaries — *OR*		
	Storage for a volume of runoff from a 2-yr, 24-hr storm — *OR*		
	3600 ft of storage per 3 disturbed acre is provided		
POST-CONSTRUCTION STORM WATER MANAGEMENT			
Part IV.D.2.b	Description of post-construction SW pollution control measures		
	Post-construction structural measures placed on upland soils to the degree attainable		
Part IV.D.2.b.(1)	Explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels		
N/A – City Requirement	Is first ½ in. of runoff detained in extended detention basin if flood control detention is specified?		
Part IV.D.2.b.(2)	Velocity dissipation devices at outfalls		
OTHER CONTROLS			
Part IV.D.2.c.(1)	No materials discharged to a Water of the US		
Part IV.D.2.c.(2)	Minimization of off-site tracking of sediments and dust generation		
Part IV.D.2.c.(3)	Demonstration of compliance with State and local waste disposal, sewer, septic regulations		

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
Part IV.D.2.c.(4)	Description of construction and waste materials on-site		
	Description of controls to reduce pollutants from waste materials including storage & spill prevention and response		
Part IV.D.2.c.(5)	Description of non-construction pollutant sources		
	Description of controls at non-construction pollutant sources to minimize pollutant discharges		
Part IV.D.2.c.(6)	Description of measures necessary to protect listed endangered or threatened species, or critical habitat		
APPROVED STATE OR LOCAL PLANS			
Part IV.D.2.d.(1)	Procedures/requirements for local compliance due to local rules		
	Statement that SWPPP is consistent with requirements specified in applicable sediment & erosion site plans or SW management site plans, or site plans or permits approved by State, Tribal, or local officials		
Part IV.D.2.d.(2)	SWPPP updates to remain consistent with changes to protect surface water resources in sediment erosion site plans or site permits, SW management site plans or site permits approved by State, Tribal, or local officials		

Federal Citation	Rule Description	OK ?	Location in SWPPP/Notes
Part IV.D.4.a.	Disturbed and material storage areas for evidence or potential for pollutant discharge		
	Sediment and erosion control measures operating correctly		
	At accessible discharge points ascertain whether BMPs are effective in preventing significant impacts to receiving waters. Where discharges are inaccessible, inspect nearby downstream locations		
	Sediment tracking at exit and entrance		
Part IV.D.4.b.	Documentation of any SWPPP revisions within 7 days of inspection		
Part IV.D.4.c.	Report with: summary, inspector's name, qualifications, date, major observations, actions taken. ID of incidents of non-compliance or certification of compliance		
	Signature of report in accord with Part VI.G		
Part IV.D.5.	*NON-SW DISCHARGES.* ID of all sources of non-SW with pollution prevention measures		
SIGNATURE			
Part IV.B.1.	Signature on SWPPP in accord with Part VI.G.		

Appendix 3-5

Construction Inspection Form

APPENDIX 3-5
CONSTRUCTION INSPECTION FORM

The following inspection is being performed in compliance with Part IV.D.4. of the NPDES Storm Water Construction General Permit [63 Fed. Reg. 36502] and being retained in accordance with Part V of the Permit. Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, placement and effectiveness of structural control measures, and locations where vehicles enter or exit the site. Inspections shall be performed at least once a month and within 24 hr of the end of a storm event of 0.5 in. or greater.

This form that follows was prepared as an example and is not a required form for use with the permit. Alternative forms may be used if they contain all of the required information as set forth in the permit.

CONSTRUCTION INSPECTION FORM

(Sample[1])

Permit Number(s) covered by this inspection (e.g. owners, developers, general contractor, builders)	
Signature and Certification in accordance with Part VI.G of the permit:	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. Signature_____Date_____
Date of Inspection	
Inspector Name	
Inspector's Qualifications	

Is there a copy of the permit language with the SWPPP?	☐Yes	☐ No
Is the inspector qualified and are the qualifications documented in the SWPPP?	☐Yes	☐ No
Is an NPDES storm water construction sign posted at the entrance for all permittees?	☐Yes	☐ No
Are all control measures identified in the SWPPP installed and operating correctly?	☐Yes	☐ No
Are erosion control measures at discharge locations operating effectively?	☐Yes	☐ No
Are sediment control measures at site entrance and exit keeping sediment onsite?	☐Yes	☐ No
Are paved areas onsite free of sediment?	☐Yes	☐ No
Is site clean and free of litter and waste?	☐Yes	☐ No

[1] This form was prepared as an example and is not a required form for use with the permit. Alternative forms may be used if they contain all of the required information as set forth in the permit.

Narrative findings of the inspection including detailed descriptions for:

1. Deficiencies noted above.
2. Any locations of discharges of sediment of other pollutants from the site
3. Locations of BMPs that need to be maintained.
4. Locations of BMPs that failed to operate as designed or proved inadequate for a particular location.
5. Locations where additional BMPs are needed that did not exist at the time of inspection.

Appendix 3-6
Notice of Intent Form (NOI)

APPENDIX 3-6 NOTICE OF INTENT FORM (NOI)

Double click on icon to open adobe acrobat file.

Acrobat Documen

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Appendix 3-7

Notice of Termination Form (NOT)

APPENDIX 3-7 NOTICE OF TERMINATION FORM (NOT)

Double click on icon to open adobe acrobat file.

Appendix 3-8

Guidance for Complying with Endangered Species Act

APPENDIX 3-8
GUIDANCE FOR COMPLYING WITH ENDANGERED SPECIES ACT

3-8.1 Instructions for Applicants

3-8.1.1 Background

To meet its obligations under the Clean Water Act and the Endangered Species Act (ESA) and to promote the goals of those Acts, the Environmental Protection Agency (EPA) is seeking to ensure that the activities regulated by the Construction General Permit (CGP) are protective of endangered and threatened species and critical habitat. To ensure that those goals are met, applicants for CGP coverage are required under Part I.B.3.e. to assess the impacts of their storm water discharges and storm water discharge-related activities on Federally listed endangered and threatened species ("listed species") and designated critical habitat ("critical habitat") by following Steps 1 through 6 listed below. EPA strongly recommends that applicants follow these steps at the earliest possible stage to ensure that measures to protect listed species and critical habitat are incorporated early in the planning process. At minimum, the procedures should be followed when developing the storm water pollution prevention plan.

