

STORM WATER MANAGEMENT HANDBOOK FOR CONSTRUCTION ACTIVITIES

Prepared by
City of Houston
Harris County
Harris County Flood Control District



2006 Edition

NOTICE TO USERS

The *Storm Water Management Handbook for Construction Activities* provides general guidance related to erosion and sediment controls and other measures to control storm water pollutants from construction activities for the jurisdictional areas of the City of Houston, Harris County Flood Control District, and unincorporated areas of Harris County. The Texas Department of Transportation (TxDOT) publishes a separate document, *Storm Water Management Guidelines for Construction Activities* which provides guidance on the use of storm water management measures for state highway construction projects.

Copies of this handbook can be obtained by contacting the Storm Water Management Joint Task Force, P.O. Box 131006, Houston, Texas 77216. Information on ordering the TxDOT handbook is available from TxDOT at 6400 E. Highway 290, Austin, Texas 78701-2483.

Additional information is provided at the following websites:

Storm Water Management Joint Task Force site: <http://www.cleanwaterclearchoice.org>

TxDOT site: <http://www.dot.state.tx.us>

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FORWARD

This handbook has been prepared to provide general guidance related to erosion and sediment controls and other measures to reduce storm water pollutants from construction sites in Harris County and the City of Houston. The Storm Water Management Joint Task Force (JTF), which includes Harris County, Harris County Flood Control District, and the City of Houston, has prepared this handbook to satisfy National Pollution Discharge Elimination System (NPDES) storm water permit requirements established by the Environmental Protection Agency (EPA) for storm water discharges from municipal separate storm sewer systems (MS4s). This handbook was initially issued in 2001. This handbook was modified, in 2006, to include the Texas Pollution Discharge Elimination System (TPDES) Construction General Permit (TPDES Permit No. TXR150000) issued by the Texas Commission on Environmental Quality (TCEQ). Emphasis is given to temporary Best Management Practices (BMPs) that will work well in conditions specific to Harris County and the City of Houston. The handbook provides information to owners, engineers, architects, and contractors about TCEQ's TPDES storm water permit requirements and about local regulations. The handbook discusses the preparation of erosion and sediment and other source control plans, the incorporation of BMPs in the design phase of improvements, and their implementation during construction. The scope of this handbook does not, however, include flood control design requirements or permanent water quality controls. Storm water management measures for state highway construction projects are presented in a separate document, *Storm Water Management Guidelines for Construction Activities* published by Texas Department of Transportation (TxDOT), also a member of the JTF.

STORM WATER QUALITY WEBSITE

The Storm Water Management Joint Task Force (JTF) maintains a Storm Water Quality website at the following address:

<http://www.cleanwaterclearchoice.org/>

Information on updates to the *Storm Water Management Handbook for Construction Activities* will be posted to the above website.

INTRODUCTION

1.0 INTRODUCTION

1.1 Background

1.1.1 Clean Water Act

The 1972 amendments to the Federal Water Pollution Control Act (also referred to as the Clean Water Act) prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Efforts to improve water quality under the NPDES program traditionally have focused on reducing pollutants in discharges of industrial process wastewater and from municipal sewage treatment plants. Efforts to address storm water discharges under the NPDES program have generally been limited to certain industrial categories with effluent limitations for storm water.

Congress amended the Clean Water Act (CWA) in 1987 to require the Environmental Protection Agency (EPA) to establish phased NPDES requirements for storm water discharges. To implement these requirements, on November 16, 1990, EPA published regulations including the initial permit application requirements for (a) 11 categories of storm water discharges associated with industrial activity, and (b) discharges from municipal separate storm sewer systems (MS4s or public drainage systems) serving a population of 100,000 or more (55 *Federal Register* 47990).

1.1.2 Storm Water Discharge from Construction Activity Regulated under the EPA NPDES Program

One of the 11 categories of industrial activity covered under EPA's regulations was **construction activity including clearing, grading, and excavation activities except: operations that result in the disturbance of less than 5 acres of total land area which are not part of a larger common plan of the development or sale.** Storm water discharges into waters of the United States from such construction activity are unlawful, unless authorized by a permit. On June 4, 1992, the United States Court of Appeals for the Ninth Circuit remanded the exemption for construction sites of less than five (5) acres to the EPA for further rulemaking (Nos. 90-70671 and 91-70200). As a result of this legal action, EPA's permit coverage requirements were extended to construction sites of one or more acres.

EPA's Baseline General Permit for Construction Activities included requirements to develop and implement a Storm Water Pollution Prevention Plan (SWP3) and file a Notice of Intent (NOI).

1.1.3 Storm Water Discharge from Construction Activity Regulated Under MS4 Programs

EPA's November 16, 1990 regulations established storm water permit requirements for municipal separate storm sewer systems (MS4s) serving a population of 100,000 or more, (e.g., the City of Houston, Harris County/Harris County Flood Control District and Texas Department of Transportation). In response to the MS4 permit requirements, the City of Houston, Harris County /Harris County Flood Control District, and Texas Department of Transportation formed the Storm Water Management Joint Task Force (JTF) to coordinate the preparation of the required permit applications and the implementation of compliance activities during the permit term.

One of the management programs required by EPA in the JTF's permit is the implementation of a construction site runoff program to reduce the discharge of pollutants from construction sites. The program must include requirements for the use and maintenance of appropriate structural and non-structural best management practices (BMPs) to reduce pollutants in storm water runoff from construction sites to the MS4s. The MS4 operator is required to reduce the discharge of pollutants to the maximum extent practicable by the implementation of management practices, control techniques, engineering methods, and other provisions appropriate for the control of such pollutants.

Effective October 1, 2001, local regulatory requirements to prevent storm water runoff pollution from construction activities to the MS4 were adopted by the City of Houston and Harris County. Additional information on the City and the County requirements is provided in Section 5.0.

1.1.4 Storm Water Discharges from Construction Activities Regulated Under TPDES Program

On September 14, 1998, EPA authorized Texas to develop and implement the Texas Pollutant Discharge Elimination System (TPDES) Program. Under the terms of this authorization, the Texas Commission on Environmental Quality (TCEQ) assumed the role of storm water permitting authority for Industrial Activity, Construction Activity, and Municipal Separate Storm Sewer Systems (MS4s).

The TPDES program implements the federal NPDES program in the state of Texas. The EPA Region 6 was the administrator for storm water general permits for construction activities disturbing 5 or more acres (Phase I) within the state of Texas until the TPDES permit was issued. The TPDES Construction General Permit, Permit No. TXR150000 was approved, signed, and became effective on March 5, 2003. On March 5, 2003, the TCEQ became the permitting authority for these discharges within the state of Texas.

The TPDES Construction General Permit coverage extends to small construction sites disturbing at least one acre but less than 5 acres. As of March 5, 2003, small construction sites are required to obtain permit coverage. Further information on the regulations for small sites can be found at the TCEQ Construction Storm Water Permit webpage at the following address:

http://www.tceq.state.tx.us/permitting/water_quality/stormwater/TXR15_1_to_5.html

For construction projects that will disturb less than one acre and are not part of a larger common plan of development, coverage under the Construction General Permit is not required, unless required by a state or local authority.

TCEQ continued EPA's permit application options for storm water discharge permits. The regulations present two (2) permit application options. The first option is to submit an individual permit application. The second option is to file a notice of intent (NOI) to seek coverage under a general permit in accordance with the requirements of the Construction General Permit. One major requirement of the Construction General Permit is that operator(s) of the construction activity prepare and implement an SWP3 to reduce the pollutants in storm water discharged from the construction site. A copy of the Construction General Permit is included in Section 5.0 of this handbook.

1.2 Purposes of the Handbook

This handbook has been prepared to provide general guidance related to erosion and sediment controls and other measures to control storm water pollutants from construction sites. The purposes of this handbook are as follows:

1. To satisfy MS4 storm water permit requirements from construction activities to the City of Houston, Harris County, Harris County Flood Control District and the Texas Department of Transportation MS4s.
2. To be used in the jurisdictional areas of the City of Houston, Harris County and the Harris County Flood Control District to provide general guidance on preparing individual storm water permit applications for construction activities or in preparing and implementing SWP3s required under provisions of the Construction General Permit. Note: Separate guidance is provided for Texas Department of Transportation projects by TxDOT due to particular requirements for state highway construction projects. The reader should refer to the *Storm Water Management Guidelines for Construction Activities* by TxDOT.
3. To be used as a guidance handbook to implement a local storm water management program for construction activities.

This handbook will provide information to owners, engineers, architects, and contractors to facilitate compliance with TCEQ's TPDES storm water permit requirements and with local ordinance and regulations pertaining to the control of storm water discharges from construction activities. The handbook discusses the preparation of erosion and sediment and other source control plans, the incorporation of BMPs in the design phase of improvements, and their implementation during construction.

The reader is advised that additional permitting requirements may apply to specific projects. All construction projects should be carefully reviewed for any additional federal, state, or local requirements.

1.3 Organization of the Handbook

This handbook is organized to function as a user's guide to meet the purposes described above. The remainder of the handbook is divided into four (4) sections:

- Section 2.0 provides an overview of the erosion and sedimentation process as well as basic principles of erosion and sediment control and other source controls.
- Section 3.0 discusses typical requirements of a storm water pollution prevention plan (SWP3) for construction activities, the process for selecting BMPs, and the procedure for developing SWP3s. Considerations have been given to requirements stipulated in the TPDES Construction General Permit.
- Section 4.0 describes various BMPs to control pollutants from construction sites, the applicability of these BMPs, and the guidance for designing and using the BMPs.
- Section 5.0 provides information on obtaining copies of the City of Houston ordinance and Harris County regulations pertaining to the control of storm water discharges from construction activities and contains a copy of the Construction General Permit.

This handbook also includes the following appendices:

- Appendix A discusses methods for calculating runoff and estimating sediment loss. These calculations are not required by current regulations and are provided for information purposes only.
- Appendix B provides three (3) sets of example SWP3s, Public Notices, Notices of Intent (NOIs) and Notices of Termination (NOTs) illustrating a theoretical approach toward preparation of these documents to meet the Construction General Permit requirements. These example SWP3s, Public Notices, NOIs, and NOTs are for (1) subdivision, (2) roadway, and (3) single-family residence construction activities.
- Appendix C presents guidance for technical specifications for the BMPs discussed in Section 4.0 of the handbook.
- Appendix D provides sample forms and useful information, such as websites.
- Appendix E provides a list of references cited in this handbook.

1.4 Disclaimer

This handbook is intended to provide general guidance in managing storm water discharges from construction sites. Technical and guidance data included have come from a number of sources. (See Appendix E.) Careful consideration must be given to selecting the most appropriate control measures based on site-specific features. Additional information from professionals, agencies, organizations, and institutions with expertise in a particular area may be required in selecting, designing, and installing the BMPs.

The handbook does not describe all TPDES storm water permit requirements for SWP3s. Instead, the handbook includes a copy of the Construction General Permit in Section 5.0. The sample SWP3s, Public Notices, NOIs, and NOTs presented in Appendix B were developed to illustrate an example of one possible way to respond to the Construction General Permit requirements. However, it is the individual applicant's responsibility to have a thorough understanding of the TPDES Construction General Permit TXR150000, applicable regulations and guidelines and any other government mandates to assure compliance with the requirements for preparing an SWP3, Public Notice, NOI, and NOT for a specific project.

As stated in the Purposes of the Handbook, this document was prepared as a guidance manual and is not intended to replace the need for a site-specific plan for activities requiring a TPDES storm water discharge permit. The specifications in Appendix C are also provided as general guidance and should be adapted to site-specific conditions and applicable agency requirements, as needed. Use of the information in this document is at the sole risk of the users. Harris County, Harris County Flood Control District, the City of Houston, Texas Department of Transportation and their agents and consultants do not represent that material contained in this document is adequate for compliance with government requirements or that it is accurate in all respects. Note that TxDOT has its own construction handbook for highway development (*Storm Water Management Guidelines for Construction Activities*).

1.5 Acknowledgements

This handbook contains information provided from handbooks developed in other cities and states. A reference list is included in Appendix E. The manuals/handbooks prepared by the Wisconsin Department of Natural Resources, the City of Austin Department of Environmental Protection, the Florida Department of Environmental Regulation, and the manual jointly developed by the North Carolina Sedimentation Control Commission, the North Carolina Department of Natural Resources and Community Development, and the North Carolina Agricultural Extension Service were used extensively. In addition, information contained in the preliminary draft of the *Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices* prepared by EPA was used in preparing this handbook.

Information provided on TCEQ's website was also used in revising this handbook to provide guidance on state requirements.

The preliminary draft of this handbook, published in July, 1992 was distributed to more than 40 organizations and public groups for review. The Storm Water Management Joint Task Force also formed a Technical Advisory Committee (TAC) to provide input to this handbook and to review comments from the public. The distribution draft of this handbook, published September 17, 1992, was used in the Houston - Harris County region. On March 30, 1999, the JTF requested comments from over 32 organizations on their experience with the 1992 final draft handbook. The TAC was also reconvened in January 1999 to assist the JTF with reviewing the handbook and comments.

The first version of this handbook was completed and submitted to the EPA in October 2000. This handbook was then revised and submitted to EPA in October 2001. In 2004, the handbook was revised to incorporate the TPDES Construction General Permit requirements and add additional BMPs. The Joint Task Force is grateful to members of the TAC and to various organizations for their efforts in reviewing the preliminary and final draft documents. As this handbook continues to be updated, public input will be an important part of the revision process.

Technical Advisory Committee

Organization

Houston Council of Engineering Companies (HCEC)
Houston Contractors Association (HCA)
Water Environment Association of Texas (WEAT)
Greater Houston Builders Association and Houston
Real Estate Council (GHBA/HREC)
American Society of Civil Engineers (ASCE)
American Institute of Architects (AIA)
Bayou Preservation Association (BPA)

Joint Task Force Agencies

City of Houston
Harris County
Harris County Flood Control District
Texas Department of Transportation

**PRINCIPLES OF STORM WATER MANAGEMENT FOR
CONSTRUCTION ACTIVITIES**

2.0 PRINCIPLES OF STORM WATER MANAGEMENT FOR CONSTRUCTION ACTIVITIES

2.1 General Principles

Construction activities produce many different kinds of pollutants which may cause storm water pollution. Grading activities remove grass, rocks, pavement and other protective ground covers resulting in the exposure of underlying soil to the elements. Because the soil surface is unprotected, soil and sand particles are easily picked up by wind and/or washed away by rain—a process called erosion. The water carrying the particles eventually reaches streams, rivers, lakes, or coastal waters where it slows down, allowing the particles to fall to the bottom of the stream bed or lake—a process called sedimentation. Gradually, layers of these clays and silt build up in the stream beds choking the river and stream channels and covering the areas where fish spawn and plants grow. The particles may also cloud the waters causing aquatic respiration problems which can kill the fish and plants growing there.

In addition to erosion and sedimentation problems, construction projects may require the use of toxic or hazardous materials such as petroleum products, pesticides, herbicides, and building materials which may pollute storm water running off the construction site. These types of pollutants can often contain small amounts of metals and other toxic materials which may be harmful to humans, plants, and fish in streams.

Although construction activities can greatly increase the potential for erosion and sedimentation and may involve the use of toxic or hazardous materials, EPA has determined that these sources of storm water pollution can be controlled through the use of “Best Management Practices”(BMPs). BMPs are measures or practices used to reduce the amount of pollution entering surface waters, air, land or groundwater. BMPs may take the form of a process, activity or physical structure.

The impact of man-induced erosion can be substantially reduced when BMPs are applied to construction sites and activities. To accomplish this, it is important to review and identify potential erosion problems early in the construction site planning process. Appropriate measures can then be developed and incorporated into the construction plan for effective erosion and sediment control. Source control BMPs and good housekeeping can prevent toxic and hazardous materials from mixing with storm water and reduce the potential for pollution.

2.2 Overview of Erosion and Sedimentation

2.2.1 Erosion Process

Erosion is the process by which soil or rock material is loosened and removed. Wind erosion can be considerable at construction sites. Wind erosion can cause the separation and gradual removal of silt, clay and organic matter from surface soils, leaving the remaining materials sandy and infertile. The windblown soils can cause abrasive damage to surfaces and vegetation, as well as deposition problems. Erosion can be caused by the movement of wind or water.

There are four categories or stages of water-induced erosion:

Splash: Raindrops impact on exposed soils and dislodge soil particles, making them easier to transport.

Sheet: Overland sheet flow transports sediments dislodged by raindrop impact.

Rill and Gully: Concentration of overland flow into rivulets and channels of increasing size and velocity which result in erosive action on exposed surfaces.

Stream and Channel: Erosion of channel banks or bottom from increased or higher flows and velocity discharge.

2.2.2 Sedimentation

Sedimentation is the deposition of soil particles transported by wind or water. Reduced velocities, whether natural or induced (as with settling basins), allow particles to settle. Larger or heavier particles settle more rapidly than finer particles such as clay and silt.