Permittees and applicants also have an independent ESA obligation to ensure that their activities do not result in any prohibited "takes" of listed species. Section 9 of the ESA prohibits any person from "taking" a listed species (e.g., harassing or harming it) unless: (1) the taking is authorized through a "incidental take statement" as part of undergoing ESA § 7 formal consultation; (2) where an incidental take permit is obtained under ESA § 10 (which requires the development of a habitat conservation plan); or (3) where otherwise authorized or exempted under the ESA. This prohibition applies to all entities including private individuals, businesses, and governments. Many of the measures required in the CGP and in these instructions to protect species may also assist permittees in ensuring that their construction activities do not result in a prohibited take of species in violation of § 9 of the ESA. Applicants who plan construction activities in areas that harbor endangered and threatened species are advised to ensure that they are protected from potential takings liability under ESA § 9 by obtaining either an ESA § 10 permit or by requesting formal consultation under ESA § 7 (as described in more detail in Step 7, below). Applicants who seek protection from takings liability should be aware that it is possible that some specific construction activities may be too unrelated to storm water discharges to be afforded incidental take coverage through an ESA § 7 consultation that is performed to meet the eligibility requirements for CGP coverage. In such instances, applicants should apply for an ESA § 10 permit. Where applicants are not sure whether to pursue a § 10 permit or a § 7 consultation for takings protection, they should confer with the appropriate Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) office.

This permit provides for the possibility of multiple permittees at a construction site. Applicants should be aware that in many cases they can meet the permit eligibility requirements by relying on another operator's certification of eligibility under Part I.B.3.e.(2)(a), (b), or (c). This is allowed under Part I.B.3.e.(2)(d) of the permit. However, the other operator's certification must apply to the applicant's project area and must address the effects from the applicant's storm water discharges and

storm water discharge-related activities on listed species and critical habitat. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based. This situation will typically occur where a developer or primary contractor, such as one for construction of a subdivision or industrial park, conducts a comprehensive assessment of effects on listed species and critical habitat for the entire construction project, certifies eligibility under Part I.B.3.e.(2)(a), (b) or (c), and that certification is relied upon by other operators (i.e., contractors) at the site. However, applicants that consider relying on another operator's certification should carefully review that certification along with any supporting information. If an applicant does not believe that the operator's certification provides adequate coverage for the applicant's storm water discharges and storm water discharge-related activities or for the applicant's particular project area, the applicant should provide its own independent certification under Part I.B.3.e.(2)(a), (b), or (c).

3-8.1.2 Procedures

To receive coverage under the Construction General Permit, applicants must assess the potential effects of their storm water discharges and storm water discharge-related activities on listed species and their critical habitat. To make this assessment, applicants must follow the steps outlined below prior to completing and submitting an NOI form. Applicants who are able to certify eligibility under Parts I.B.3.e.(2)(b), (c) or (d) because of a previously issued ESA § 10 permit, a previously completed ESA § 7 consultation, or because the applicant's activities were already addressed in another operator's certification of eligibility may proceed directly to Step 6.

Note - The revised NOI form which was included in the CGP (see 62 FR 29822-29823, June 2, 1997) requires that applicants provide detailed certification information on listed species. That form is still under development and is not expected to be finalized before this permit is issued. Until the revised NOI form is finalized, applicants must use the existing NOI form which does not contain the specific certification provisions relating to listed species and critical habitats at construction projects. However, use of the existing NOI form does **not** relieve applicants of their obligation to follow the procedures listed below to determine if their construction storm water discharges or storm water discharge-related activities meet permit eligibility requirements for the protection of listed species and critical habitat. By following these instructions, applicants will have sufficient information on listed species and critical habitat in order to complete either the existing or revised NOI form and sign the certification statement.

Step 1: Determine if the Construction Site is Found Within Designated Critical Habitat for Listed Species

Some, but not all, listed species have designated critical habitat. Exact locations of such habitat is provided in the Service regulations at 50 CFR Parts 17 and 226. To determine if the construction site is within designated critical habitat, applicants should either:

- Contact the nearest FWS Office shown below; or
- Contact the Arizona Heritage Data Management Center, which frequently has the most current information on listed species and critical habitat; or
- Review those regulations (which can be found in many larger libraries).

Field Supervisor

U.S. Fish and Wildlife Service

Arizona State Office

W. Royal Palm Road, Suite 103

Phoenix, AZ 85021-4951

Arizona Heritage Data Management System

Arizona Game & Fish Department WM-H

2221 W. Greenway Road

Phoenix, AZ 85023

602/789-3612 Fax: 602/789-3928

Internet: hdms@gf.state.az.us

Internet: hdms1@gf.state.az.us

If the construction site is not located in designated critical habitat, the applicant does not need to consider impacts to critical habitat when following Steps 2 through 6 below. If the site is located within critical habitat, the applicant must look at impacts to critical habitat when following Steps 2 through 6. Note that many but not all measures imposed to protect listed species under these steps will also protect critical habitat. Thus, meeting the eligibility requirements of this permit may require measures to protect critical habitat that are separate from those to protect listed species.

Step 2: Determine if Listed Species are Located in the County(ies) Where the Construction Activity Will Occur.

Applicants must also check for updated lists of endangered and threatened species. Sources include: EPA's Office of Wastewater Management's web page at "http://www.epa.gov/owm" where updates of the county-by-county list are posted on a periodic basis; Federal Register Notices; Arizona Game & Fish Department; a biologist or similar professional in the environmental field; or any other method that reasonably can be expected to provide this information. Applicants with construction projects located in Scottsdale can contact the EPA Region 9 office at (415) 744-1500.

Where a facility is located in more than one county, the lists for all counties in which it is located should be reviewed. Where a facility discharges into a water body that serves as a border between counties or crosses a county line that is in the immediate vicinity of the point of discharge, applicants should also review the species list for the county that lies immediately downstream or is across the water body from the point of discharge. After a review of the available information from the sources

mentioned above, if no listed species are located in a facility's county or if a facility's county is not listed, and the construction site is not located in critical habitat as described under Step 1, an applicant is eligible for CGP coverage without further inquiry into the presence of, or effect on, listed species. The applicant must check the appropriate certification item on the revised NOI form (Part I.B.3.e.(2)(a)). Once the applicant has determined which listed species are located in his/her facility's county, he/she proceeds to Step 3.

Step 3: Determine if any Federally Listed Endangered and Threatened Species May Be Present in the Project Area

The project area consists of:

- The areas on the construction site where storm water discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity

Examples

1) Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity

2) Where grading causes storm water to flow into a small wetland or other habitat that is on the site which contains listed species

- The areas where storm water discharges flow from the construction site to the point of discharge into receiving waters

Example

1) Where storm water flows into a ditch, swale, or gully which leads to receiving waters and where listed species (such as amphibians) are found in the ditch, swale, or gully

- The areas where storm water from construction activities discharge into receiving waters and the areas in the immediate vicinity of the point of discharge

Example

1) Where storm water from construction activities discharges into a stream segment that is known to harbor listed aquatic species

- The areas where storm water BMPs will be constructed and operated, including any areas where storm water flows to and from BMPs

Example

1) Where a storm water retention pond would be built

The project area will vary with the size and structure of the construction activity, the nature and quantity of the storm water discharges, the storm water discharge-related activities and the type of receiving water. Given the number of construction activities potentially covered by the CGP, no specific method to determine whether listed species may be located in the project area is required for

coverage under the CGP. Instead, applicants should use the method that allows them to determine, to the best of their knowledge, whether listed species are located in their project area. These methods may include:

- Conducting visual inspections: This method may be particularly suitable for construction sites that are smaller in size or located in non-natural settings such as highly urbanized areas or industrial parks where there is little or no natural habitat, or for construction activities that discharge directly into municipal storm water collection systems.

- Contacting the nearest State or Tribal wildlife agency, the FWS, or the NMFS. Many endangered and threatened species are found in well-defined areas or habitats. Such information is frequently known to State, Tribal, or Federal wildlife agencies. A list of FWS and NMFS offices is provided in Section II of this Addendum below.

- Contacting local/regional conservation groups or the State or Tribal Natural Heritage Centers (see Section III of this Addendum). State and local conservation groups may have location specific listed species information. The Natural Heritage Centers inventory species and their locations and maintain lists of sightings and habitats.

- Submitting a data request to a Natural Heritage Center. Many of these centers will provide site specific information on the presence of listed species in a project area. Some of these centers will charge a fee for researching data requests.

- Conducting a formal biological survey. Larger construction sites with extensive storm water discharges may choose to conduct biological surveys as the most effective way to assess whether species are located in the project area and whether there are likely adverse effects. Biological surveys are frequently performed by environmental consulting firms. A biological survey can be used to follow Steps 4 6 of these instructions.

- Conducting an environmental assessment under the National Environmental Policy Act (NEPA). Some construction activities may require environmental assessments under NEPA. Such assessments may indicate if listed species are in the project area. Coverage under the CGP does not trigger such an assessment because the permit does not regulate any dischargers subject to New Source Performance Standards under Section 306 of the Clean Water Act, and is thus statutorily exempted from NEPA. See CWA § 511(c). However, some construction activities might require review under NEPA because of Federal funding or other Federal involvement in the project.

If no species are found in the project area, an applicant is eligible for CGP coverage. Applicants must provide the necessary certification on the revised NOI form. If listed species are found in the project area, applicants must indicate the location and nature of this presence in the storm water pollution prevention plan and follow the items outlined in Step 4.

Step 4: Determine if Listed Species or Critical Habitat are likely to be Adversely Affected by the Construction Activity's Storm Water Discharges or Storm Water Discharge-related Activities.

To receive CGP coverage, applicants must assess whether their storm water discharges or storm water discharge-related activities are likely to adversely affect listed species or critical habitat. "Storm water discharge-related activities" include:

- Activities that cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to excavation, site development, grading, and other surface disturbance activities; and

- Measures to control storm water discharges including the siting, construction, operation of best management practices (BMPs) to control, reduce or prevent storm water pollution.

Potential adverse effects from storm water discharges and storm water discharge-related activities include:

- **Hydrological**. Storm water discharges may cause siltation, sedimentation or induce other changes in receiving waters such as temperature, salinity or pH. These effects will vary with the amount of storm water discharged and the volume and condition of the receiving water. Where a storm water discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely. Construction activity itself may also alter drainage patterns on a site where construction occurs which can impact listed species or critical habitat.

- **Habitat.** Excavation, site development, grading, and other surface disturbance activities from construction activities, including the installation or placement of storm water BMPs, may adversely affect listed species or their habitat. Storm water may drain or inundate listed species habitat.

- **Toxicity.** In some cases, pollutants in storm water may have toxic effects on listed species. The scope of effects to consider will vary with each site.

If the applicant is having difficulty in determining whether his or her project is likely to adversely affect a listed specie or critical habitat, then the appropriate office of the FWS or Natural Heritage Center should be contacted for assistance. If adverse effects are not likely, then the applicant should make the appropriate certification on the revised NOI form and apply for coverage under the permit. If adverse effects are likely, applicants must follow Step 5.

Step 5: Determine if Measures Can Be Implemented To Avoid any Adverse Effects

If an applicant makes a preliminary determination that adverse effects are likely, it can still receive coverage under Part I.B.3.e.(2)(a) of the CGP if appropriate measures are undertaken to avoid or eliminate the likelihood of adverse effects prior to applying for permit coverage. These measures may involve relatively simple changes to construction activities such as re-routing a storm water discharge to bypass an area where species are located, relocating BMPs, or by changing the "footprint" of the construction activity. Applicants may wish to contact the FWS and/or NMFS to see what appropriate measures might be suitable to avoid or eliminate the likelihood of adverse impacts to listed species

and/or critical habitat. (See 50 CFR 402.13(b)). This can entail the initiation of informal consultation with the FWS and/or NMFS which is described in more detail in Step 6.

If applicants adopt measures to avoid or eliminate adverse affects, they must continue to abide by those measures during the course of permit coverage. These measures must be described in the storm water pollution prevention plan and may be enforceable as permit conditions. If appropriate measures to avoid the likelihood of adverse effects are not available to the applicant, the applicant must follow Step 6.

Step 6: Determine if the Eligibility Requirements of Part I.B.3.e.(2)(b)-(d) Can Be Met.

Where adverse effects are likely, the applicant must contact the EPA and FWS/NMFS. Applicants may still be eligible for CGP coverage if any likely adverse effects can be addressed through meeting the criteria of Part I.B.3.e.(2)(b)-(d)of the permit. These criteria are as follows:

1) An ESA Section 7 Consultation is Performed for the Applicant's Activity (See Part I.B.3.e.(2)(b)

Formal or informal ESA § 7 consultation is performed with the FWS which addresses the effects of the applicant's storm water discharges and storm water discharge-related activities on listed species and critical habitat. The formal consultation must result in either a "no jeopardy opinion" or a "jeopardy opinion" that identifies reasonable and prudent alternatives to avoid jeopardy, which are to be implemented by the applicant. The informal consultation must result in a written concurrence by the Service(s) on a finding that the applicant's storm water discharge(s) and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat (for informal consultation, see 50 CFR 402.13).

Most consultations are accomplished through informal consultation. By the terms of this permit, EPA has automatically designated applicants as non-Federal representatives for the purpose of conducting informal consultations. See Part I.B.3.e.(5) and 50 CFR 402.08 and 402.13. When conducting informal ESA § 7 consultation as a non-Federal representative, applicants must follow the procedures found in 50 CFR 402 of the ESA regulations.

Applicants must also notify EPA and the FWS of their intention and agreement to conduct consultation as a non-Federal representative. Consultation may occur in the context of another Federal action at the construction site (e.g., where ESA § 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project or where a NEPA review is performed for the project which incorporates a section 7 consultation). Any terms and conditions developed through consultations to protect listed species and critical habitat must be incorporated into the SWPPP. As noted above, applicants may, if they wish, initiate consultation with the Services at Step 5. Applicants should also be aware that while formal § 7 consultation provides protection from incidental takings liability, informal consultation does not.