2.2.3 Factors Impacting Erosion and Sedimentation

The magnitude and extent of erosion and sedimentation impacts are affected by a number of interrelated site factors:

Soils

Soil erodibility is affected by its infiltration characteristics and resistance to transport. These factors in turn are affected by soil texture (percentages of sand, clay, silt); organic matter content; structure (shape, arrangement, compaction of soil particles) and permeability. Low erosion potential results from a relatively high infiltration rate coupled with high resistance to transport; this occurs in well vegetated, well drained areas such as loamy, sandy soils with vegetative cover. Exposed clay soils or compacted soils have low permeability that can result in increased runoff rates. While clays and compacted soils are less erodible, increased runoff flows can create severe erosion problems in downstream disturbed silty, sandy and other unprotected soils.

According to the *Soil Survey of Harris County* by the Natural Resource Conservation Service (NRCS) (formerly the Soil Conservation Service (SCS)), local soils in Harris County are classified in the Coast Prairie and East Texas Timberlands Land Resource Areas. The soils in the Coast Prairie Area formed under grasses and are dominantly dark colored, loamy and clayey. The soils in the East Texas Timberlands Area formed under forest vegetation and are dominantly light colored, sandy and loamy. The three largest soil groups are:

1. the nearly level, clayey and loamy, prairie soils (39%), with clay underlying layers;
2. the nearly level, loamy prairie soils (47%), with loamy or clayey underlying layers; and
3. the nearly level to gently sloping, loamy forested soils (10%), with loamy or clayey underlying layers.

These soils have low to moderate erodability (“K” factor) based on NRCS classification. The effects of erodability can be modified by slope and length conditions. Low slope angles and short slope distances reduce the effects of erodability on soil erosion.

Topography

Topography affects runoff rates, volumes and direction, and indirectly affects vegetative cover. Long, steep slopes and rilling or gullying may result in increased runoff velocities

and volumes. Vegetation may also be more difficult to reestablish on slopes with greater exposure to wind and/or sun.

Surface Cover

The type and condition of surface cover greatly affects the volume and velocity of runoff. Well-established vegetation shields the soil from the impact of falling rain, reduces flow velocity, disperses flow, and promotes infiltration. Impervious surfaces protect soil from erosion but prevent infiltration, thereby increasing the potential runoff volume and velocity. Wind erosion can be significant on unprotected, disturbed soil surfaces.

Climate

Climate is a fundamental aspect of the hydrologic cycle. The frequency, intensity and duration of rainfall and temperature affect the potential amount of runoff and erosion from a given site at a given time of year. Coastal regions in Texas are subject to moderate to high temperatures, and storms ranging from localized showers and intense thunderstorms to hurricanes. The timing and duration of construction activities directly affect the amount of exposure to runoff-producing rain.

2.3 Basic Principles of Erosion and Sediment Control and Other Source Controls

The following basic principles of erosion and sedimentation control derive from two basic objectives. First, protection of soils from the erosive forces of rain, wind, and runoff; and secondly, the onsite capture of eroded soils and sediments.

1. Review site conditions prior to development.

Consider all existing conditions at the site, including soils, topography, drainage patterns, and existing vegetation. Modifications to site topography, cover and drainage patterns will change the site hydrology and runoff. Such modification will require well-engineered erosion and sediment controls during and after construction.

2. Divert upslope runoff.

Overland flow from upslope areas should be diverted around disturbed areas to minimize the amount of erosion generating runoff from the disturbed area without impacting adjacent properties.

3. Minimize the extent of disturbed areas.

The disturbed areas' size and the duration of disturbance should be minimized to the extent practicable to minimize the amount of sediment leaving the site. Natural cover should be retained to the maximum extent feasible. Protective measures for significant trees and stands of vegetation that will be retained should be included in the construction site plan.

4. Schedule clearing and grading to minimize exposure.

Where practicable, construction activities should be sequenced to minimize the amount of area disturbed at one time. Plan the development stages so that only the areas that are actively being developed are exposed. All other areas should be protected with temporary or permanent vegetation or mulching. Grading should be completed as soon as possible after it is initiated. Seasonal variations in climate should be considered.

5. Stabilize disturbed areas.

Stabilization of exposed soils should be provided as soon as practicable but no later than 14 days after the construction activity has ceased. Stabilization practices may include temporary seeding, permanent seeding, mulching, geotextiles, sodding, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures.

6. Keep runoff velocities low.

Clearing vegetation reduces infiltration and surface roughness, resulting in increased runoff volumes and velocities. Measures that break slope lengths and diffuse flows or divert flows to stabilized outlets can reduce problems associated with concentrated flows and increased velocities.

7. Retain sediment on the site.

While the site is disturbed, measures should be used to trap sediment and to prevent its movement from the site and into the street. Suspended sediment can be captured by filtration or sedimentation measures. Filtration devices include bagged gravel barrier, filter fabric fences, hay bales, filter fabric barriers, and drop inlet baskets. Sedimentation devices include sediment basins and sediment traps. Transported sediments, such as on truck beds and equipment tires, can be hosed off, and runoff can be directed to temporary or permanent sedimentation basins where practicable. The paved streets on site and adjacent to the site entrance should be cleaned daily to remove any sediment tracked from the site.

8. Prepare drainage facilities to handle concentrated or increased runoff.

Drainage channel(s) should be protected to prevent scour and erosion. Rock, sod, and other means of stabilization can be used on outlets providing conveyance to the storm drainage system. Such measures can provide protection against erosion and provide filtration of larger soil particles.

9. Inspect and maintain control measures.

Vital to the success of the above eight principles is the periodic and thorough checking and maintenance of the erosion and sediment control practices used. A routine "end of day check" with periodic detailed inspection could be used to apply this principle. Improperly maintained practices may cause more damage than they prevent. Failure of a practice may be hazardous or damaging to both people and property, as in the case of a large sediment basin failure or a breached dike. It is essential to properly inspect practices and correct problems as soon as they develop.

10. Control sources of other pollutants.

The use of good housekeeping practices at the construction site is the most economical and effective source control for other potential pollutants, (e.g., petroleum products, pesticides and herbicides). These practices will minimize the potential of pollutant material mixing with storm water runoff. Efforts should be made to store only enough product to complete the project. Potential pollutants should be kept in their original containers, stored neatly, and out of the weather if possible. Manufacturer's instructions on the use and disposal of products should be followed. Whenever possible, all of a product should be used before disposing of the

container. Daily inspections should be conducted to ensure proper use and disposal of potential pollutants.

STORM WATER POLLUTION PREVENTION PLANS

3.0 STORM WATER POLLUTION PREVENTION PLANS (SWP3s)

This section describes general planning and implementation procedures for obtaining storm water permit coverage and developing SWP3s for construction site activities based on the requirements of the TPDES General Permit TXR150000 (Construction General Permit). Storm water discharges from large construction sites (5 acres or greater) and small construction sites (1 to less than 5 acres) construction activities are eligible for coverage under the Construction General Permit. Additionally, discharges of storm water associated with construction support activities, including temporary concrete batch plants, asphalt batch plants, equipment staging areas, material storage yards, material borrow areas, and excavated material disposal areas may be authorized under the Construction General Permit.

Operators of large construction sites must apply for storm water permit coverage for the discharge of storm water from sites associated with construction activities by developing and implementing a SWP3, submitting a Notice of Intent (NOI) form and fee to TCEQ and the MS4 operator (City of Houston or Harris County), and posting a Construction Site Notice at the work site. Operators of small construction sites must develop and implement a SWP3, submit a Construction Site Notice to the MS4 operator, and post the Construction Site Notice at the work site. Property owners, contractors, and developers may all meet the definition of operator, as defined by TCEQ in the Construction General Permit. Operators can develop a shared SWP3, but must submit independent NOIs to TCEQ.

Preparation and implementation of a SWP3 is part of obtaining Construction General Permit coverage for storm water discharges from sites associated with construction activity. The SWP3 must be fully developed and implemented prior to commencing construction activities. The NOI must be submitted to TCEQ and the operator of the MS4 receiving the discharges at least 2 days prior to commencing construction activities. Upon completion of construction activity, the operator must submit a Notice of Termination (NOT) to terminate coverage under the Construction General Permit for storm water discharges from the site, within 30 days.

The SWP3 and permitting requirements described in this section are a partial summary of the Construction General Permit requirements. The Construction General Permit, included in Section 5.0, of this handbook should be consulted for a thorough understanding of the requirements. In addition the City of Houston and Harris County have local requirements for construction activities. Additional information on local requirements is provided in Section 5.0.

Regulatory Requirements

Construction projects must comply with applicable federal, state and local laws, including the Endangered Species Act and historic preservation laws. The City has implemented an ordinance and the County has implemented regulations for discharges associated with construction activity and for post-construction controls on new development and significant redevelopment. The reader is directed to the JTF website www.cleanwaterclearchoice.org for additional information and links to these documents.

Fees

For large construction activity, an application fee of \$100 must be submitted to TCEQ with each NOI for coverage of a large construction activity. A fee is not required for submission of an NOT or NOC letter. Large construction activities authorized under the Construction General Permit must also pay TCEQ an annual Water Quality Fee of \$100 under Texas Water Code 26.0291 and according to TAC Chapter 205 (relating to General Permits for Waste Discharges). Local fees

for construction activities also apply. The user should review local requirements for applicable fees.

3.1 Construction Site Storm Water Pollution Prevention Plan (SWP3) Requirements

SWP3s must include the following items:

- Site or Project Description
- Best Management Practices (BMPs)
- Structural Control Practices
- Permanent Storm Water Controls
- Other Controls
- Consistency with Approved State and Local Plans
- Maintenance
- Inspections of Controls
- Non-Storm Water Discharges

Additional information on these items is provided below.

3.1.1 Site or Project Description

- A. Nature of construction activity, potential pollutants and sources
- B. Intended schedule or sequence of major construction activities.
- C. Estimates of total area of the site and of the total area of the site expected to be disturbed by construction activities including offsite material storage areas, storage area, overburden and stockpiles of soil, and borrow and fill areas. If information on offsite borrow or fill areas is not available at the time the SWP3 is proposed, then the SWP3 should be amended to include such information when it becomes available.
- D. Soils Data and Runoff Water Quality
Existing data describing the information of soil including soil erodibility or quality of any discharge from the site
- E. General Location Map
- F. Detailed Site Map
 1. Drainage patterns and approximate slopes anticipated after major grading activities
 2. Areas of soil disturbance
 3. Locations of all major structural controls either planned or in place
 4. Locations where stabilization practices are expected to be used
 5. Locations of off-site material, waste, borrow, or equipment storage areas
 6. Surface waters, including wetlands, either adjacent or in close proximity

- 7. Locations where storm water is discharged from the site directly into a surface water body
- G. Location and description of asphalt plants and concrete plants providing support to the construction site and authorized under the Construction General Permit.
- H. Name of receiving water(s), at or near the site which will be affected by or receive discharges from disturbed areas of the project.
- I. A copy of the TPDES General Permit TXR150000.

3.1.2 Best Management Practices (BMPs)

The SWP3 should clearly describe the appropriate BMPs, the general timing or sequence, and who will be responsible for implementing the control measures. The SWP3 should also clearly describe the items listed below for each major activity that disturbs the site (e.g., grubbing, excavation, grading, etc.).

A. Erosion and Sedimentation Controls

Short and Long Term Goals and Criteria

1. Sediment should be retained on site to the maximum extent practicable.
2. Controls measures must be properly selected, installed, and maintained in accordance with manufacturers' specifications and good engineering practice. The operator must replace or modify any control that is performing inadequately, as soon as practicable, after discovery.
3. Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.
4. If sediment escapes the site, off-site accumulations must be removed at a frequency to minimize further negative effects, and, whenever feasible, prior to next rain event.
5. Controls must be developed to limit, to the extent practicable, offsite transportation of litter, construction debris, and construction materials.

B. Stabilization Practices

Describe interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans should ensure that existing vegetation is preserved where it is possible.

1. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing trees and vegetation, and other similar measures.
2. The following records must be maintained and either attached to or referenced in the SWP3, and made readily available upon request as described in the TPDES Construction General Permit: 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.
3. Stabilization measures must be initiated as soon as practicable whenever construction activities have temporarily or permanently ceased for that portion of

the site, and must be initiated no more than 14 days after the construction activity has temporarily or permanently ceased unless the following exceptions apply: stabilization measures are precluded by snow cover or frozen ground conditions; earth disturbing activities will be resumed within 21 days for that portion of the site. (Additional exceptions apply for drought-stricken areas. Refer to the TPDES Construction General Permit for additional information.)

3.1.3 Structural Control Practices

Describe structural practices to direct flows from exposed soils, store flows, or otherwise limit runoff and discharge of pollutants from exposed areas of the site to the degree attainable. Sediment basins serving site drainage area(s) of 10 or more acres disturbed should be sized for the 2-year, 24-hour storm where attainable. Public safety must be considered when designing a sediment basin.

3.1.4 Permanent Storm Water Controls

Describe 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.

3.1.5 Other controls

- A. Off-site vehicle tracking of sediment and control of dust generating activities.
- B. Describe construction and waste materials expected to be stored onsite and controls to reduce pollutants from these materials.
- C. Describe pollutant sources from areas other than construction (including construction support activities) and controls for them.
- D. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that natural physical and biological characteristics and functions are maintained and protected.

3.1.6 Consistency with Approved State and Local Plans

- A. The permittees must ensure the SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits or storm water management site plans or permits approved by federal, state or local officials.
- B. The SWP3 must be updated, as necessary, to remain consistent with any changes applicable to protecting surface water resources.

3.1.7 Maintenance

Describe procedures for the timely maintenance of control measures. Maintenance must be performed as soon as practicable before the next anticipated storm event or as necessary to maintain the continued effectiveness of the BMPs.

3.1.8 Inspections of Controls

Describe inspection reporting and procedures.

- A. Personnel provided by the permittee(s) and familiar with the SWP3 must inspect the areas listed below at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. As an alternative, the SWP3 may

be developed to require that these inspections will occur at least once every seven (7) calendar days. If the 7-day inspection schedule is selected, the inspections must occur on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

- 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.
 - Sediment and erosion control measures
 - Locations where vehicles enter or exit the site.
 - Inspect areas where final and temporary stabilization has occurred at least once every month.
- B. Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may use representative inspection procedures described in the Construction General Permit.
- C. The SWP3 must be modified based on the results of inspections, as necessary to better control pollutants in runoff. Revisions to the SWP3 must be completed within 7 calendar days following the inspection. If existing BMPs are modified or if additional BMPs are necessary, an implementation schedule must be described in the SWP3 and wherever possible those changes implemented before the next storm event. If implementation before the next anticipated storm event is impracticable, these changes must be implemented as soon as practicable.
- D. A report summarizing the scope of the inspection, names and qualifications of personnel making the inspection, the dates of the inspection, and major observations relating to the implementation of the SWP3 must be made and retained as part of the SWP3. Major observations should include: The locations of discharges of sediment or other pollutants from the site; locations of BMPs that need to be maintained; locations of BMPs that failed to operate as designed or proved inadequate for a particular location; and locations where additional BMPs are needed.

Actions taken as a result of inspections must be described within, and retained as a part of the SWP3. Reports must identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the facility or site is in compliance with the SWP3 and the Construction General Permit. The report must be signed by the person and in the manner required by 30 TAC Section 305.128.

3.1.9 Non-Storm Water Discharges

Identify and implement appropriate pollution-prevention measures for any eligible non-storm water components of the discharge.

3.1.10 Numeric Effluent Limitations – Concrete Batch Plants

The Construction General Permit has numeric effluent limitations and monitoring and reporting requirements for concrete batch plants. (Refer to Part IV. of the Construction General Permit.)

3.2 Preparation of Storm Water Pollution Prevention Plan (SWP3)

The plan should be prepared in accordance with good engineering practice. Text and drawings should be clear, to scale, and in a readily viewable format, using standard symbols where applicable (see Section 4.0).

3.2.1 Collect Site Information

The first phase in preparing a SWP3 is collecting site information. The items listed below should be included with the site map. Offsite related support activities (e.g. borrow or fill sites, dedicated concrete plants or asphalt plants, material storage areas, etc.) must also be addressed in the SWP3. It may be necessary to provide multiple site maps to provide a complete description of the planned construction activities.

A. Site Map

A map of existing conditions at the site should be obtained. This map will be the starting point for the site map required by the SWP3. The map should be to scale and preferably topographic. The map should indicate the existing land use for the site as well as the location of surface waters which are located on or adjacent to the site. The scale of the map should allow important features such as drainage swales and control measures to be easily distinguished.

B. General Location Map

A general location map should be added to the site information requirements. Offsite sources such as dedicated asphalt or concrete plants should be identified and described on the map.

C. Soils Information

The type of soils present on the site should be determined based on information from the specific project site and not regional characteristics. The most accurate soils information is obtained by performing soil borings at the site. If soil borings data are unavailable, the NRCS (formerly the SCS) soils map can be used to determine the types of surface soils on the project site. Although limited to surface conditions, the NRCS soil surveys are excellent sources of information for surface soils or previously undisturbed areas. To determine soil erodibility, additional information on soil classification or textural analysis will be needed.