2) An Incidental Taking Permit Under Section 10 of the ESA is Issued for the Applicants Activity (See Part I.B.3.e.(2)(c))

The applicant's construction activities are authorized through the issuance of a permit under § 10 of the ESA and that authorization addresses the effects of the applicant's storm water discharge(s) and storm water discharge-related activities on listed species and critical habitat. Applicants must follow FWS and/or NMFS procedures when applying for an ESA Section 10 permit (see 50 CFR § 17.22(b)(1) (FWS) and § 222.22 (NMFS)). Application instructions for Section 10 permits for NMFS species can be obtained by 1) accessing the "Office of Protected Resources" sector of the NMFS Home Page at "http://www.nmfs.gov" or by contacting the National Marine Fisheries Service, Office of Protected Resources, Endangered Species Division, F/PR3, 1315 East-West Highway, Silver Spring, Maryland 20910; telephone (301) 713-1401, fax (301) 713-0376.

3) The Applicant Is Covered Under the Eligibility Certification of Another Operator for the Project Area (See Part I.B.3.e.(2)(d))

The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part I.B.3.e.(2)(b), or (c) which also included the applicant's project area. By certifying eligibility under Part I.B.3.e.(2)(d), the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part I.B.3.e.(2)(a), (b) or (c) was based.

The applicant must comply with any terms and conditions imposed under the eligibility requirements of paragraphs I.B.3.e(2)(a), (b), (c), (d) to ensure that its storm water discharges and storm water discharge-related activities are protective of listed species and/or critical habitat. Such terms and conditions must be incorporated in the project's SWPPP. If the eligibility requirements of Part I.B.3.e.(2)(a)-(d) cannot be met, then the applicant may not receive coverage under the CGP. Applicants should then consider applying to EPA for an individual permit.

Appendix 7-1

City of Scottsdale Industrial SWPPP Checklist Industrial On-Site Inspection Form

CITY OF SCOTTSDALE
INDUSTRIAL SWPPP CHECKLIST

Facility Name: _____ **Facility Number:** _____

Inspector: _____ **Date of Inspection:** _____

Facility Representative: _____

STORM WATER POLLUTION PREVENTION PLAN

	Location in SWPPP Page No.
1. Cover Sheet	
Company name	
Address	
Phone number	
Emergency phone number	
NPDES Permit Number	
2. Certificate signature page	
Certification statement	
Name, title, and signature	
Plan as amended section — Not applicable	
3. Pollution Prevention Team	
Identifies specific individuals	
Outlines their responsibilities	
4. Description of potential pollutant sources, including:	
A. Site map included in plan	
Does the site map indicate:	
Drainage areas	
Drainage patterns/outfalls	
Structural and nonstructural controls	
Surface waters — Not applicable	
Significant materials exposed to precipitation — Not applicable	
Location of leaks or spills that have occurred in last 3 years — Not applicable	
Location of industrial activities exposed to precipitation, including:	
Fueling stations — Not applicable	
Vehicle/equipment maintenance or cleaning — Not applicable	
Loading/unloading areas — Not applicable	
Waste treatment/storage, and disposal area — Not applicable	
Processing areas — Not applicable	
Storage areas	

Location in SWPPP Page No.	
	B. List of pollutants likely to be present in the discharges. C. Materials inventory Description of significant materials handled, treated, stored or disposed of such that exposure to storm water occurred in the last 3 years Description of method and location of storage or disposal Description of all material management practices Description and location of existing structural and non–structural controls Description of any treatment of storm water runoff Current list of significant materials exposed to storm water List of significant spills and leaks occurring in the 3 years prior to effective date of permit Summary of existing storm water sampling data Description of areas with a high potential for significant soil erosion A narrative summarizing potential pollutant sources 5. A description of appropriate measures and controls, including: Good housekeeping procedures Preventive maintenance procedures Spill prevention and response procedures Inspection procedures Employee training programs Recording and internal reporting procedures Non-storm water discharge certification or failure to certify non-storm water discharge certification Identified authorized non-storm water discharges and appropriate controls Erosion and sediment controls for areas with a high erosion potential A narrative consideration of traditional storm water management practices Plans for implementation and maintenance of traditional measures found to be reasonable and appropriate 6. Annual site compliance evaluation reports (prepared after the inspection is performed) A summary of the scope of the inspection Personnel making the inspection Major observations Actions taken to revise the pollution prevention pan Certification of compliance or a list of incidents of non-compliance 7. If discharging to a large or medium municipal separate storm sewer, compliance with applicable requirements in the municipal storm water management program Not applicable

Location in SWPPP Page No.	
	8. Consistency of the Storm Water Pollution Prevention Plan with other plans — Not applicable 9. Additional requirements for Facilities Subject to Emergency Planning and Community Right to Know Act (EPCRAPO Section 313 Requirements) A description of the measures used in areas where Section 313 Water Priority chemical are stored, processed or otherwise handled to minimize the potential contact or storm water run-on with the chemicals, or prevent exposure of the chemicals to storm water and wind A discussion of the measures taken to minimize the discharge of section 3.3 Water Priority Chemicals from the following areas: Liquid storage areas — Not applicable Non-liquid storage areas — Not applicable Truck and rail car loading areas — Not applicable Transfer, processing, or handling areas — Not applicable Other areas — Not applicable Preventive maintenance and housekeeping Facility security Training Professional engineer (PE) certification every 3 years 10. Any salt piles present on the site must be covered or enclosed — Not applicable Comments on SWPPP Completeness:

CITY OF SCOTTSDALE
INDUSTRIAL ON-SITE INSPECTION

Facility Name: _____ **Facility Number:** _____

Inspector: _____ **Date of Inspection:** _____

Facility Representative:
_____

Does this facility have a No-Exposure certification? Yes No

Is there a Vehicle Maintenance Facility on site? Yes No

Number of UST's on site: _____ Number of ASTs onsite _____

Have there been any reported spills in the last 3 years: Yes No

If so, material spilled: _____ Quantity in gallons _____

Any mitigation action taken

_____

Is storm water monitored at this site? Yes No

Date of last significant rain event _____

Past NOVs, citations, or other regulatory actions against the facility by ADEQ, EPA or others in the past 3 years

_____

Interior floor drains discharge to:	Sanitary sewer	Storm drain
Exterior floor drains discharge to:	Sanitary sewer	Storm drain
Outside areas clean		Not applicable
Process debris removed regularly		Not applicable
Area clear of excessive dust from industrial operations		Not applicable
No evidence of leaks and drips from equipment		Not applicable
Catch basins, storm water conveyance pipes and storm water treatment facilities cleaned regularly		Not applicable
Outdoor maintenance areas clean		Not applicable
Chemical containers labeled		Not applicable
Spill containment and clean-up materials on site and in convenient locations		Not applicable
Used absorbent materials removed and disposed of in a timely manner		Not applicable
Drainage ditches and outfall areas free of erosion		Not applicable
Unpaved areas free of erosion		Not applicable
Wastebins/dumpsters sealed and closed		Not applicable

Outdoor drums covered with lids			Not applicable
Outdoor drum storage areas covered			Not applicable
Outdoor materials storage areas covered			Not applicable
Adequate spill containment structures for outdoor liquid storage areas			Not applicable
Vehicle and equipment wash area discharges to storm drain			Not applicable
Vehicle and equipment wash area discharges to sanitary sewer			Not applicable
Vehicle and equipment wash area discharges to ground			Not applicable
Dry weather flow at outfall No. _____	Monitored?	Yes	No
Dry weather flow at outfall No. _____	Monitored?	Yes	No
Dry weather flow at outfall No. _____	Monitored?	Yes	No
Dry weather flow at outfall No. _____	Monitored?	Yes	No
Dry weather flow at outfall No. _____	Monitored?	Yes	No

List any materials stored outdoors:

_____

_____

_____

On-Site inspection violations:

Enforcement action taken:	None	Verbal warning	NOV
	Citation	Show cause hearing	
Was EPA notified?	Yes	No	

The SWPPP is being implemented on site
The SWPPP is not being implemented on site.

Facility Representative: Date:

Inspector: Date:

Appendix 8-1

Facility Inspection and Documentation Manual

APPENDIX 8-1
FACILITY INSPECTION AND DOCUMENTATION MANUAL

8-1.1 EXECUTIVE SUMMARY

The Clean Water Act of 1987 requires municipalities to apply for NPDES (National Pollutant Discharge Elimination System) permits for controlling urban storm water runoff. The issued permits include requirements for:

- Field inspection and documentation of drainage systems
- Detection procedures for illegal discharge/illicit connections/ordinances prohibiting illegal discharges/illicit connections
- An implementation plan for prosecuting violators and eliminating illegal discharges

This facility inspection and documentation manual was prepared by the City as a part of the Illicit Discharge Identification and Elimination Program that is one component of the overall Storm Water Management Plan (SWMP).

This Facility inspection and Documentation Manual has been prepared in order to comply with the NPDES permit requirements. The purpose of the manual is twofold:

- To assist in the screening, identification and elimination of illegal discharges and illicit connections
- To document the storm drain systems and incidences of illegal dumping and accidental spills

This Facility Inspection and Documentation Manual serves as a guideline to ensure consistency for the City inspection program. The City is responsible for inspecting and documenting the drainage facilities.

8-1.2 INSPECTION PROCEDURES

All open drainage facilities and the outfalls of underground drainage facilities (36 in. and larger) under the jurisdiction of the City will be inspected to identify pollutant discharges and to regulate undocumented and illegal drainage entries into said facilities on a 5-yr cycle, with no less than 20 percent of the facilities inspected each year.

8-1.2.1 Inspection Frequencies

Open storm drains, retention basins and other above-ground facilities and the outfalls of underground storm drains with diameters 36 in. or greater will be inspected on a rotating annual basis as described in the Illicit Discharge Identification and Elimination Program section of the SWMP. Facility inspection frequencies will be re-evaluated after consultation with Region 9 after the first round of inspections. Based on this review, the frequencies may be modified.

The City also performs maintenance inspections (see Appendix 8-3) of the municipal flood control and drainage systems. Suspected illicit connections or discharges encountered as a part of these inspections are referred to the Field Inspection Team for documentation and action.

8-1.2.2 Documenting Facility Inspections

- Each facility surveyed will be documented by filling out a Field Inspection Log; an example is included at the end of this section. Information will include facility, location, and land use.
- Inspectors will be responsible for filling out log sheets, updating maps and completing reports.
- All newly identified storm water connections to the municipal storm drain system not shown on current maps will be transferred onto the City master plan. This information will be compiled and provided to the EPA during reapplication for the storm water permit.
- Updating drainage maps will be an ongoing task for the City. Permanent changes will be made after completion of the annual inspections.

8-1.2.3 Illegal Discharges/Illicit Connections

- Any suspected illegal discharge or illicit connections discovered during inspections must be documented on the Field Log and reported as specified in the Illicit Discharge Identification and Elimination Program for response or further investigation. Spills will be reported to the Fire Department. Prohibited dry weather flow noted during outfall inspections conducted as a part of the IC/ID program will be referred to Maricopa County FCD for sampling per the Field Sampling guidelines (Appendix 8-2. Spill reporting guidelines for Arizona are included as Attachment 1.
- All undocumented connections to the storm drain system will be logged and forwarded to the City Floodplain and Stormwater Management Division for further investigation and verification of permit status. The City's storm drain system is relatively new and illicit connections to the storm drain system are not suspected as a significant problem. If the field sampling program uncovers illicit connections to the storm drain system, a more intensive effort relative to illicit connection investigation will be developed.
- Appropriate actions will be taken to approve undocumented storm water discharge entries (connections) into the municipal storm drain system by permit procedures and/or pursue abatement of those entries that are determined to be illegal/illicit connections and not in compliance with City standards.
- Any accidental spill shall also be documented using the form included at the end of this section.

8.3.1 8-1.2.4 Safety

The inspection of underground facilities will be performed in compliance with appropriate safety standards. The use of video technology is encouraged.

8-1.3 Field Inspection Log

The field inspection log is shown on the following page.

STORMWATER FACILITY INSPECTION PROGRAM

FIELD INSPECTION LOG

Inspector/Date:	
Facility:	
System Location:	**Reach:**
Condition of channel/drain (include debris accumulations):	
Drainage area/land use:	
POSSIBLE UNDOCUMENTED ENTRY AND/OR SUSPECTED ILLEGAL DISCHARGE	
Location of entry in system:	
Dimensions/type of connection:	
Type of flow /discharge (ongoing, intermittent, past discharge, permitted, estimated volume in gpm):	
Source of connection?	
Record any evidence of illegal discharge – odor, color, consistency, wildlife/vegetation affected, staining, etc.	
List any nearby industries or businesses.	
Source of discharge?	
Environmental Planning and Design Office notified by phone? List contact/time:	
Action required: • Submit copy to permits to verify documentation • Submit copy for map update • Submit copy to Floodplain and Stormwater Management Division • Facility maintenance needed (dumping or debris accumulation) • Notify FCD for sampling (as appropriate)	

Comments (if spill, describe cleanup and follow-up needed, notify RMFD if Hazardous):

Attachment 1

Hazardous Spill Notification Procedures
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
EMERGENCY SPILL REPORTING: RCRA HAZARDOUS WASTE

A. **Reportable incidents:** All fires, explosions, sudden releases, and non-sudden releases that could threaten or have affected human health or the environment outside the facility. Applies to all large and small generators, and permitted facilities. Hazardous waste transportation incidents involving death, hospitalization, major damage, evaluation or main artery closures. See 40 CFR 265 Subpart D; 40 CFR 263.30; and A.A.C. R18-8-262.

B. **Reportable Chemicals:** All hazardous wastes, including "characteristic" or listed" (40 CFR 261 Subparts C&D). Includes "commercial chemical products" that become hazardous waste when discharged; see 40 CFR 262.23.

C. **Reportable Amounts:** No quantity or time thresholds – "any release. . . which could threaten human health or the environment."