D. Runoff Water Quality

Data which may be available should be collected for information on the quality of the runoff from the site. In many cases, there will be little water quality data from runoff collected specifically from a site. However, sites located on, or next to, an existing industrial facility, or draining to a municipal separate storm sewer in a city or county with a population greater than 100,000, may have water quality data which indicate the quality of runoff from the site. Other sources of runoff water quality information are state and local watershed protection agencies.

E. Name of Receiving Water

The body of water which will receive runoff from the construction site should be identified. If the receiving water is a tributary, the name of the ultimate body of water should be identified, if possible. Receiving waters could include rivers, lakes, streams, creeks, estuaries, bayous, wetlands, bays, etc. If the site drains into a

Municipal Separate Storm Sewer System, identify the system and indicate the receiving waters to which the system discharges. This information is usually available from county, state, or USGS maps.

F. Rainfall Data

It is useful to determine the amount of anticipated rainfall in the design of storm water management measures. These rainfall amounts are often referred to as design storms. Design storms typically are described in terms of the average amount of time that elapses before that amount of rain falls again and by the duration of the rain (e.g., the 2-year, 24-hour storm).

3.2.2 Develop the Site Plan

The next step in the process is to develop a preliminary site plan for the facility which is to be constructed. The site plan will be based primarily on the goals and objectives of the proposed facility. However, the following pollution prevention principles should be considered when developing the site plan for the project:

- Disturb the smallest vegetated area possible.
- Keep the amount of cut and fill to a minimum.
- Avoid disturbing sensitive areas such as steep and/or unstable slopes, wetlands, areas with erodible soils, and critical habitats.

In addition to reducing pollution in storm water runoff from the site, incorporating the objectives listed above into the site plan can reduce construction costs for grading and landscaping, can reduce the amount of sediment and storm water management controls, and can improve aesthetics of the completed project.

Once the preliminary design is developed, a narrative description of the nature of the construction activity should be prepared and included in the SWP3. The narrative should provide a brief description of the project, including its purpose, the major soil-disturbing activities that will be necessary to complete the project, and the approximate length of time required to complete the project.

3.2.3 Prepare the Site Map

When the site plan is complete, the information should be transferred onto the pollution prevention plan site map. The construction site plan and the SWP3 site map can be the same map. At this phase in the SWP3 development, the following items should be indicated on the site map: the approximate slopes after grading, the drainage pattern, and the areas of disturbance. Appendix B includes example SWP3s with site maps.

A. Approximate Slopes after Grading

Revised grades should be indicated on the same topographic map as existing grades. Separate symbols should be used for existing and proposed contours. Topographic maps indicating existing and proposed contours for a site will facilitate a determination of the areas which will be disturbed by regrading. If it is not practical to prepare a topographic map of the site, then the approximate location, direction, and steepness of slopes should be indicated on the site map.

B. Areas of Soil Disturbance

After indicating the proposed grading on the site map, the next step is to indicate the entire area which will be disturbed by the construction activity. This may be represented by a limit of disturbance line on the site plan. The limit of disturbance should include the areas of activities such as clearing, excavation, backfill, stock piling, paving, etc. The limit of disturbance should be a closed boundary line around the entire disturbed area. There can be islands of undisturbed areas inside the limit of disturbance boundary line. If the entire project site area will be disturbed, this should be indicated with a note on the site map.

C. Drainage Patterns

In addition to the slopes anticipated after grading and the areas of soil disturbance, the SWP3 site map also should indicate drainage patterns of the site after major grading activities.

It is suggested that drainage patterns be shown on a topographic map of the site. Indicate drainage basin boundaries and drainage channels or pipes. A drainage basin for the purposes of the SWP3 is an area of the site in which water, sediments, and dissolved materials drain to a common outlet from the site. There can be one or more drainage basins on a site. Drainage boundaries can be changed by grading and structural controls. The site map should indicate the drainage boundaries after major grading has occurred and structural controls have been installed. If the site plan does not include contour lines, arrows should be used to indicate the direction of water flow. Show the location of sheet flow and of concentrated flow in channels and swales. Proposed storm sewer systems should be indicated on the SWP3 site map. Include the pipe diameters and slopes for the storm sewer systems.

The SWP3 site map is not complete until the locations of major control structures and the areas anticipated to be stabilized are shown. These are discussed in Section 3.2.7.

3.2.4 Measure the Site Area

The SWP3 should include estimates of the total site area and the area which will be disturbed. A site map which clearly indicates the site boundary and the limits of disturbance can be used to make this determination.

The total area of the site should include the area inside the project's property boundaries, easements, and rights-of-way. The total area includes both the disturbed and undisturbed areas. The area to be disturbed should be based on the area(s) enclosed by the limits of disturbance drawn on the site map.

3.2.5 Determine the Drainage Area(s)

The size of the drainage area(s) for each point where concentrated flow will leave the site should be determined. This information will be used in selecting and designing the erosion and sedimentation controls and the storm water management measures for the project.

For the design of erosion and sedimentation control measures, it is necessary to know the area or the portion of each drainage basin which will be disturbed. For calculations related to storm water runoff and the design of permanent storm water management controls (e.g., the calculation of the runoff coefficient), it is necessary to determine the

total area of each drainage basin and the areas of each land use in the basin after the construction is complete.

3.2.6 Discharges from the Site

The SWP3 must provide data describing the soil or the quality of any discharge from the site. One method of providing this data is to calculate the runoff coefficient. The runoff coefficient (“C” value) is the partial amount of the total rainfall which will become runoff. The less rainfall that infiltrates into the ground, evaporates, or is otherwise absorbed into the site, the higher the “C” value. The runoff coefficient “C” values in the rational method formula will vary based on the types of land use. For a construction site with a single land use type, “C” values may be obtained from Table A.1 in Appendix A. Alternatively, runoff coefficient “C” values in the rational method may also be calculated using equations provided in design manuals, such as the *City of Houston Department of Public Works and Engineering Infrastructure Design Manual*. For a construction site with multiple land use types a “weighted C” should be calculated. A formula for calculating a “weighted C” value is provided in Appendix A – Part 2.

3.2.7 Select Erosion and Sedimentation Controls

Erosion and sedimentation controls are implemented during the construction period to prevent and/or control the loss of soil from the construction site into the receiving waters.

Selection of the most appropriate erosion and sedimentation controls for a construction project depends on a number of factors, but is most dependent on site conditions. Information collected in the site evaluation, design, and assessment steps is used to select the controls. There are detailed descriptions of commonly used erosion and sedimentation control measures in Section 4.0.

Section 4.0 identifies where these practices apply and provides guidance for designing and using the best management practices. Practices other than those given may be proposed, subject to the review and approval of the applicable regulatory agency.

A. Stabilization practices are used to control erosion by preserving existing vegetation or revegetating disturbed soil. Appropriate practices include the following:

- Seeding
- Mulching
- Sod stabilization
- Vegetative buffer strips
- Protection of trees

B. Structural practices are used to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site.

1. Erosion control

Flow diversion protects disturbed areas from external flow. Appropriate practices include the following:

- Temporary diversion dikes and channels during construction

- Downspouts and discharge outlets extended to stabilized inlets or detention facilities

2. Sediment Control

Sediment trapping in overland and channelized flow removes sediment from discharge. Sediment controls operate by filtration or settling and should not be placed in natural channels or drainways. Appropriate practices include the following:

- Filter fabric fences
- Vegetative buffer strips
- Reinforced filter fabric barrier
- Sediment traps
- Sediment basins
- Bagged gravel barriers

Pumping of water to permit underground construction transports sediments through high-velocity discharge. Dewatering settling basins provide reduced velocities and allow adequate settling time. Appropriate practices include the following:

- Sediment tanks
- Sediment sump pits
- Dewatering bag

Vehicles departing construction sites transport sediments offsite on equipment tires and treads. Appropriate practices include the following:

- Temporary stabilized access roads and parking areas to reduce equipment/soil contact.
- Hosing tires and treads at designated wash areas before exiting a site. Collect discharge into sedimentation basins.
- Street sweeping and vacuuming to remove remaining soil tracked offsite.

3. Runoff Conveyance

Storm water conveyances can be improved or provided to reduce channel erosion during construction activities. Appropriate practices include the following:

- Permanent drainageways
- Sodding
- Grassed waterways
- Reinforced grassed waterways
- Ripraps
- Lined waterways

Inlets and other existing drainage facilities should be temporarily reinforced or augmented to handle concentrated discharges and increased silt. Appropriate practices include the following:

- Inlet protection barriers
- Inlet insert baskets

3.2.8 Select Permanent Storm Water Quality Management Controls

Permanent storm water management controls are constructed to prevent or control pollution of storm water after the construction is complete. Selection of these controls is beyond the scope of this handbook. The SWP3 must include a description of any 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.

As with erosion and sedimentation controls, the selection of the most appropriate storm water management measures is dependent upon a number of factors, but is most dependent on site conditions. Information collected in the site evaluation, design, and assessment steps is used to select controls.

3.2.9 Select Other Controls

There are several other controls which should be addressed in the SWP3. These include proper waste disposal; control of offsite vehicle tracking; control of pollutants from construction and waste materials storage on site; control of pollutants from other sources than construction, including dedicated asphalt plants and concrete plants; compliance with applicable federal, state and local waste disposal, sanitary sewer, or septic system regulations; and control of allowable non-storm water discharges.

The following source controls are addressed in Section 4.8 of this handbook.

A. General construction management

- Topsoiling
- Protection of trees
- Dust control
- Vehicle washing areas
- Demolition areas

B. Non-erosion controls

- Equipment maintenance and repairs
- Waste collection and disposal
- Storage of construction materials and chemicals
- Sanitary facilities
- Pesticides

3.2.10 Indicate Location of Controls on the Site Map

Pollution controls should be indicated on the site map. Provide the location of each measure used for erosion and sedimentation control, storm water management, and other

controls. For other items, such as the timing of the implementation of control measures and identification of the responsible permittee who will implement the measure, it may be more practical to provide such information in a separate specification, plan, or plan sheet document. It may not be feasible to indicate some controls on the site map. For example, it may be very difficult to indicate appropriate waste control or the exact location of temporary seeding and mulching on the site map.

Once controls are indicated on the site map, it may be necessary to revise the limit of disturbance and/or the drainage boundaries. The limit of disturbance should be indicated outside of any perimeter control because the construction of most controls requires some soil disturbance. Drainage boundaries often are impacted by diversion structures. This is because the intent of a diversion device typically is to divert runoff from one drainage area to another. The drainage patterns on the site map should reflect the drainage patterns on the site while the controls are in place.

After the locations of the controls are indicated, the site map is ready to be included in the SWP3.

3.2.11 Prepare the Inspection and Maintenance Plan

Once the SWP3 is put into effect, the operator(s) will be responsible for inspecting and maintaining the controls that have been proposed to prevent and control pollution of storm water on the construction site. Qualified personnel must inspect disturbed areas of the facility at least once every fourteen (14) calendar days and within 24 hours of the end of a storm that is 0.5 inch or greater; or at a minimum of once every seven (7) calendar days. Where sites have received final or temporary stabilization, such inspections should be conducted at least once every month.

It is important to plan for the inspection and maintenance of vegetation, erosion, and sedimentation control measures and other protective measures which are a part of the plan. These controls must be in good working condition until the construction project is complete and disturbed soil areas are stabilized.

It is recommended that an inspection and maintenance checklist which addresses each of the control measures proposed for the project be developed. A blank checklist for the project could be included in the SWP3 prior to starting construction. The inspector could complete a copy of the blank checklist during each inspection. The inspection and maintenance checklist should be prepared based on requirements for each individual measure. For example, sediment should be removed from a sediment trap when it has filled to one-half of its depth. Consult Section 4.0 for maintenance requirements for control measures. Appendix B contains blank inspection and maintenance forms. Consult the Construction General Permit requirements for specific inspection reporting and other requirements.

3.2.12 Prepare Plan To Address Non-Storm Water Discharges

Except for flows from fire-fighting activities, sources of non-storm water listed in Part II.A.3 of the Construction General Permit that are combined with storm water discharges must be identified in the SWP3. The SWP3 should identify and assure implementation of appropriate pollution prevention measures for the non-storm water components of the discharge. (Refer to Part II.A.3 for authorized non-storm water discharges.)

3.2.13 Coordinate Controls with Construction Activity

Once the planning of construction activities has been completed and the controls have been selected, a list should be made of each type of control to be used on the site. This list should include a description of each control, its purpose, and why it is appropriate for this location.

Prepare a sequence of major activities. List all tasks required for construction of control measures, earth disturbing construction activities, and maintenance activities for control measures in the order in which they will occur. Specific timing requirements for installation and maintenance of control measures are dependent upon the measures and/or the construction activities. Refer to Section 4.0 for specific timing information on the site controls. There are, however, general principles of construction planning to follow when developing the sequence of major construction activities. These principles include the following:

- Downstream and sideslope perimeter controls should be installed before the land-disturbing activity occurs.
- Do not disturb an area until it is necessary for construction to proceed.
- Do not remove temporary perimeter controls until after all upstream areas are stabilized.

3.2.14 Obtain Local Approval

Local storm water management program requirements for construction activities have been implemented in the City of Houston and Harris County. Construction operations are subject to local storm water management requirements in addition to any requirements in the site's TPDES storm water permit. Local requirements for construction activities identified in the City of Houston ordinances and Harris County Regulations should be reviewed for specific projects.

State and local regulations are in place that require the SWP3 to be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in erosion and sedimentation control site plans or site permits, or storm water management site plans or site permits approved by state and local officials.

3.2.15 Plan Signatures

The SWP3 should be reviewed by the operators (both owners of the property and contractors may meet the TCEQ's definition of operator) so that they understand what is being proposed. The SWP3 should be included with, or referenced by, the project bid documents so that the operator understands what is being proposed. A preconstruction conference with the owner and the contractor is recommended to coordinate implementation of the SWP3.

In order to assure that the site SWP3 is developed completely and implemented adequately, the Construction General Permit requires that the operator or authorized representative sign the plan.

Each operator must also sign an NOI. The NOI includes a certification. In signing the NOI certification, the owner certifies that the information is true, accurate and complete and will comply with the terms of the Construction General Permit. Official signatures provide a basis for an enforcement action to be taken against the person signing the

document. As stated in the certification, the permittee should be aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Specific signatory requirements for the SWP3 and other reports are provided in the Construction General Permit. Though not required, it is recommended that a copy of the NOI be included in the SWP3.

3.2.16 Construction General Permit Process Example Flow Charts For Residential Development

Example procedures for developing an SWP3 for residential development and obtaining coverage under the Construction General Permit are shown in Figures 3.1 and 3.2. These flow charts are meant to be illustrative of the general process and do not cover all requirements or details for a specific construction project. With adaptation, these flow charts may be applied to other types of development, such as a public works projects, road construction, or portions thereof, as well as specific contractual arrangements among the owner, general contractor, and subcontractors.

Figure 3.1 shows the permitting process for construction of a residential subdivision for a developer. Figure 3.2 shows the permitting process for a residential subdivision for a contractor or builder. Note that these charts are guides only and the developer and contractor are responsible for reviewing and studying the Construction General Permit for a thorough understanding of the requirements.

Note that the flow charts are based on the Construction General Permit.

Major steps in the Example Construction Permit Flow Chart for Residential Subdivision – Developer (Figure 3.1) include the following:

- A. Determine site size. Note: site size includes not only the area of one tax lot, but those sites or common plans of development or sale that will be disturbed.
- B. Develop a Storm Water Pollution Prevention Plan (SWP3): This process is explained throughout Section 3. Example SWP3s are available in Appendix B.
- C. For sites of 5 acres or greater, complete a Notice of Intent (NOI) Form and submit the NOI to TCEQ and the local MS4 operator, as required. See process described in Section 3.3. Example NOIs are available in Appendix B. For small sites (1 to <5 acres) complete a Construction Site Notice and submit the Construction Site Notice to the MS4 operator. Copies of NOIs and Construction Site Notices must be posted at the site.

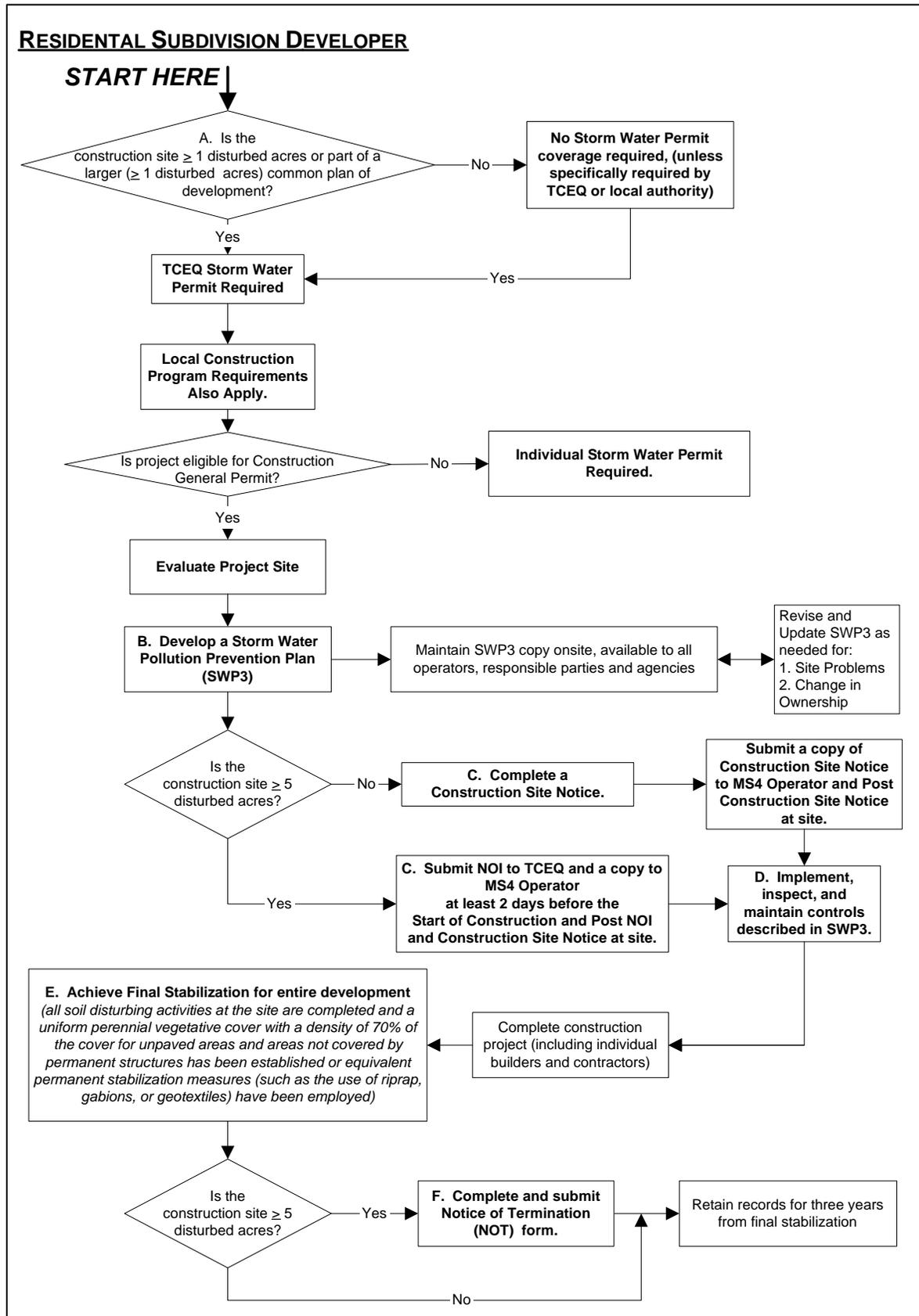
(Note: If the operator failed to submit any relevant facts, or submitted incorrect information in an NOI, the correct information must be provided in a Notice of Change letter (NOC) within 14 days after discovery. A copy of the NOC must be provided to the operator of any MS4 receiving the discharge.)

- D. Implement, inspect, and maintain controls described in SWP3.
- E. Following completion of the construction project, the non-stabilized areas must be stabilized. Final stabilization measures include either a uniform perennial vegetative cover that has a density of 70% of the native background vegetation on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles). Records must be kept by the permittee for 3 years following final stabilization.

F. At completion of construction, the current owner must complete a NOT form, as explained in Section 3.6.

(Note: If there is a change in ownership, the previous or current owner must complete a Notice of Termination (NOT) form and the new owner must complete a new Notice of Intent form.)

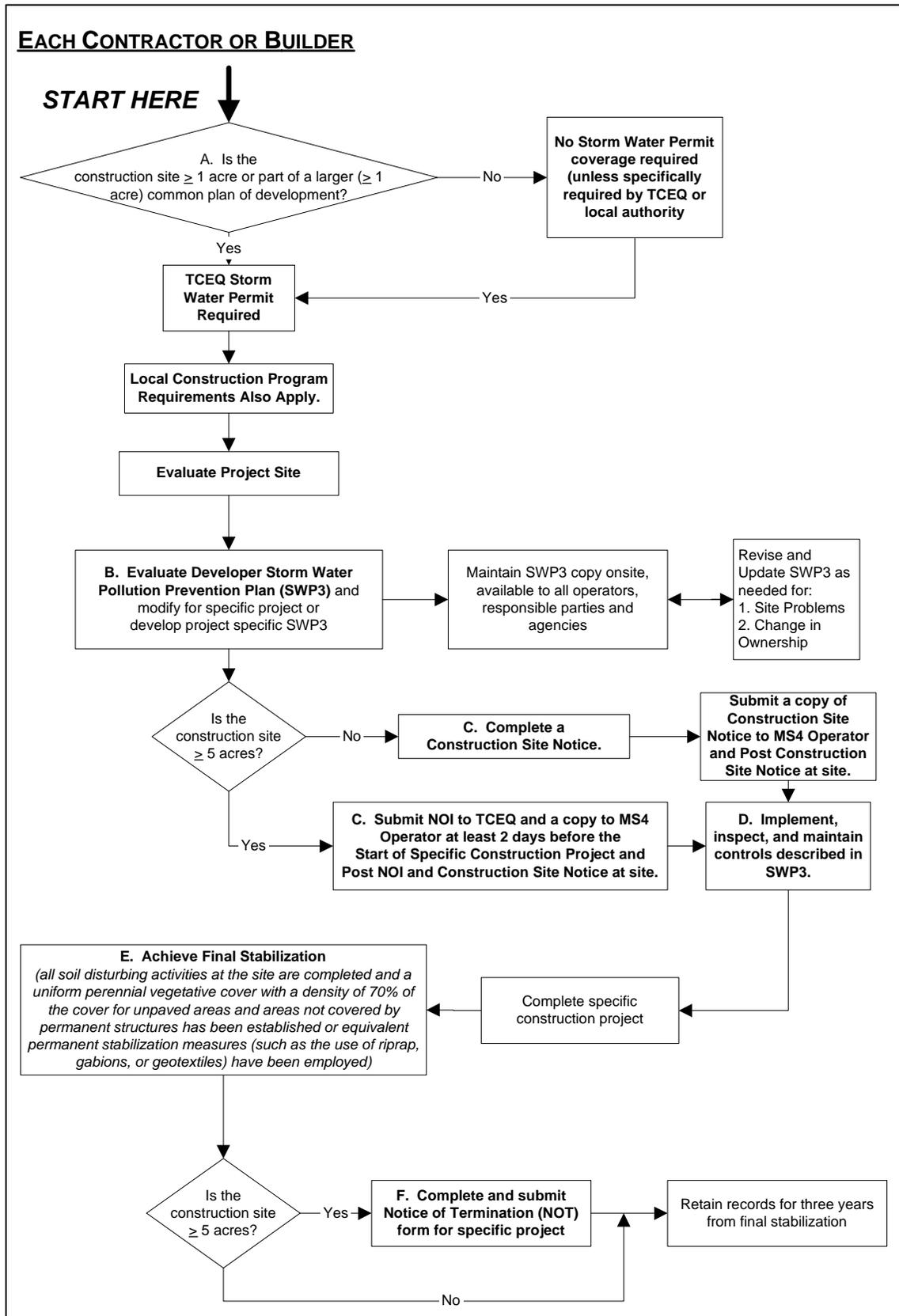
**FIGURE 3.1
CONSTRUCTION PERMIT EXAMPLE FLOW CHART
FOR RESIDENTIAL DEVELOPMENT - DEVELOPER**



Major steps in the Example Construction Permit Flow Chart for Residential Subdivision – Builder (Figure 3.2) include:

- A. Determine site size. Note: site size includes not only the area of one tax lot, but those sites or common plans of development or sale that will be disturbed.
- B. Evaluate the developer's SWP3 and modify as required to fit the project.
- C. Complete a Notice of Intent (NOI) Form: See process described in Section 3.3. Example NOIs are available in Appendix B. A copy of the NOI and site notice must be posted at the site.
- D. Implement, inspect, and maintain controls described in SWP3.
- E. Following completion of the construction project, the non-stabilized areas must be stabilized. Final stabilization measures include either a uniform perennial vegetative cover that has a density of 70% of the native background vegetation on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles). Records must be kept for 3 years following final stabilization.
- F. Complete a Notice of Termination (NOT) form for the specific project, as described in Section 3.7.

**FIGURE 3.2
CONSTRUCTION PERMIT EXAMPLE FLOW CHART
FOR RESIDENTIAL DEVELOPMENT - BUILDER**



3.3 Notice Of Intent (NOI) and Construction Site Notice

3.3.1 Notice of Intent (NOI)

If a large construction site project is to be covered under the Construction General Permit, an NOI must be submitted to the TCEQ and the operator of the MS4 receiving the discharges at least two (2) days prior to commencement of construction. However, it should be noted that the NOI cannot be submitted until the SWP3 has been prepared and implemented. The example SWP3s included in Appendix B includes NOIs for illustrative purposes.

The NOI must be submitted by the operator(s) of the project site. The operator is the legal entity with day-to-day operational control at the time of the NOI submittal. When there are multiple operators at the time of the initial NOI submittal, a NOI may be submitted for each operator. Multiple NOIs may be attached and submitted in the same envelope. As mentioned above, an owner and a contractor may both be operators of a construction site at the same time. In that case, each should submit a NOI. A new NOI must be submitted if a new operator is selected after submittal of the original NOI(s).

3.3.2 Construction Site Notice

For small construction sites, a Construction Site Notice is required. A copy of the notice must be submitted to the operator of the MS4 receiving the discharge at least two days prior to commencing the activity. A copy of the notice must also be posted at the site prior to commencing activities and maintained until completion of the construction activity. For large construction sites, the construction site notice information must be posted at the site along with a copy of the NOI.

3.4 Plan Review and Making Plans Available

3.4.1 Submittal Requirements/Plan Location

The Construction General Permit does not require that the SWP3 be submitted to the state for review. Local regulations may require the submittal of the SWP3 to the local permitting authority.

The permittee is required to keep the SWP3 at the construction site from the date of project initiation to the date of final stabilization. The SWP3 must be readily available at the time of an on-site inspection to federal, state, and local agency officials and the operator of the MS4 receiving discharges from the site. The permittee also is required to retain copies of the SWP3 and all reports required by the permit for a period of at least three years from the date the site is finally stabilized.

3.4.2 Posted Notices and Public Access

A copy of the NOI or the Construction Site Notice must be posted near the main entrance of the construction site. Sample NOI and Construction Site Notice forms for large and small construction sites are provided in Appendix D.

The NOI posted at the site must be readily available for viewing by the general public, local, state and federal authorities. The Construction General Permit does not provide the general public with any right to trespass on a construction site for any reason, including inspection of a site; nor does the permit require permittees to allow the general public access to a construction site.

3.5 Implementation of the Storm Water Pollution Prevention Plan (SWP3)

3.5.1 Implement Controls

The contractor may not perform clearing and grubbing or rough cutting before installing the required erosion and sediment control systems.

The erosion and sediment control measures and practices should be installed, maintained, and inspected in general accordance with the standard specifications included in Appendix C and in the order specified in the SWP3.

Equipment and vehicles should be prohibited from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damage caused by construction traffic to erosion and sediment control systems must be repaired immediately upon discovery.

Best Management Practices for flow diversion, management of overland flow, sediment trapping in channel flow and during site dewatering, stabilization practices, inlets protection, tracking prevention, and other source controls on construction sites are discussed in detail in Section 4.0 of this manual.

3.5.2 Inspect and Maintain Controls

Inspection and maintenance of the control measures are as important to pollution prevention as are proper planning and design. Inspection should be performed at the frequency specified in the SWP3. The inspector should note in an inspection report any damage or deficiencies in the control measures. The operator should correct damage or deficiencies as soon as practicable after the inspection, and any changes that may be required to correct deficiencies in the SWP3 should be made within 24 hours of the inspection or as soon as practicable.

The frequencies of required sediment removal from erosion and sedimentation controls depend on the types of controls used. The standard specifications included in Appendix C indicate the maintenance requirements for each control. Generally, the following rules apply:

- A. Sediment should be removed from behind the filter fabric fences, reinforced filter fabric barriers, hay bales, brush berms, and other fencing controls when it becomes about 1/3 the height of the device.
- B. Sediment should be removed from sediment traps or basin when storage capacity has been reduced by 50 percent.
- C. Sediment in the storm sewer inlets should be removed immediately or as soon as practicable.

The qualified person or persons designated to perform periodic inspections on the controls should:

- A. Make sure that the erosion and sediment control measures identified in the plan are installed and operated correctly and that they are effective in preventing significant impacts to receiving waters;
- B. Prevent runoff from disturbed areas and areas used for storage of materials that are exposed to precipitation from entering the drainage system; and

C. Prevent off-site sediment tracking from vehicles entering or exiting the site.

The inspection should be conducted once every 14 calendar days and within 24 hours after a storm of 0.5 inch or greater; or at a minimum of once every seven (7) calendar days. After the portion of the site is finally or temporarily stabilized, inspection should be conducted at least once every month.

Based on the results of the inspection, the site description and erosion and sediment control descriptions should be revised, as appropriate, within 7 calendar days following the inspection.

A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3, and actions taken should be made and retained as part of the SWP3 for at least 3 years from the date the site is finally stabilized. The report should be signed in accordance with Part III.F.8.d of the TPDES Construction General Permit.

3.5.3 Changing the Plan

In order for a construction activity to be in full compliance with its TPDES storm water permit, and in order for the SWP3 to be effective, the plan must be consistent with permit conditions, and the plan must reflect site features and operations accurately. Should either of these conditions not be satisfied by the plan, the plan should be changed.

The SWP3 is developed based on site-specific features and functions. Where there are changes in design, construction, operation, or maintenance, and those changes should have a significant effect on the potential for discharging pollutants in storm water at a site, the SWP3 should be modified by the permittee to reflect the changes and new conditions. For example, a change in the construction schedule or design specifications should be incorporated in the SWP3. Another situation in which the plan should be modified is where the plan proves to be ineffective in controlling pollutants. This determination could be made based on results of regular visual inspections.

3.5.4 Releases of Reportable Quantities

Because construction activities may involve the use of certain hazardous substances over the course of the project, spills of these substances in amounts that equal or exceed reportable quantity (RQ) levels are possible. The SWP3 should include a description of potential spill areas and specific procedures to prevent spills, and to respond to and clean up spills in the event they occur.

The following good housekeeping practices should be followed on-site during construction to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff:

Good Housekeeping Practices

- A. Store only enough product required to do the job.
- B. Store all materials stored on-site in a neat, orderly manner in the appropriate containers and, if possible, under a roof or other enclosure.
- C. Keep products in their original containers with the original manufacturer's label.
- D. Do not mix substances with one another unless recommended by the manufacturer.

- E. Whenever possible, use all of a product before disposing of the container.
- F. Follow manufacturers' recommendations for proper use and disposal of materials.
- G. The site superintendent should inspect the site daily to ensure proper use and disposal of materials.
- H. Clean up all spills, regardless of size, expeditiously and in accordance with federal, state and local rules and regulations.
- I. Immediately report spills that qualify as a reportable quantity to the state of Texas and the EPA.
- J. Dispose of all materials used to clean-up spills of fuels, lubricants, solvents, fertilizers, herbicides, and other related items in an appropriate manner.
- K. Designate separate areas to be used for equipment fueling, maintenance, and lubrication. Provide containment (such as berms) for these areas to prevent the flow of fuel and maintenance fluids into storm water.
- L. Keep on-site storage of raw or bulk material to a minimum. Provide containment measures (such as a filter fabric fence) for bulk materials.

3.6 Notice of Termination (NOT)

Submitting the NOT is typically the final task of a TPDES storm water permit for a construction activity. The NOT communicates to the permit enforcement agency that the construction activity has ceased, and the area is stabilized. The submittal of an NOT is required under the Construction General Permit for each operator that has submitted an NOI for permit coverage. Prior to submittal of the NOT, all disturbed soils at the site must be finally stabilized and all temporary erosion and sediment control measures must be removed or will be removed at the appropriate time, or all storm water discharges have been eliminated. The term final stabilization means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the native vegetation has been established for unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. An NOT must also be submitted within thirty (30) days after another operator has assumed control over areas that have not been finally stabilized.

3.7 Performance Requirement

The regulatory agency may require a performance bond or similar guarantee to assure implementation of erosion and sedimentation controls in accordance with the approved plan. If required, the performance guarantee should be released only upon satisfactory final inspection, including stabilization of permanent vegetation.

BEST MANAGEMENT PRACTICES

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4.0 BEST MANAGEMENT PRACTICES (BMPs)

Purpose

The purposes of this section are to:

- Describe BMPs to control pollutants on construction sites.
- Identify where the BMPs apply.
- Provide guidance on designing and implementing the BMPs.

This section primarily addresses temporary BMPs designed to control pollutants during construction. These temporary measures are generally removed from the site when they are no longer needed. In some situations, these BMPs may remain in place for years after the construction or land disturbance has ended. Additional requirements for these applications may apply.