D. **When to Report:** "Immediately" for site-based reports. "At the earliest practicable moment" for transportation incidents.

E. **Who to Report to:** Always call 911 or your local Fire Department/Emergency Service number when you need assistance. You must call the National Response Center at 1-800/424-8802. You must call ADEQ at 602/207-2330 (also accessible through 1-800/234-5677 x 2330). Calls by the Fire Department or ADEQ do not fulfill a facility's duty to file a verbal report to these numbers. You may leave a detailed message with all the information required by you. You may request on-site emergency assistance from ADEQ by calling our 24 hour number at 602/207-2330 and your call will be referred to our on-call duty officer. Local government agencies should call the NRC within 24 hr of response if they are seeking federal reimbursement for response cost. See 40 CFR 310.50.

F. **Follow-up Written Reports:** For off-site incidents as described above, and for any other on-site hazardous waste incident, **a written report is required within 15 calendar days.** Send your written report to ADEQ: Emergency Response Unit; 3033 North Central Avenue, Phoenix, AZ 85012. (See 40 CFS 265.57(j)).

   The facility must also notify ADEQ that it is ready to resume operations prior to resumption. This may be done using the ADEQ phone numbers above. (See 40 CFR 265.56(I))

G. **Penalties for Not Reporting:** Arizona and federal law can subject you to a civil penalty not exceeding twenty-five thousand dollars for each day of violation; A.R.S. 49-924.

H. **Information Requirements:** See the attached form.

For Further Assistance: Please call the ADEQ Emergency Response Unit office at 602/207-4150 for any questions about how to make spill reports.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

EMERGENCY SPILL REPORTING: CERCLA HAZARDOUS SUBSTANCES

A. **Reportable incidents:** Any release to the environment (air, water, land) from a facility, vessel, vehicle, rolling stock or aircraft exceeding reportable quantities in any 24-hour period. On-site or off-site releases. Exceptions for some metals with particle diameters over 100 micrometers. Includes provisions for notification of ongoing or continuous releases; see 40 CFR 302.8.

B. **Reportable Chemicals:** Any hazardous substance listed in 40 CFR 302.4, and any unlisted characteristic hazardous waste.

C. **Reportable Amounts:** Any release equal to or exceeding a reportable quantity of at 40 CFR 302.4, in any 24 hour period. For mixtures with all hazardous substance quantities identified: count only the portion contributed by the hazardous substance. For mixtures with one or more quantities of hazardous substances unknown: count the quantity of the entire mixture. Includes 100 lb RQ for ignitable, corrosive, and reactive hazardous waste. For TCLP hazardous wastes count entire mixture of waste and apply constituent RQ.

D. **When to Report:** As soon as you have knowledge of any such release.

I. Who to Report to: Always call 911 or your local Fire Department/Emergency Service number when you need assistance. **You must call the National Response Center at 1-800/424-8802. You must call ADEQ at 602/207-2330 (also accessible through 1-800/234-5677 x 2330). You must call the Local Emergency Planning Committee if the release is off-site**; see attached list. Calls by the Fire Department or ADEQ do not fulfill a facility's duty to file a verbal report to these numbers. You may leave a detailed message with all the information required by rule. You may request on-site emergency assistance from ADEQ by calling our 24 hour number at 602/207-2330 and your call will be referred to our on-call duty officer. Local government agencies should call the NRC within 24 hr of response if they are seeking federal reimbursement for response cost. See 40 CFR 310.50.

E. **Follow-up Written Reports:** Written reports are required for "continuous releases" see 40 CFR 302.8. This includes provisions for initial written notification within 30 days of verbal reports, first anniversary follow-up or a SARA Title III Section 313 report.

F. **Penalties for Not Reporting.** Arizona and federal law provide for penalties including up to ten thousand dollars under Arizona law A.R.S. 49-284.

G. **Information Requirements:** See attached form.

For Further Assistance: Please call the ADEQ Emergency response Unit office at 602/207-4150 for any questions about how to make spill reports.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

EMERGENCY SPILL REPORTING: EPCRA EXTREMELY HAZARDOUS SUBSTANCES

A. **Reportable incidents:** Any release to the environment (air, water, land, and "the interrelationship between these and all living things") that exposes people off-site. Excepts any release which results in exposure to persons solely within the boundaries of the facility. Excepts continuous releases under CERCLA; see 40 CFR 355.40.

B. **Reportable Chemicals:** All EPCRA "Extremely Hazardous Substances," see 40 CFR Part 355, Appendix A; and all CERCLA hazardous substances.

C. **Reportable amounts:** For any CERCLA substance the quantity established in 40 CFR 302.4; for other substances the reportable quantity is 1 lb. See 40 CFR Part 355, Appendix A.

D. **When to Report:** Immediately.

E. **Who to Report to:** Always call 911 or your local Fire Department/Emergency Service number when you need assistance.). **You must call the Local Emergency Planning Committee; see attached list. You must call ADEQ at 602/207-2330 (also accessible through 1-800/234-5677 x 2330. You must call the National Response Center at 1-800/424-8802 if the release is a CERCLA substance.** Calls by the Fire Department or ADEQ do not fulfill a facility's duty to file a verbal report to these numbers. You may leave a detailed message with all the information required by rule. You may request on-site emergency assistance from ADEQ by calling our 24 hour number at 602/207-2330 and your call will be referred to our on-call duty officer. Transportation related releases may be reported by calling 911 or absent a 911 system, the telephone operator. Local government agencies should call the NRC within 24 hr of response if they are seeking federal reimbursement for response cost. See 40 CFR 310.50.

F. **Follow-up Written Reports:** As soon as is practicable after a release requiring immediate verbal notice you must provide a written follow-up notice (or notices, as more information becomes available) setting forth and updating the information provided initially. See 40 CFR 355.40(b)(3). This notice must be received within 30 days.; see A.R.S. 26-348. The written notices must be sent to the effective LEPCs and to the Arizona Emergency Respond Commission at 5636 East McDowell Road, Building 103, Phoenix, Arizona 85008.

G. **Penalties for Not Reporting:** Federal law provides for civil penalties of up to twenty five thousand dollars per day of continuing violation, and seventy five thousand dollars for each day of second or subsequent violation. See 40 CFR 355.50(b).

H. **Information Requirements:** See attached form.

For Further Assistance: Please call the ADEQ Emergency Response Unit office at 602/207-4150 or ADEMA at 602/231-6346 for any questions about how to make a spill report or how to contact affected LEPCs.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

EMERGENCY SPILL REPORTING: ARIZONA SOIL REMEDIATION RULES

A. Reportable Incidents: Emergency Soil Remediation. "Remediation" means either (a) the treatment or removal of contaminated soils to meet predetermined risk levels or site specific risk levels; or (b) soils that meet predetermined risk levels or site specific risk levels as determined by a risk assessment. See A.A.C. R18-7-209.