This section is intended to provide general guidance only. Designers should use the appropriate criteria of the applicable agency and consider site-specific conditions when designing BMPs for construction projects. For example, note that side slopes of 2:1 or flatter are shown for structural controls in this handbook. Generally, BMP structural designs should include side slopes of 3:1. Side slopes of 2:1 may be acceptable for temporary structures where velocities are limited to five (5) feet per second.

This chapter includes descriptions and discussions of individual BMPs for the following:

- *Diverting flow* (Section 4.1)
- *Managing overland flow* (Section 4.2)
- *Trapping sediment in channelized flow* (Section 4.3)
- *Establishing permanent drainageways* (Section 4.4)
- *Protecting inlets* (Section 4.5)
- *Trapping sediment during site dewatering* (Section 4.6)
- *Preventing tracking* (Section 4.7)
- *Other source controls on construction projects* (Section 4.8)

For quick reference, the applications and standard symbols for BMPs presented in this section are summarized in the following table.

Limitations

This section is intended to provide general guidance in managing storm water discharges from construction sites. Technical and guidance data included have come from a number of sources. (See Appendix E.) Careful consideration must be given to selecting the most appropriate control measures based on site-specific features. Additional information from professionals, agencies, organizations, and institutions with expertise in a particular area may be required in selecting, designing, and installing the BMPs.

SUMMARY OF BEST MANAGEMENT PRACTICES (BMPs)
FOR CONSTRUCTION ACTIVITIES

BMPs	APPLICATION	SYMBOL
4.1 DIVERTING FLOW		
4111 Diversion Dike	Diverting overland flow to a stabilized outlet or sediment-trapping device.	→ (DD) →
4112 Interceptor Dike		→ (ID) →
4113 Diversion Swale		→ (DS) →
4114 Interceptor Swale		→ (IS) →
4115 Diversion Dike and Swale		→ (DDS) →
4121 Downspout Extender	Prevents water discharged from a building's downspouts from eroding disturbed areas.	→ (DE) →
4131 Pipe Slope Drain	Conveys concentrated surface runoff safely down slopes without causing erosion.	→ (PSD) →
4141 Paved Flume	Conveys concentrated surface runoff safely down slopes without causing erosion. Can be left in place permanently for final stabilization of the site.	→ (PF) →
4151 Level Spreader	Releases concentrated runoff from dike or swale evenly as sheet flow over a stabilized area.	→ (LS) →
4.2 MANAGING OVERLAND FLOW		
4211 Filter Fabric Fence	Intercepts and detains small amounts of sediment from disturbed areas. Decreases the velocity of sheet flow.	× (FF) ×
4212 Triangular Filter Fence	Intercepts and detains small amounts of sediment from disturbed areas. Decreases the velocity of sheet flow.	× (TFF) ×
4221 Hay Bale Fence	Intercepts and detains small amounts of sediment from disturbed areas. Decreases the velocity of sheet flow.	× (HBF) ×
4231 Brush Berm	Intercepts and detains small amounts of sediment from disturbed areas. Decreases the velocity of sheet flow.	× (BB) ×
4241 Seeding with Mulching	Stabilizes disturbed areas to minimize erosion. Decreases the velocity of sheet flow	[SM]

BMPs	APPLICATION	SYMBOL
4251 Vegetated Sediment Filter Strips	Reduces storm water runoff velocity as it passes through the vegetated strip, filters sediment and coarse debris.	
4.3 TRAPPING SEDIMENT IN CHANNELIZED FLOW		
4311 Reinforced Filter Fabric Barrier	Sediment barrier used in areas of concentrated flow.	
4321 Stone Outlet Sediment Trap	Intercepts sediment-laden concentrated runoff and traps the sediment to protect drainageways, downstream properties and rights-of-way.	
4322 Excavated Earth Outlet Sediment Trap		
4323 Embankment Earth Outlet Sediment Trap		
4331 Sediment Basin with Pipe Outlet	Intercepts sediment-laden runoff in a waterway to reduce the amount of sediment leaving the disturbed area to protect drainage ways, properties, and rights-of-way below the sediment basin.	
4332 Sediment Basin with Stone Outlet		
4312 Sandbags	Intercepts sediment-laden storm water runoff from disturbed areas, detains sediment, and releases water as sheet flow.	
4351 Bagged Gravel Barrier	Intercepts and filters sediment-laden storm water runoff from disturbed areas, detains sediment, and releases water as sheet flow.	
4.4 ESTABLISHING PERMANENT DRAINAGEWAYS		
4421 Sodding	Stabilizes disturbed areas to minimize erosion. Decreases the velocity of sheet flow. Protects drainageway channels from erosion.	
4451 Riprap	Protects soil surfaces from erosion at outlets for storm sewers, swales and dikes, drop structures and channel side slopes.	
4.5 PROTECTING INLETS		
4511 Inlet Protection Barriers	Placed around storm sewer inlets to prevent sediment from entering conveyance system.	
4521 Drop Inlet Insert Baskets	Placed within storm sewer inlet to prevent sediment from entering conveyance system.	
4531 Storm Inlet Sediment Trap	Collects sediment around a curb inlet or yard drain to prevent sediment from entering conveyance system.	

BMPs	APPLICATION	SYMBOL
4.6 TRAPPING SEDIMENT DURING SITE DEWATERING		
4611 Dewatering Settling Basin	Detains discharge pumped from excavated areas to allow the sediment to settle out.	
4621 Portable Sediment Tank	Detains discharge pumped from excavated areas to allow the sediment to settle out.	
4631 Sediment Sump Pit	Traps and filters sediment from water pumped from excavated areas.	
4641 Dewatering Bag	Filters and collects sediment from water pumped into the bag which seeps through the bottom and sides of the bag.	
4.7 PREVENT TRACKING		
4711 Stabilized Construction Access	Reduces the amount of sediment transported into public roads.	
4721 Street Cleaning	Reduces sediment tracked onto roadways from construction site.	
4.8 OTHER SOURCE CONTROLS ON CONSTRUCTION PROJECTS		
4821 Temporary Vehicle and Equipment Fueling Area	Contain accidental spilling of fuel, allowing for the clean up of spill once it happens and to prevent spilled fuel from running into unprotected area	

4.1 BEST MANAGEMENT PRACTICES FOR DIVERTING FLOW

Concentrated or sheet runoff flow to a disturbed area greatly increases the amount of erosion of the disturbed area and the amount of sediment carried in runoff from the disturbed area. Diverting the runoff around the disturbed area generally is an effective best management practice when the disturbed area cannot be stabilized immediately. Diverting runoff from the disturbed area also increases the practicability of controlling the pollutants from the disturbed area.

It is recommended that:

- **Channelized runoff** from adjacent areas passing through the site should be diverted around disturbed areas whenever practicable.
- **Sheetflow runoff** from adjacent areas of more than 10,000 square feet should be diverted around disturbed areas, unless the disturbed area has less than 0.2% slope.
- **Diverted runoff** should be conveyed in a manner that will not erode the conveyance and receiving channels.

Diversions may be *temporary or permanent BMPs* and include the following:

- *Dikes and swales* (Section 4.1.1)
- *Down spout extender* (Section 4.1.2)
- *Pipe slope drain* (Section 4.1.3)
- *Paved flume* (Section 4.1.4)
- *Level spreader* (Section 4.1.5)

4.1.1 Dikes and Swales

A. Definition

A **dike** is a temporary ridge of compacted soil located either (1) immediately above cut or fill slope (2) across disturbed areas or rights-of-way or (3) along the perimeter of the site or disturbed areas.

A **swale** is a temporary excavated drainage way located across disturbed areas or right of way or along the perimeter of the construction site.

B. Purpose

Diversion dikes and swales divert runoff around disturbed areas to a stabilized outlet where the water can be discharged without adversely impacting the receiving area or channel. Diversion dikes and swales can also be used along the perimeter of the site or disturbed area to carry sediment laden runoff to a sediment trapping facility.

Interceptor dikes and swales are used to shorten the length of exposed slopes by intercepting runoff and diverting it to a stabilized outlet.

C. Conditions Where Practice Applies

1. Upslope of disturbed areas where erosion is likely to occur.
2. Upslope of soil piles.
3. To direct runoff from an area to a stabilized outlet, sediment trap, or sediment basin.

D. Planning Considerations

If the dike or swale is going to remain in place for longer than 14 days, it should be stabilized with temporary or permanent vegetation. The slope behind the dike or swale also is an important consideration. The dike or swale must have a positive grade to assure drainage, but if the slope is too steep, precautions must be taken to prevent erosion due to high flow velocity.

This practice is considered an economical one because it uses material available on the site and usually can be constructed with equipment used for site grading. The useful life of the practice can be extended by stabilizing the dike or swale with vegetation.

Permanent diversion dikes and swales should be planned as part of the initial site development. Design of a permanent diversion requires assessment of potential hazards in the event of failure and should be designed in accordance with existing regulatory agency design criteria. The dike or swale should be designed so as to avoid ponding and to avoid directing flows upon adjacent property.

E. Design Criteria and Requirements

Timing Diversions and outlets shall be constructed and stabilized prior to disturbing the project area.

Capacity The capacity of a permanent dike or swale should be designed in accordance with existing regulatory agency design criteria. The capacity of a temporary dike or swale shall be designed to carry the peak runoff from at least a 2-year, 24-hour frequency storm with a freeboard not less than 0.3 feet. The drainage area of a temporary dike or swale shall not exceed five (5) acres.

Cross Section: Dikes

Top width: 2 feet minimum
Height: 18 inches minimum measured vertically from upslope toe or bottom of swale
Side slopes: 2:1 or flatter

Cross Section: Swales

Bottom width: 4 feet minimum; the bottom shall be level
Depth: 1 foot minimum
Side slope: 2:1 or flatter

Grade and Velocity

The channel grades may be uniform or variable. Channel velocity should be non-erosive and may not exceed permissible velocities shown in the table below. Flow behind dikes should be limited to grades between 0.05 and 1.00 percent.

Permissible Velocities for Diversion Swales (in feet per second)

Soil Texture	Channel Vegetation			
	Bare	Poor	Fair	Good
Sand, silt, sandy loam, and silty loam	1.5	1.5	2.0	3.0
Silty clay, loam, and sandy clay loam	2.0	2.5	3.0	4.0
Clay	2.5	3.0	4.0	5.0

Spacing for Interceptor Dikes and Swales

Slope of Disturbed Area Above Interceptor	<3%	3-5%	5-10%	>10%
Maximum Distance Between Interceptors	500 ft	300 ft	200 ft	100 ft

Outlets Each diversion or interceptor dike and swale should have an adequate outlet capable of conveying runoff to a location where the discharge will not cause adverse impacts. The design elevation of the water surface in the dike or swale may not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Stabilization

The permanent dike side slopes, ridge, and the downslope side of the berm shall be stabilized either by sodding or seeding and mulching within 14 days of final grading.

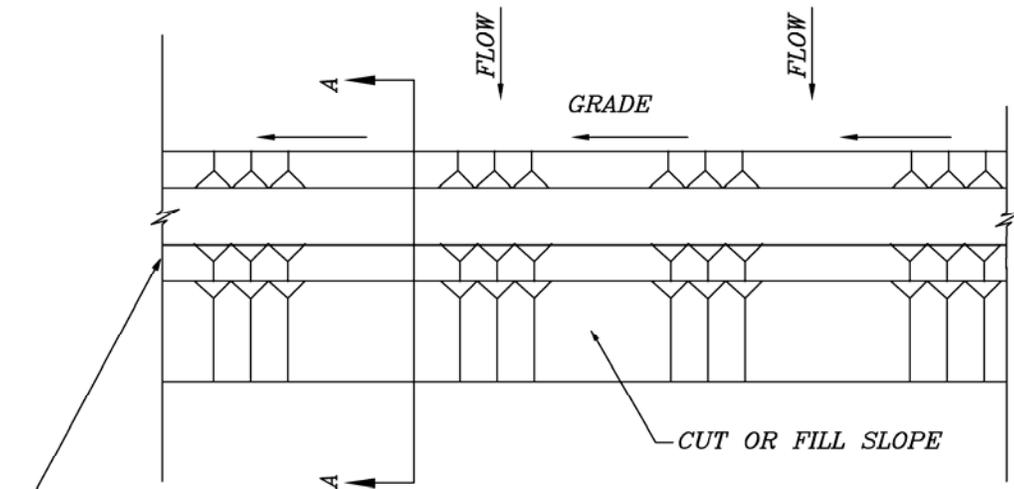
F. Inspection and Maintenance

Dikes and swales shall be inspected within 24 hours after each rainfall and daily during periods of prolonged rainfall until the vegetative cover is stabilized. Thereafter, dikes and swales should be inspected, at least once every 14 calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repairs shall be made immediately. The life expectancy of temporary diversion dikes and swales is 18 months.

G. Corresponding Technical Specifications (Refer to Appendix C)

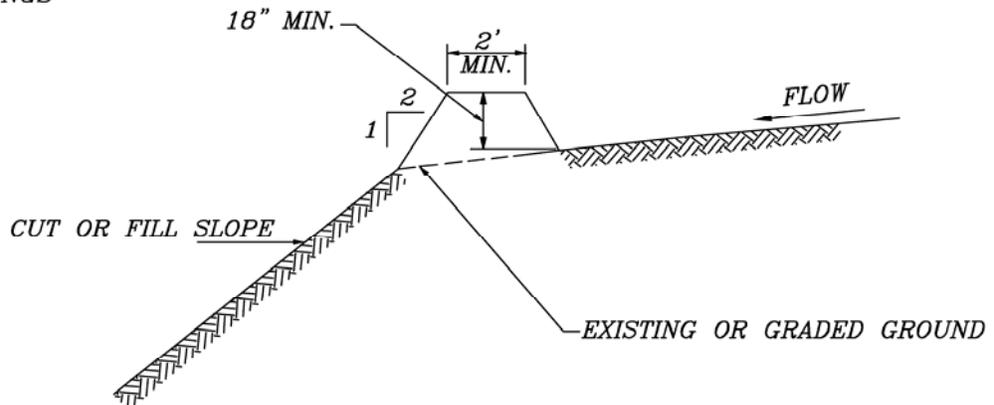
Item No. 4111	Diversion Dikes
Item No. 4112	Interceptor Dikes
Item No. 4113	Diversion Swales
Item No. 4114	Interceptor Swales
Item No. 4115	Diversion Dikes and Swales

DIVERSION DIKE



DISCHARGE ONTO STABILIZED
OUTLET, SEDIMENT TRAPPING
DEVICE OR LEVEL SPREADER
AS SHOWN ON CONSTRUCTION
DRAWINGS

PLAN



SECTION A-A

Not to Scale

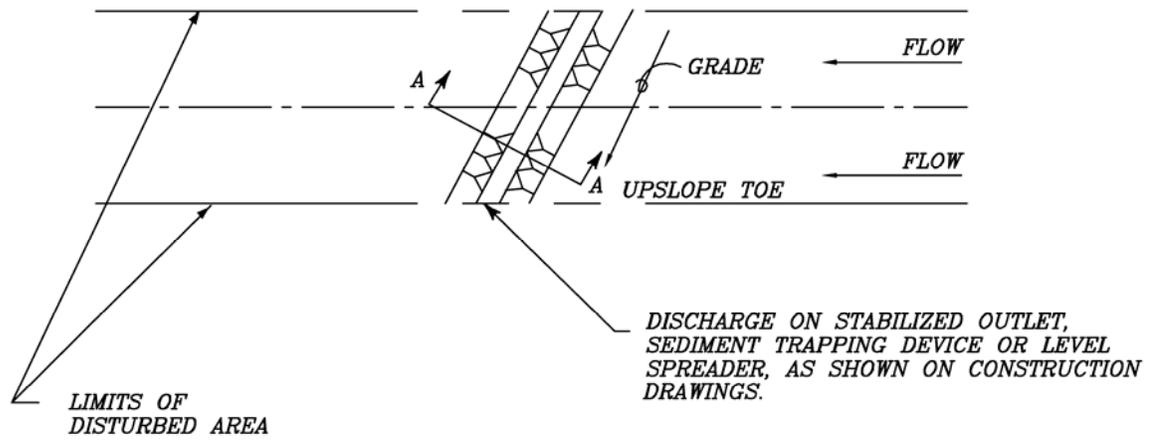
General Notes:

1. Material – Machine compacted soil.
2. Height – 18 inches minimum, measured from the existing or graded ground at the upslope toe to the top of the dike.
3. Side Slopes – 2:1 or flatter.
4. Grade – As shown on the construction drawings, if not shown, provide positive drainage to point of discharge.

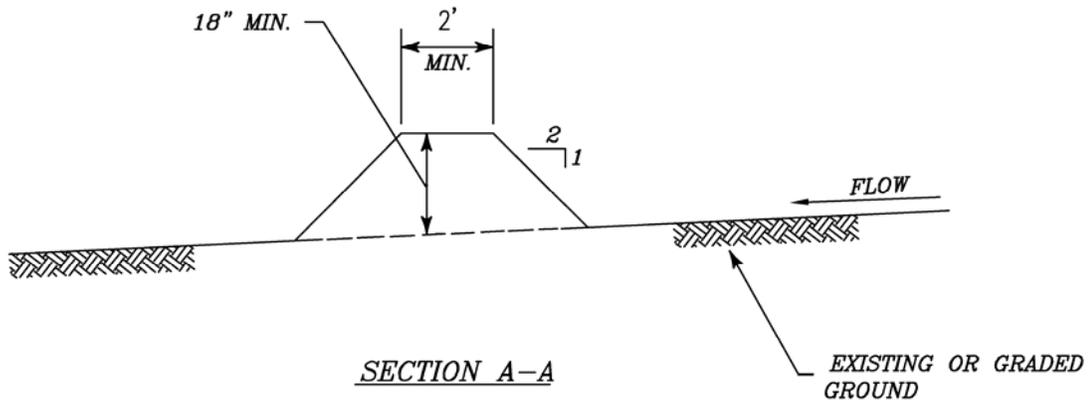


FIGURE 4.1-1
BMP 4111
DIVERSION DIKE

INTERCEPTOR DIKE



PLAN



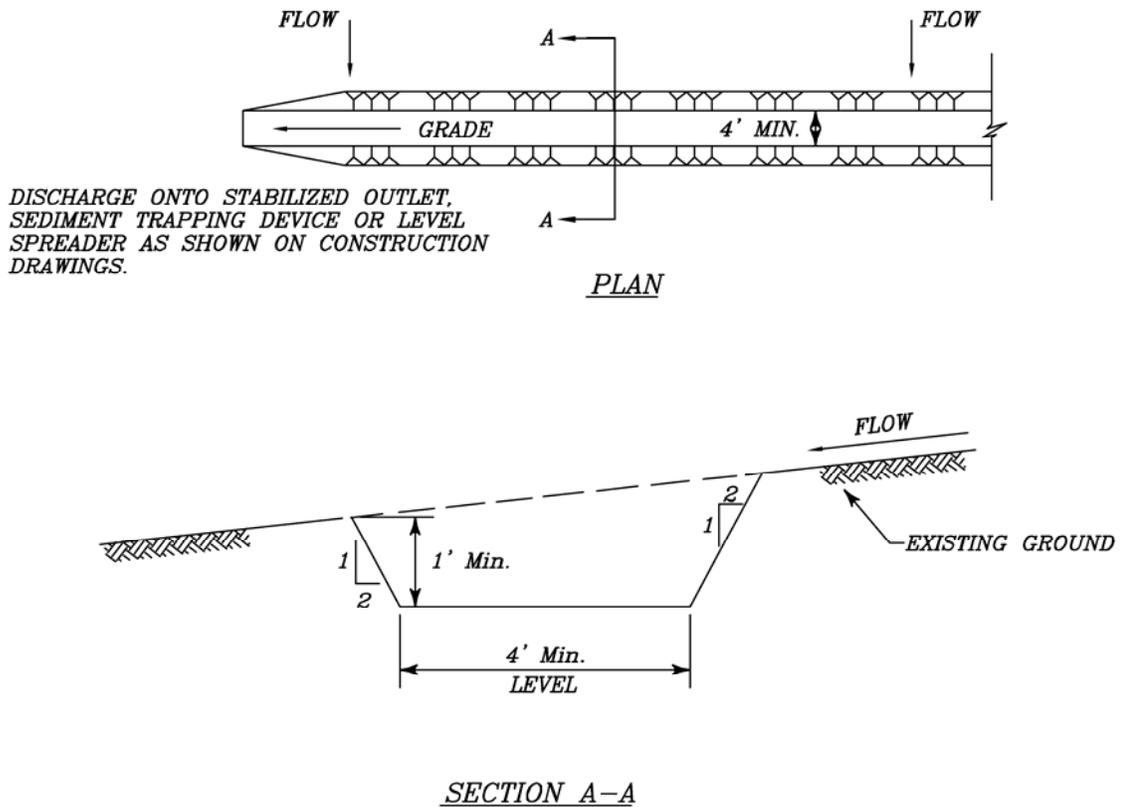
Not to Scale

General Notes:

1. Material – Machine compacted soil.
2. Height – 18 inches minimum, measured from the existing or graded ground at the upslope toe to the top of the dike.
3. Side Slopes – 2:1 or flatter.
4. Grade – As shown on the construction drawings, if not shown, provide positive drainage to point of discharge.

FIGURE 4.1-2
BMP 4112
INTERCEPTOR DIKE

DIVERSION SWALE



DISCHARGE ONTO STABILIZED OUTLET,
SEDIMENT TRAPPING DEVICE OR LEVEL
SPREADER AS SHOWN ON CONSTRUCTION
DRAWINGS.

Not to Scale

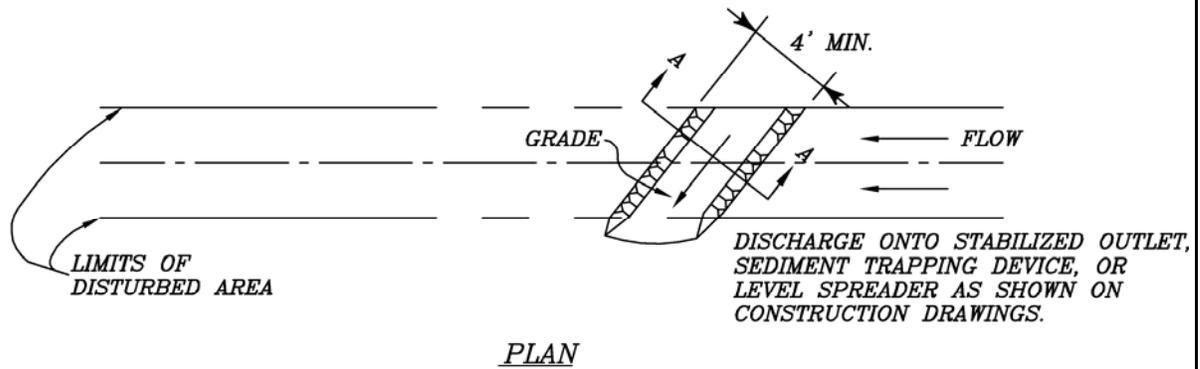
General Notes:

1. Bottom Width – 4 feet minimum, constructed level.
2. Depth – 1 foot minimum.
3. Side Slopes – 2:1 or flatter.
4. Grade – As shown on the construction drawings, if not shown, provide positive drainage to point of discharge.

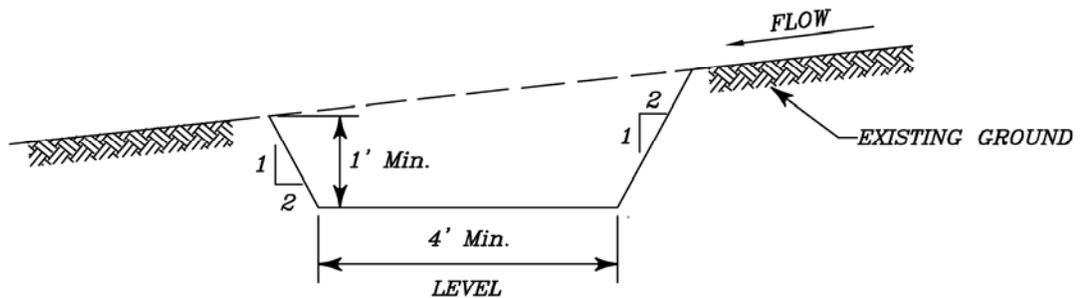


FIGURE 4.1-3
BMP 4113
DIVERSION SWALE

INTERCEPTOR SWALE



PLAN



SECTION A-A

Not to Scale

General Notes:

1. Bottom Width – 4 feet minimum, constructed level.
2. Depth – 1 foot minimum.
3. Side Slopes – 2:1 or flatter.
4. Grade – As shown on the construction drawings, if not shown, provide positive drainage to point of discharge.

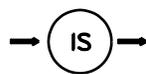
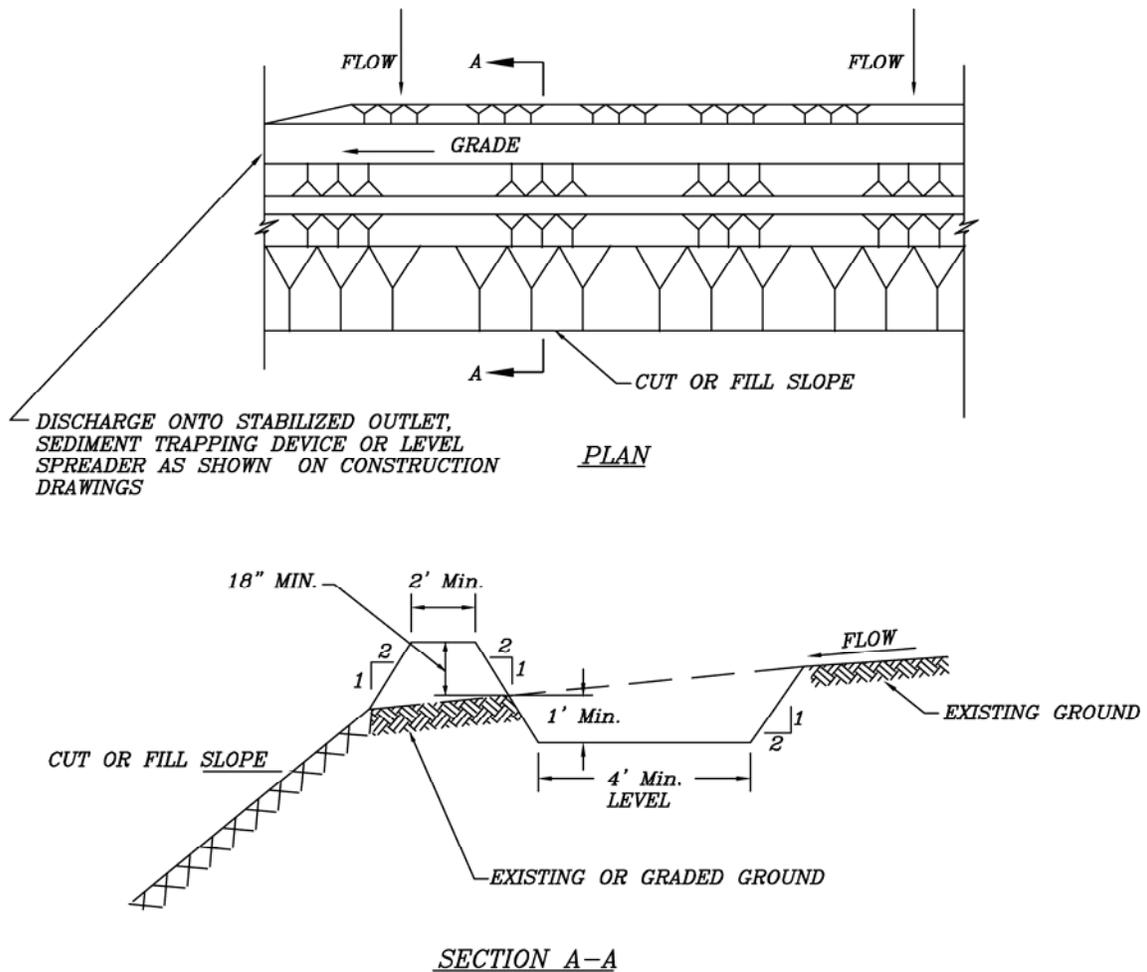


FIGURE 4.1-4
BMP 4114
INTERCEPTOR SWALE

DIVERSION DIKE WITH SWALE



DISCHARGE ONTO STABILIZED OUTLET,
SEDIMENT TRAPPING DEVICE OR LEVEL
SPREADER AS SHOWN ON CONSTRUCTION
DRAWINGS

Not to Scale

General Notes:

1. Dike Material – Machine compacted soil.
2. Dike Height – 18 inches minimum, measured from the existing or graded ground at the upslope toe, to the top of the dike.
3. Side Slopes of the Dike with swale – 2:1 or flatter.
4. Grade – As shown on the construction drawings, if not shown, provide positive drainage to point of discharge.

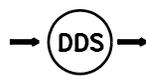


FIGURE 4.1-5
BMP 4115
DIVERSION DIKE AND SWALE

4.1.2 Downspout Extender

A. Definition

A **downspout extender** is a temporary tube or pipe used to convey water from a building's rain downspouts to a stable area.

B. Purpose

To prevent water discharged from a building's downspouts from eroding disturbed areas.

C. Conditions Where Practice Applies

On downspouts discharging to disturbed areas.

D. Planning Considerations

Conveying water from roofs can greatly decrease the amount of water flowing across disturbed areas.

E. Design Criteria and Requirements

Timing The downspout extender shall be installed as soon as downspouts are installed.

Removal Downspout extenders may be removed only after the disturbed area is stabilized by permanent best management practices.

Materials Non-slotted, non-perforated PVC or similar plastic pipe material should be used.

F. Inspection and Maintenance

Downspout extenders shall be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.

G. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4121 Downspout Extender

DOWNSPOUT EXTENDER

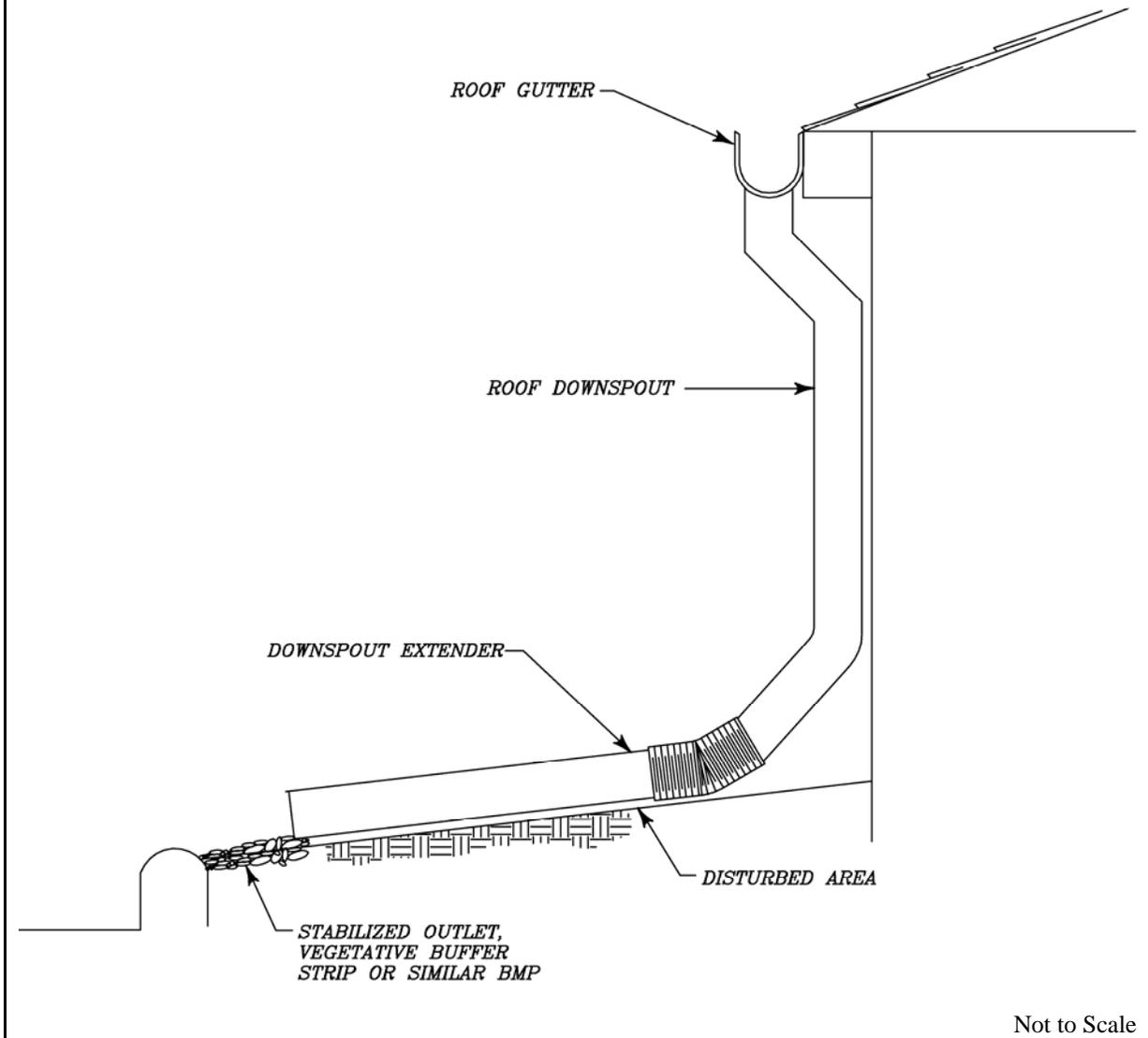


FIGURE 4.1-6
BMP 4121
DOWNSPOUT EXTENDER

4.1.3 Pipe Slope Drain

A. Definition

A **pipe slope drain** is a rigid pipe with a prefabricated entrance temporarily placed to extend from the top of a slope to the bottom of a slope.