B. Reportable Chemicals: "Contaminants" regulated by any of the following ADEQ programs: Aquifer Protection Permit, Hazardous Waste Management, Solid Waste Management, Special Waste, Underground Storage Tanks, Water Quality Assurance Revolving Fund, and Any Other Program under Title 498 that regulates soil remediation. Includes the Greenfields and Voluntary programs.

C. Reportable Amounts: No quantity thresholds; any soil remediation.

D. When to Report: A person conducting a soil remediation during an emergency who has notified the ADEQ in accordance with emergency notification requirements prescribed in the Arizona WQARF/Superfund law (A.R.S. 49-284) is not required to submit a Notice of Remediation. This call must be made as soon as the person has knowledge of a release. Otherwise, a person conducting soil remediation shall submit a Notice of Remediation prior to beginning remediation.

E. Who to Report to: Call ADEQ at: 602/207-2330 (also accessible through 1-800-234-5677 x2330). Calls by the Fire Department or ADEQ do not fulfill a facility's duty to file a verbal report.

F. Follow-up Written Reports: Any person who continues or initiates a soil remediation after the initial emergency response shall submit a written Notice of Remediation.

G. Penalties for Not Reporting: Any penalties would depend on the regulatory programs controlling the clean up. (See Reportable Chemicals paragraph, above).

H. Information Requirements: If you are calling as soon as you have knowledge of the release during an emergency, the information requirements are the same as for a CERCLA Hazardous Substance Release notification

   If you must file a written Notice of Remediation, it must include the following information: (1) the name and address of the real property owner; (2) the name and address of the remediating party; (3) a legal description and street address of the property; (4) a list of each contaminant to be remediated; (5) the background concentration or Soil Remediation Level (SRL), the clean up will address; (6) the current and post-remediation land use; (7) the rationale for selection of a residential vs. non-residential SRL; and (8) the proposed technologies for remediating the site.

For Further Assistance: Please call the ADEQ Emergency Response Unit office at 602/207-4150 for any questions about how to make spill reports.

EMERGENCY SPILL REPORTING: IMMEDIATE VERBAL REPORT

Reporter name:

Reporter telephone number:

Transportation Carrier* or other entity represented by report:

Facility Name:

Facility Address:

Location of incident:[1]

Date of incident:

Time of incident:

Duration of release:[2]

Type of incident:

Nature of hazardous materials involvement: [1]

Media into which released occurred: air: [ ] water: [ ] land: [ ] [2]

Continuing danger to life existing at scene: [1]

Name of Material:

Chemical name of material: [2]

US DOT Classification: [1]

Quantity, amount and units of measure:

Material is a: CERCLA Haz Substance: [ ] EPCRA Extremely Haz Substance: [ ] RCRA Haz Waste [ ][2]

Extent of injuries:

Possible Hazards to Human Health or the Environment outside the facility:[3]

Any known or anticipated acute or chronic health risks; and advice regarding medical attention necessary for exposed individuals: [2]

Proper precautions to take as a result of release, including evacuation: [2]

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*National Response Center: 1-800/424-8802 ADEQ: 602/207-2330 or 1-800/234-5677 x2330

[1] From U.S DOT 49 CFR 171.15 verbal report
[2] From EPCRA 40 CFR 355.40(b) immediate verbal report
[3] From RCRA 40 CFR 265.56(f)(2) immediate verbal report

EMERGENCY SPILL REPORTING: ADDITIONAL ITEMS FOR WRITTEN REPORTS

Assessment of actual or potential hazards to human health or the environment:[4]

Estimated Quantity and Disposition of recovered material resulting from incident;[4]

Manner of disposition of any removed material; name and address of facility and attached manifest:[5]

Actions taken to respond to and contain the release:[6]

Known or anticipated acute or chronic health risks:[6]

Advice regarding medical attention necessary for exposed individuals:[6]

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[4] US EPA RCRA 40 CFR 265.56(j) written report. Due within 15 days to ADEQ.

[5] US DOT 171.156 written report. Due within 30 days of discovery to US DOT; and ADEQ if material is a hazardous waste.

[6] EPCRA written reports. Due as soon as practicable after release but not later than 30 days. Additional reports due as more information becomes available updating earlier reports. Send to ADEMA and LEPC.

Appendix 8-2

Field Screening Sample Collection

Procedures for Sampling Illegal Discharges to the Storm Drain System

APPENDIX 8-2
FIELD SCREENING PROGRAM – SAMPLE COLLECTION AND TESTING

This program is designed to detect gross contamination of regional flood control facilities by illegal/illicit discharges. Monitoring involves one dry season (two samplings at least 4 hr apart) and one storm sampling of the facilities listed in Table 8-2, Section 8, that have been identified by the inspection program (Appendix 8-1) as requiring a sample. A map to the locations listed in Table 8-2 can be found in Figure 6-1. The criteria for site selection were drainage area size and/or presence of industrial land uses in the corresponding watershed. Those channels with drainage areas greater than 50 acres, and smaller conduits in industrialized watersheds are included. Also included are retention/detention basins with detention times greater than 24 hr. The monitoring parameters are those listed on the attached Field Sampling Information sheet. This information includes channel configuration, discharge rate (measured if pollution is observed; otherwise estimated), instrumental determinations of physical conditions, visual and olfactory observations, and field chemical analyses, and is consistent with federal regulations. The chemical analyses are used as indicators of swimming pool (chlorine residual), illegal construction dewatering (total suspended and settleable solids), printed circuit board plating (copper), (chromium, cyanides), plastics manufacturing (phenols), and sewer lines (MBAS, phenols) discharges. Samples for Chemical Oxygen Demand (COD) are also collected.

All of the chemical analyses from can be performed in the field except for MBAS and suspended and settleable solids. Samples are collected for "laboratory" analyses if high silt-clay turbidity or foam are observed.

The in-situ chemical analyses are performed with a field UV/visible spectrophotometer and pre-packaged, single analysis reagents.* Information from the sampling which indicates pollution is referred to the Code Enforcement Department. If the source is determined to be continuous and non-point, follow-up sampling is performed to assess the mass loading. Identified point sources will be issued a discharge permit or be eliminated through enforcement.

The stations in the field screening program are monitored according to the procedure outlined in the Illicit Connection/Illicit Discharge portion of the Storm Water Management Plan. Additional locations will be added to the list if the land uses in the watersheds become industrial.