B. Purpose

The purpose of a pipe slope drain is to convey surface runoff safely down slopes without causing erosion.

C. Conditions Where Practice Applies

Pipe slope drains are to be used where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion. Recommended maximum drainage area is five (5) acres.

D. Planning Considerations

A pipe slope drain should only be used temporarily. For permanent applications, a paved flume (Section 4.1.4) may be used.

E. Design Criteria and Requirements

Dimensions Unless otherwise specified, pipe slope drains are to be sized as follows:

Pipe Diameter, Inches	Maximum Drainage Area, Acres
12	0.5
15	1.0
18	1.5
21	2.5
24	3.5
30	5.0

Inlet The height of the earth dike at the entrance to the pipe slope drain should be equal to, or greater than, the diameter of the pipe (D) plus 12 inches. Provide a flared entrance section (See Figure 4.1-7b).

Outlet The pipe slope drain should outlet onto a riprap apron, a stabilized area, or into a stabilized watercourse. A sediment trapping device should be used to trap sediment from any sediment-laden water conveyed by the pipe slope drain. A level spreader should be used if flow is to be discharged onto stabilized areas.

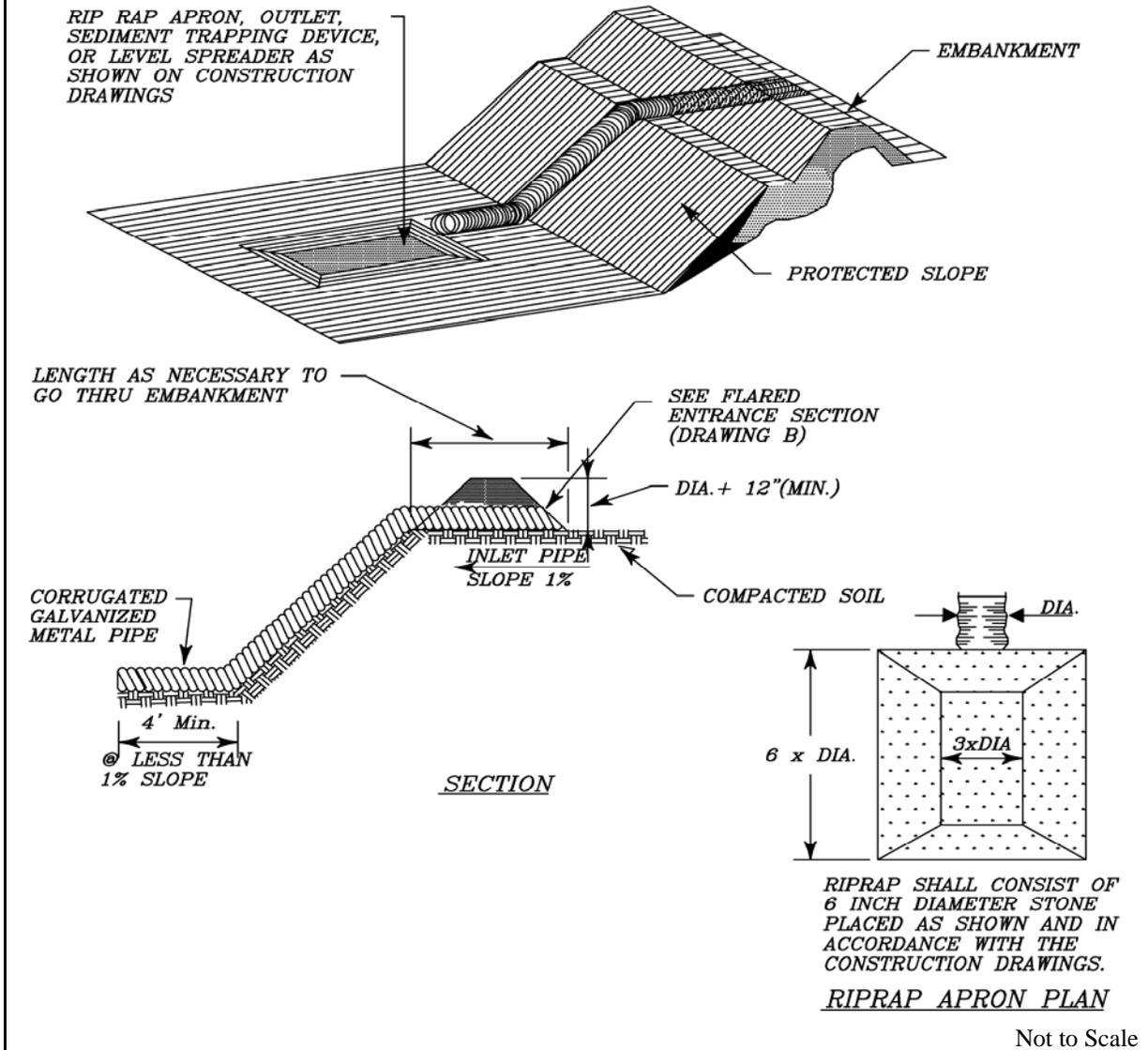
F. Inspection and Maintenance

Slope drains should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Damaged sections should be repaired. Riprap or stabilization at the outlet should be replaced as needed. Sediment in the stabilized outlet should be removed when accumulated to a depth of one-half the pipe diameter or one foot, whichever is less.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4131 Pipe Slope Drain

PIPE SLOPE DRAIN



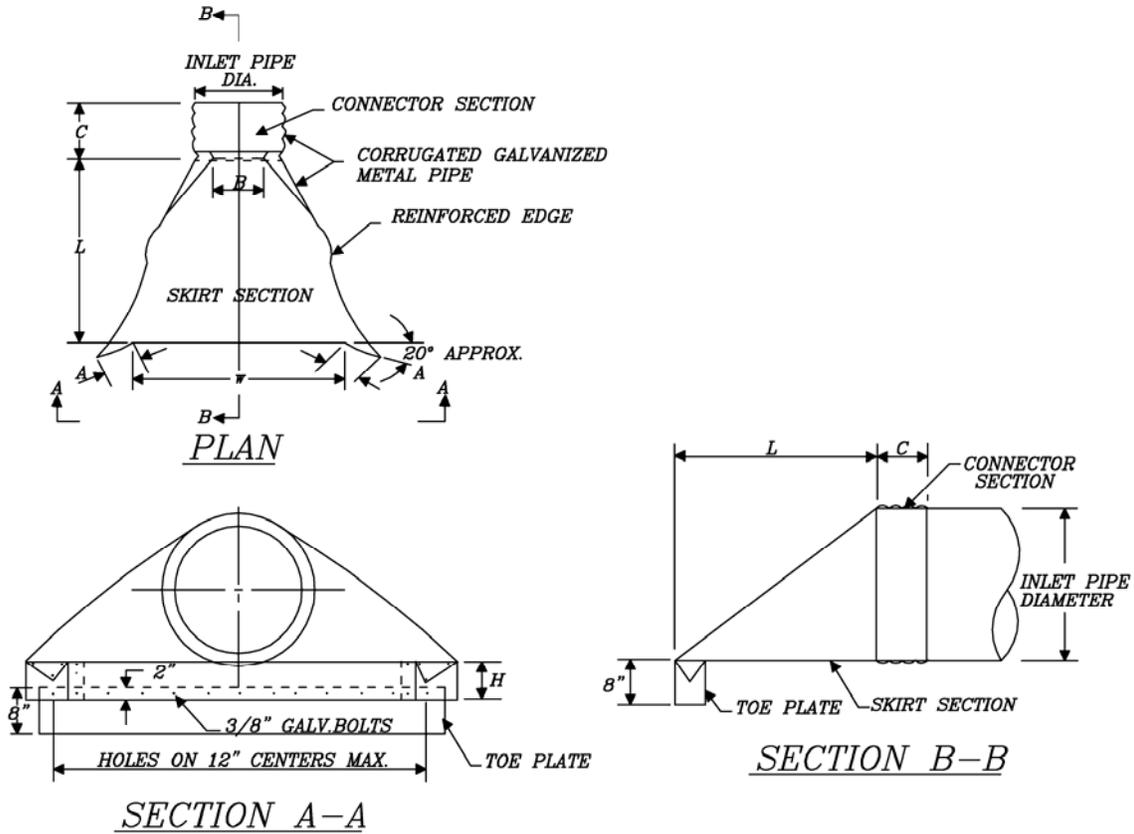
General Notes:

1. The inlet pipe shall have a slope of 1 percent or greater. Pipe diameter shall be as indicated on the construction drawings.
2. The top of embankment shall be at least 1-foot higher at all points than the top of the inlet pipe.
3. Unless otherwise specified, the pipe shall be corrugated galvanized metal pipe with watertight connection bands.
4. Pipe shall be secured with hold-down grommets spaced 10-feet on centers.
5. Depth of riprap apron shall be equal to the pipe diameter with 2:1 side slopes and placed in minimum 12 inch thick lifts.



FIGURE 4.1-7a
BMP 4131
PIPE SLOPE DRAIN (DRAWING A)

PIPE SLOPE DRAIN FLARED ENTRANCE SECTION



PIPE DIA.	SHEET THICKNESS	DIMENSIONS (WITH TOLERANCE OR MAXIMUM ALLOWED DIMENSION INDICATED)					
		A 1" TOL	B MAX.	H 1" TOL	L 1 1/2" TOL	W 2" TOL	C
12"	0.064"	6"	6"	6"	21"	24"	24"
15"	0.064"	7"	8"	6"	26"	30"	24"
18"	0.064"	8"	10"	6"	31"	36"	24"
21"	0.064"	9"	12"	6"	36"	42"	24"
24"	0.064"	10"	13"	6"	41"	48"	24"
30"	0.079"	12"	16"	8"	51"	60"	24"

Not to Scale

General Notes:

1. Flared entrance section to be used with pipe slope drain.
2. Length of toe plate shall be $W + 10"$ for 12" to 30" pipe and $W + 22"$ for 36" to 60" pipe. Toe plate shall be galvanized metal pipe with same thickness as pipe.



FIGURE 4.1-7b
BMP 4131 (CONT.)
FLARED ENTRANCE SECTION FOR PIPE
SLOPE DRAIN (DRAWING B)

4.1.4 Paved Flume

A. Definition

A **paved flume** is a channel lined with bituminous concrete, Portland cement concrete, or comparable nonerodible material placed to extend from the top of a slope to the bottom of a slope.

B. Purpose

The purpose of the paved chute or flume is to convey surface runoff safely down slopes without causing erosion.

C. Conditions Where Practice Applies

A paved chute or flume is to be used where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion. The maximum allowable drainage area shall be 36 acres.

D. Planning Considerations

A paved flume may be used temporarily during construction of site improvements and/or permanently for final development of the site. If only temporary use is anticipated, a pipe slope drain may also be considered.

E. Design Criteria and Requirements

Dimensions Paved flumes are designated by size groups. These size groups are a function of certain dimensions.

Size Group A:

Height (H) of the dike at the entrance is at least 1.5 feet.

Depth (d) of the chute down the slope is at least eight (8) inches.

Length (L) of the inlet and outlet sections is five (5) feet.

Size Group B:

Height (H) of the dike at the entrance is at least two (2) feet.

Depth (d) of the chute down the slope is at least ten (10) inches.

Length (L) of the inlet and the outlet sections is six (6) feet.

The size is designated with a letter and a number, such as A-6, which denotes a Size Group A chute or flume with a six-foot (6-foot) bottom width. The selected size shall be shown on the plans.

Each size group has various bottom widths and allowable drainage as shown below:

Size	Bottom Width, b (feet)	Maximum Drainage Area (acres)
A-2	2	5
A-4	4	8
A-6	6	11
A-8	8	14
A-10	10	18
B-4	4	14
B-6	6	20
B-8	8	25
B-10	10	31
B-12	12	36

If a minimum of 75 percent of the drainage area will have a good grass or woodland cover throughout the life of the structure, the drainage areas listed above may be increased by 50 percent. If a minimum of 75 percent of the drainage area will have a good mulch cover throughout the life of the structure, the drainage areas listed above may be increased by 25 percent.

Materials A temporary paved flume may be constructed of bituminous concrete or unreinforced Portland cement concrete. Use applicable agency design criteria. A permanent paved flume should have reinforcing steel and be designed to conform with the applicable agency criteria.

Outlet When a paved chute or flume is used, the velocity at its outfall should be checked for erosion potential downstream. When required, energy dissipation structures should be installed.

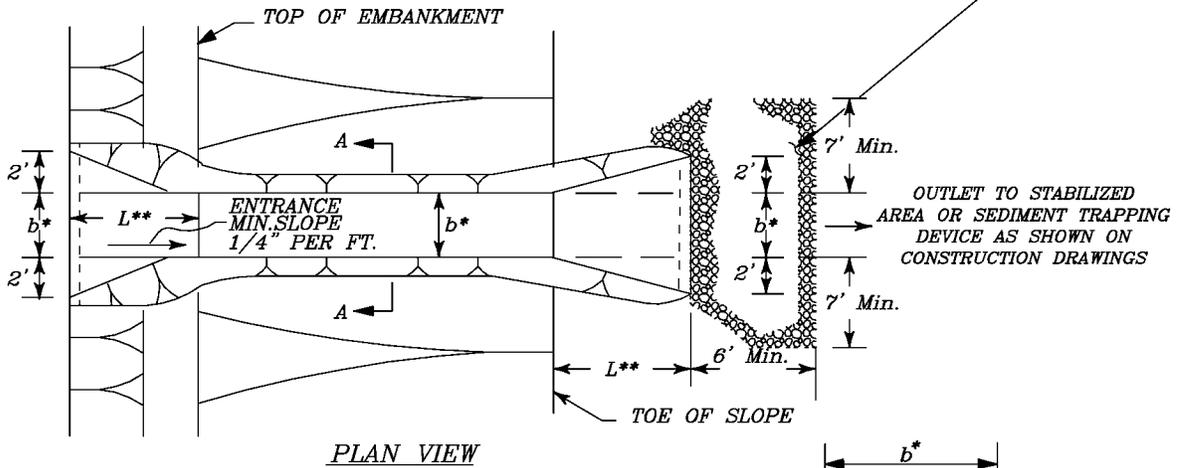
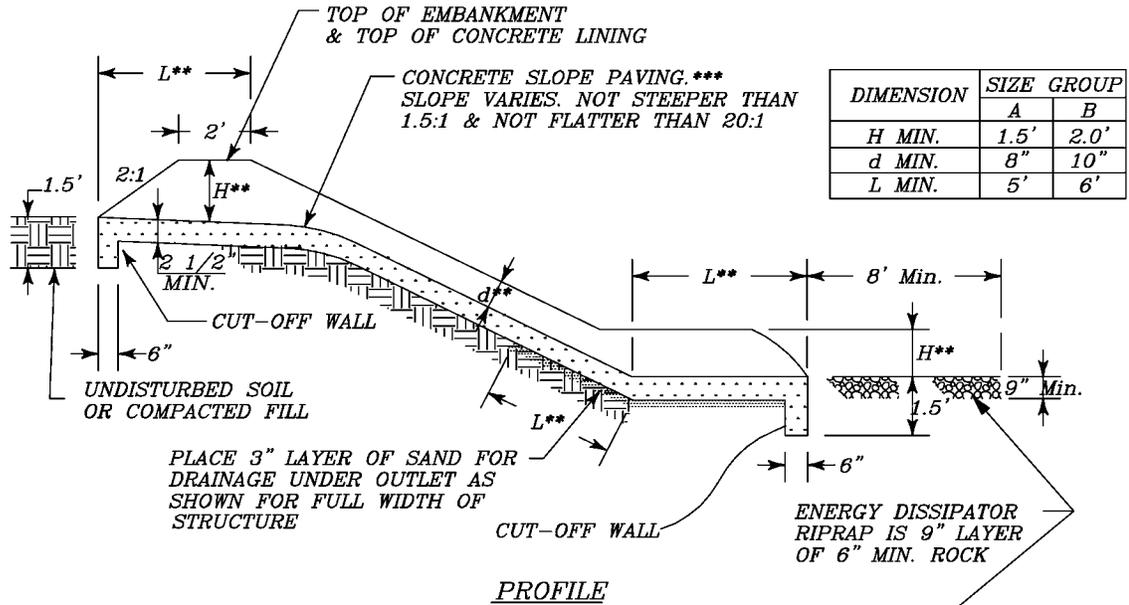
F. Inspection and Maintenance

Inspect paved flumes at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair damaged sections. Redress and replace stone or riprap at the outlet as needed. Remove sediment from the stabilized outlet when sediment has accumulated to a depth of one (1) foot.