* Following field screening equipment used for the analysis: Hach storm water field test kit (SW-1)

FIELD SAMPLING INFORMATION

CHANNEL/OUTFALL NAME:	Date: ___/___/_____
OUTFALL NO.	Map Page No. _____
SAMPLING LOCATION: u/s d/s	
DRAINAGE AREA: ❑ Industrial ❑ Commercial ❑ Agricultural ❑ Other	
CHANNEL CONFIGURATION: ❑ Concrete ❑ Earthen ❑ Pipe ❑ Culvert ❑ Trapezoidal ❑ Vertical ❑ Walled ❑ Rectangular box ❑ Gabion ❑ Grass lined ❑ Rip-rap ❑ Other	
DIMENSIONS: Channel width/pipe diameter _____ ft/in.	Average depth _____ ft/in.
WEATHER: ❑ Sunny ❑ Cloudy ❑ Windy ❑ Hot ❑ Cold ❑ Rain ❑ Fog ❑ Other	
Time _____ Air Temperature ____ C	Flowrate: _____ cfs ❑ Est ❑ Meas
pH _____ ECL: _____umhos/cm	DO: _____ppm Temp _____C
Floatables ❑ Yes ❑ No	Oil sheen ❑ Yes ❑ No
Odor: ❑ Yes ❑ No Describe (sewage, sulfide, oil, gas, rancid-sour, other):	
Turbidity: ❑ Yes ❑ No ❑ Organic ❑ Silt-clay	Sample # / Sample #
Foam: ❑ Yes ❑ No	Sample # / Sample #
Algae: ❑ Yes ❑ No	
Aquatic life: ❑ Yes ❑ No ❑ Stressed	
Total chlorine: _____mg/L	Total chlorine: _____mg/L
Total copper _____mg/L	Total copper _____mg/L
Total phenol: _____mg/L	Total phenol: _____mg/L
Total chromium _____mg/L	Total chromium _____mg/L
Hexavalent chromium: _____mg/L	Hexavalent chromium: _____mg/L
Free cyanide: _____mg/L	Free cyanide: _____mg/L
COD Sample #	COD Sample #
COD	COD
Comments (provide narrative description of the sampling results. Turbidity: clear, cloudy, opaque): Photo attached?	

Appendix 8-3

Flood Control and Storm Drain System Maintenance Inspection Guidelines

APPENDIX 8-3
EXISTING DRAINAGE SYSTEM INSPECTION AND MAINTENANCE PROCEDURES

The City of Scottsdale's storm drain system is currently maintained by staff from the City's Field Services Division. Staff performs general maintenance on the system's drain inlets, storm drain storage structures and culverts. Generally, cleaning is required when the accumulation of debris has reached a level that impairs the function of the component. Existing citywide litter and debris control programs, including street sweeping, waste management, pubic outreach and construction site BMPs are also important elements in the maintenance of the City's storm drain system.

The maintenance of the various storm drain system components is tracked, documented and evaluated annually on the City's Storm Water Maintenance Management System. Field data is collected by Field Services Division staff and entered into the system, which integrates the data with the City's GIS to produce reports and maps.

The purpose of inspection of drainage facilities is to ensure that they are in an acceptable state of repair, have not become blocked by debris, or that illegal dumping has not occurred that could adversely impact storm water quality. It is the policy of the City that all facilities shall be inspected and maintained as applicable per the adopted maintenance schedule.

8-3.1 Inspection Program

The Field Services Division will visually inspect all open channel conveyance facilities in the City on a bi-monthly basis. The Field Services Division will schedule cleaning as needed at regular service intervals, unless it is determined that conveyance within the system could be impaired, or deposited material could become a pollutant.

The following defines the regular service interval for City storm drain facilities:

1. Recorded Drainage Easements: Inspected and cleaned, if needed, quarterly
2. Dedicated Natural Washes: Inspected quarterly and cleaned annually.
3. Non-dedicated Natural Washes: Inspect annually and notify property owner to clean as needed. If the property owner does not remove the debris from the area, the City shall take enforcement action.
4. Detention/Retention Basins: Inspect quarterly and clean as needed.
5. Storm Drain Inlets: Inspect quarterly and clean as needed.

The Parks and Maintenance Division will respond to complaints regarding clogged facilities or inlets, and correct the problem within five days of notification. The above service intervals are for routine maintenance. Special circumstances will be addressed on a case-by-case basis.

Solid Waste BMPs. Solid waste BMPs to be implemented will include the following:

- Removal of debris, trash, silt and sediment during the cleaning of the storm drain system. Debris capture systems will be used to prevent material from washing into streams or channels during cleaning procedures.

  Provision of proper containment for the temporary storage of removed debris. The surface types of temporary storage sites will be of asphalt concrete or other types of impermeable material.

- Dewatering of waste collected from the storm drain system for proper disposal to a Class III landfill. Dewatering sites should not drain to storm drains or creeks.

8-3.2 Problem Tracking and Process Improvement

The City will develop and implement processes for tracking problem areas and ensuring that appropriate BMPs and standard operating procedures will be implemented for storm drain operation and maintenance activities. The City will evaluate the effectiveness of its BMPs in achieving the goals of reducing pollutants in storm water to the maximum extent practicable through an annual review process. The review will identify operational improvements and consider opportunities for structural retrofit and design changes. The City will also provide a referral/follow-up process between the Storm Drain O & M Program and the Illicit Discharge Identification and Elimination Program to ensure those problem areas are identified and targeted for response. Operation and maintenance provisions will also be included in the planning and design phases of Capital Improvement Projects to ensure that storm water quality issues are considered in the design of storm drain systems.

8-3.3 Staff/Contractor Training and Coordination

The City will provide annual training to its municipal staff in the use of appropriate BMPs and/or control measures. The training will be conducted prior to the start of the rainy season, and will emphasize controlling storm water pollution through storm drain operation and maintenance (O&M). The training process also includes the provision of a mechanism for obtaining feedback from staff on the implementation and effectiveness of the BMPs and control measures.

The City will develop and implement a process to ensure that contractors employed to perform storm drain O&M activities use the appropriate BMPs. The process will include the integration of standard boilerplate language regarding storm water pollution prevention into the relevant municipal contract specifications.

8-3.4 Data Analysis

The City will continue to maintain records tracking inspection and cleaning activities through its Storm Water Maintenance Management System and Illicit Discharge Identification and Elimination Programs. In addition to records showing when and which facilities have been inspected and cleaned, information regarding problem areas, spills and illegal dumping will be maintained and evaluated annually by the Floodplain and Stormwater Division. The purpose of the annual evaluation is to analyze the effectiveness of storm drain O&M practices, and develops modifications to those practices as necessary. The City's responses to all reported incidents will also be tracked. Other

activities include documenting any unusual dry weather flows during inspections and the follow-up actions/referrals.

STORM DRAIN MAINTENANCE INSPECTION PROGRAM

FIELD INSPECTION LOG

Inspector/Date:	
Facility:	
System Location:	**Reach:**
Condition of channel/drain (include debris accumulations)	
Is maintenance required (explain):	
MAINTENANCE REQUIREMENT	
Location of inspection entry:	
Dimensions/type of facility:	
Type of debris:	
Illegal Dumping (if yes notify Parks)?	
Record any evidence of illegal dumping/characterize:	
List any nearby industries or businesses.	
Possible pollutant if in contact with storm water?	
Water pollution response agency notified by phone? List contact/time:	
Action required:	

Comments (if spill, describe cleanup and follow-up needed, if hazardous, notify RMFD for abatement):