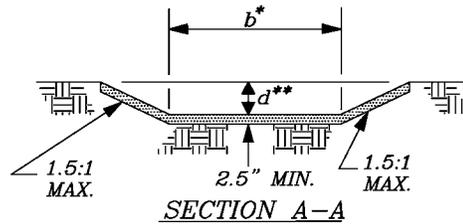
G. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4141 Paved Flume

PAVED FLUME



- * DIMENSION *b* IS SPECIFIED BY THE NUMBER DESIGNATED IN SIZE GROUP SUCH AS A-6 WHICH MEANS SIZE GROUP A WITH *b* EQUAL 6 FEET.
- ** STRUCTURE DIMENSIONS SHALL BE SPECIFIED BELOW
- *** TEMPORARY PAVED FLUME TO BE UNREINFORCED CONCRETE. PERMANENT PAVED FLUME MUST BE REINFORCED, AND DESIGNED TO CONFORM WITH THE LOCAL AGENCY'S DESIGN CRITERIA.



Not to scale



FIGURE 4.1-8
BMP 4141
PAVED FLUME

4.1.5 Level Spreader

A. Definition

A **level spreader** is a specialized swale segment excavated on a level grade to allow uniform sheet flow to discharge onto stabilized surfaces.

B. Purpose

The purpose of the level spreader is to convert a concentrated flow of sediment-free runoff into a sheet flow and to discharge it onto areas stabilized by existing vegetation without causing erosion.

C. Conditions Where Practice Applies

The level spreader is used only in those situations where the spreader can be constructed on undisturbed soil; where the area directly below the level lip is stabilized by existing vegetation; where the drainage area above the spreader is stabilized by existing vegetation (or the runoff to be discharged is relatively sediment free); and where the water will not be reconcentrated immediately below the point of discharge.

D. Planning Considerations

Level spreader can be used to discharge runoff by diversion or interceptor dikes and swales, slope drains, and other devices conveying concentrated flows.

E. Design Criteria

1. The design criteria for level spreader shall be a maximum of one (1) cubic foot per second per foot of length, based on the peak rate of flow from a two-year (2-year) frequency rainfall event. The minimum length shall be five (5) feet. An alternate such as a stabilized outlet, grassed waterway, etc., should be considered where the length of the level spreader exceeds 20 feet.
2. Final discharge should be over the level lip onto an existing stabilized area with a complete vegetative cover sufficiently established to be erosion resistant.

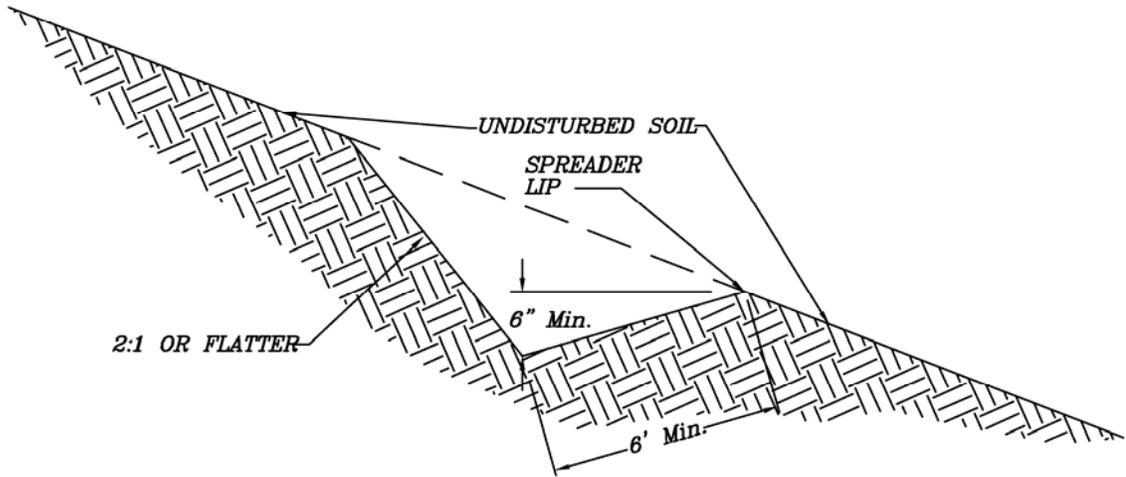
F. Inspection and Maintenance

Level spreaders should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repairs should be made immediately. Remove sediment deposits and any projections or other irregularities which will impede normal flow.

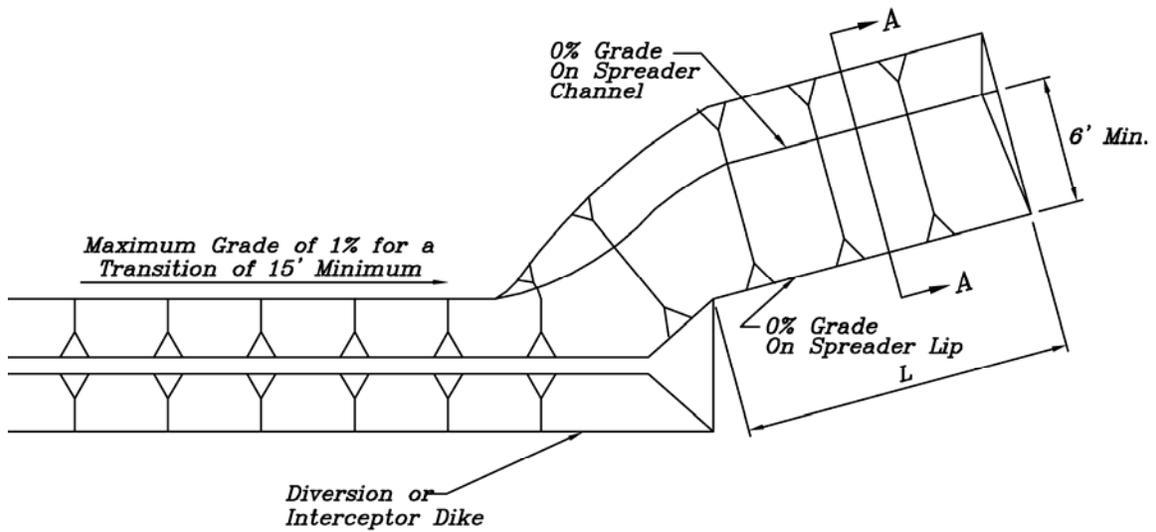
G. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4151 Level Spreader

LEVEL SPREADER



SECTION A-A



LEVEL SPREADER

Not to Scale



FIGURE 4.1-9
BMP 4151
LEVEL SPREADER

4.2 BEST MANAGEMENT PRACTICES FOR MANAGING OVERLAND FLOW

Overland flow refers to *runoff flowing as a “sheet” over the land and not concentrated in runoff channels*. Generally, areas with overland flow are small in size. Best management practices usually are placed on sideslope locations.

Temporary best management practices include:

- *Filter fabric fences* (Section 4.2.1)
- *Hay bale fence* (Section 4.2.2)
- *Brush berm* (Section 4.2.3)

Filter fabric fences (Section 4.2.1) are preferred over hay bales because durability and maintenance requirements are far less desirable in hay bales.

Permanent best management practices include:

- *Seeding with mulching* (Section 4.2.4)
- *Vegetative sediment filter strip* (Section 4.2.5)
- *Sodding* (Section 4.4.2)

These best management practices are applicable to areas where overland flow occurs and where it is necessary to contain pollutants from soil storage piles. These may also be used as temporary BMPs.

It is recommended that:

- *Filter fabric fences or equivalent best management practices be placed along all sideslope and downslope sides of sites where less than 10 acres are disturbed at one time.*
- *At sites with less than 10 acres disturbed at one time, where a channel or area of concentrated runoff passes through the site, filter fabric fences should be placed along the channel edges to reduce the amount of sediment reaching the channel.*
- *Filter fabric fences or equivalent best management practices should be placed around soil piles with more than 10 cubic yards of material if the soil pile will exist for more than 14 days.*
- *Vegetative buffer strips of original undisturbed grasses or new sodding may be used along the perimeter of disturbed areas to trap sediment.*

4.2.1 Filter Fabric Fences

A. Definition

A **filter fabric fence** is a temporary sediment control fence consisting of a geotextile filter fabric stretched across and attached to supporting posts or frame and entrenched.

B. Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations to prevent sediment from leaving the site.
2. To decrease the velocity of sheet flows.

C. Conditions Where Practice Applies

1. Downslope of disturbed areas where erosion is likely to occur in the form of sheet or rill erosion.
2. Around or downslope of soil piles.
3. Where the maximum size of the drainage area is 0.50 acres per 100 feet of fence length, the maximum length of slope behind the fence is 200 feet, and the maximum gradient behind the fence is 50% (2:1). The maximum slope length is as follows:

Slope (%)	Maximum Slope Length (feet)
< 0.2	200
0.2 to 0.5	175
0.5 to 1.0	140
1.0 to 2.0	100
2.0 to 5.0	75
5.0 to 10.0	50
10.0 to 20.0	25
> 20.0	15

4. Under no circumstances may filter fabric fences be used in streams, swales, ditches, or below ordinary high-water marks along streams. See Section 4.3 for BMPs for trapping sediment in channelized flow.

D. Planning Considerations

1. Under normal conditions, filter fabric fences require removal of trapped sediment. If maintenance is difficult due to location or presence of wet soils that prohibit prompt cleaning after runoff events, additional parallel fences should be constructed.
2. Filter fabrics degrade due to ultraviolet light. Consult the manufacturer's specifications for useful life.
3. Strength, permeability, and suitability for various soil textures vary with the type of filter fabric.
4. Multiple parallel fences may be needed on steep or long slopes.
5. Filter fabric fences will be more effective if runoff from areas upslope of the disturbed area is diverted around the disturbed area.
6. When installed in vehicular traffic areas, adjacent to such areas, or where vehicular traffic hazards exist (e.g. parking lots, roadways, etc.) orange filter fabric material (or another high-visibility color) should be used.

E. Design Criteria and Requirements

<i>Timing</i>	Filter fabric fences shall be installed prior to disturbing the upslope area.
<i>Removal</i>	Filter fabric fences may be removed once final stabilization of the disturbed area is completed.
<i>Placement</i>	Filter fabric fences shall be placed on the contour to the extent practicable. Filter fabric fences may not be placed perpendicular to

the contour on slopes of greater than 2%. Parallel fences may be used. The parallel spacing may not exceed the slope lengths for the appropriate slope specified in Section C.3. The ends of the fence should be turned upslope 1 to 2 feet in elevation to prevent flanking.

Height

18 inches minimum height, measured from existing graded ground.

Support

Field constructed: The full height of the filter fabric fence shall be supported by 2-inch x 2-inch wooden posts or equivalent. The posts shall be driven at least 12 inches into the ground. The maximum spacing of the posts shall be 3 feet. The filter fabric shall be stapled using at least 0.5-inch staples to the upslope side of the posts.

Factory pre-assembled: The full height of the filter fabric fence shall be supported by 2-inch x 2-inch wooden posts or equivalent. The posts shall be driven at least 12 inches into the ground. If support netting is provided, the maximum spacing of the posts should be 8 feet. If support netting is not provided, then the spacing of the posts should not exceed 3 feet.

Triangular filter fabric fence: Attach the filter fabric to the fence structure fashioned from 6 gauge, 6-inch x 6-inch wire mesh, 18 inches on each side as shown on Figure 4.2-2 (BMP 4212). The fabric cover and skirt should be continuous wrapping of filter fabric. The skirt should form a continuous extension of the fabric on the upstream side of the fence. Place overlap on bottom of filter fabric so as not to impede flow thru the triangular filter fabric fence.

The triangular filter fabric fence may be secured in place using one of the following methods:

- The skirt may be toed-in 6 inches with mechanically compacted material.
- The skirt may be weighted down with a continuous layer of 3- to 5-inch graded rock.
- The entire structure may be trenched-in 4 inches.

The triangular filter fabric fence structure and skirt, if provided, should be anchored securely in place using 6-inch wire staples on 2-foot centers on both edges and on the skirt, or staked using 18-inch by 3/8-inch diameter rebar with tee ends.

The filter fabric material should be lapped over 6 inches to cover the segment joints. The joints should be fastened with galvanized shoat rings.

Anchoring

The filter fabric shall be anchored by placing at least 8 inches of the fabric in a 6-inch x 6-inch trench or in a 4-inch deep V-trench on the upslope side of the fence as shown in Figure 4.2-1 (BMP 4211). The trench shall be backfilled and compacted.

Fabric Specifications

The filter fabric shall meet the following specifications:

Grab Strength	100 lb. minimum in any principal direction (ASTM D 4632)
Apparent Opening Size (specify on construction drawings)	Between 50 and 140 for soils with more than 15% by weight passing a No. 200 sieve. Between 20 and 50 for soils with less than 15 percent by weight passing a No. 200 sieve
Water Flow Rate	40 gal/min/ft ² at frontal area, at 50 mm constant head as determined by multiplying permittivity in sec-1 as determined by ASTM D 4491.
Ultraviolet Ray Inhibitors and Stabilizers	Should provide an expected useable life comparable to anticipated construction period. Ultraviolet stability exceeding 70% after 500 hours of exposure (ASTM D 4355). Fabric with support netting shall be reinforced with an industrial polypropylene netting with a 3/4-inch spacing or equivalent. A heavy-duty nylon top support cord or equivalent is required.

F. Inspection and Maintenance

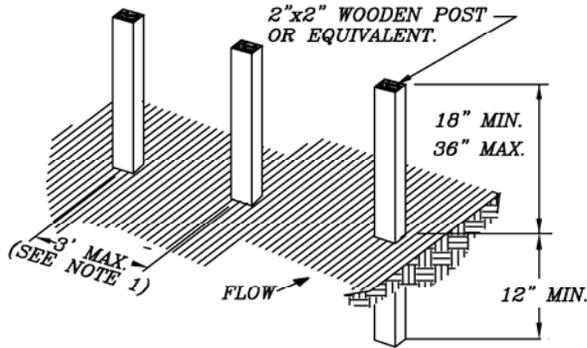
1. Filter fabric fences shall be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.
2. Sediment deposits should be removed after each storm event and before deposits reach one-third the height of the fence.

G. Corresponding Technical Specification (Refer to Appendix C)

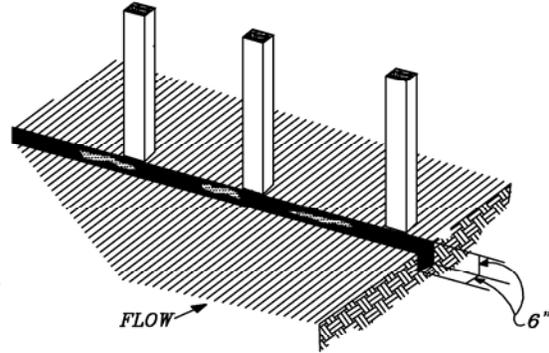
Item No. 4211	Filter Fabric Fence
Item No. 4212	Triangular Filter Fabric Fence

FILTER FABRIC FENCE

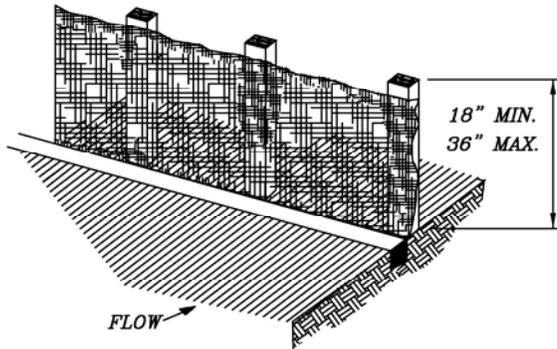
1. SET POSTS AT REQUIRED SPACING AND DEPTH



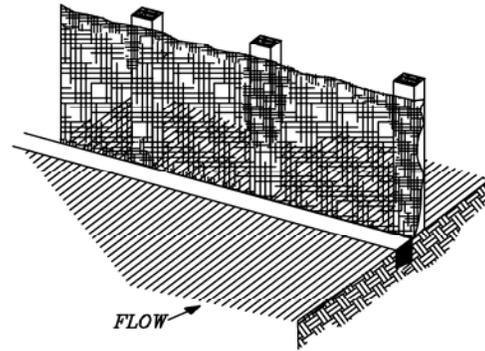
2. EXCAVATE A 6"x6" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



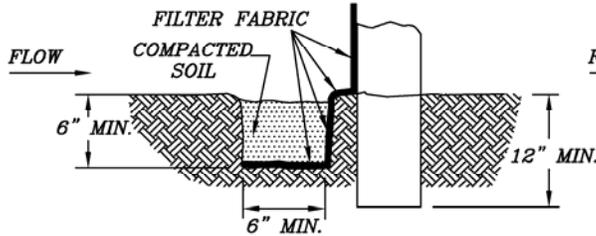
3. ATTACH FILTER MATERIAL TO STAKES AND INSTALL IT INTO THE TRENCH.



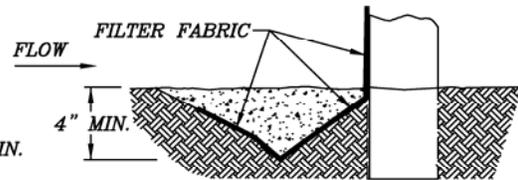
4. BACKFILL THE TRENCH AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC INTO TRENCH.



ALTERNATE V-TRENCH EXTENSION OF FABRIC INTO TRENCH.



General Notes:

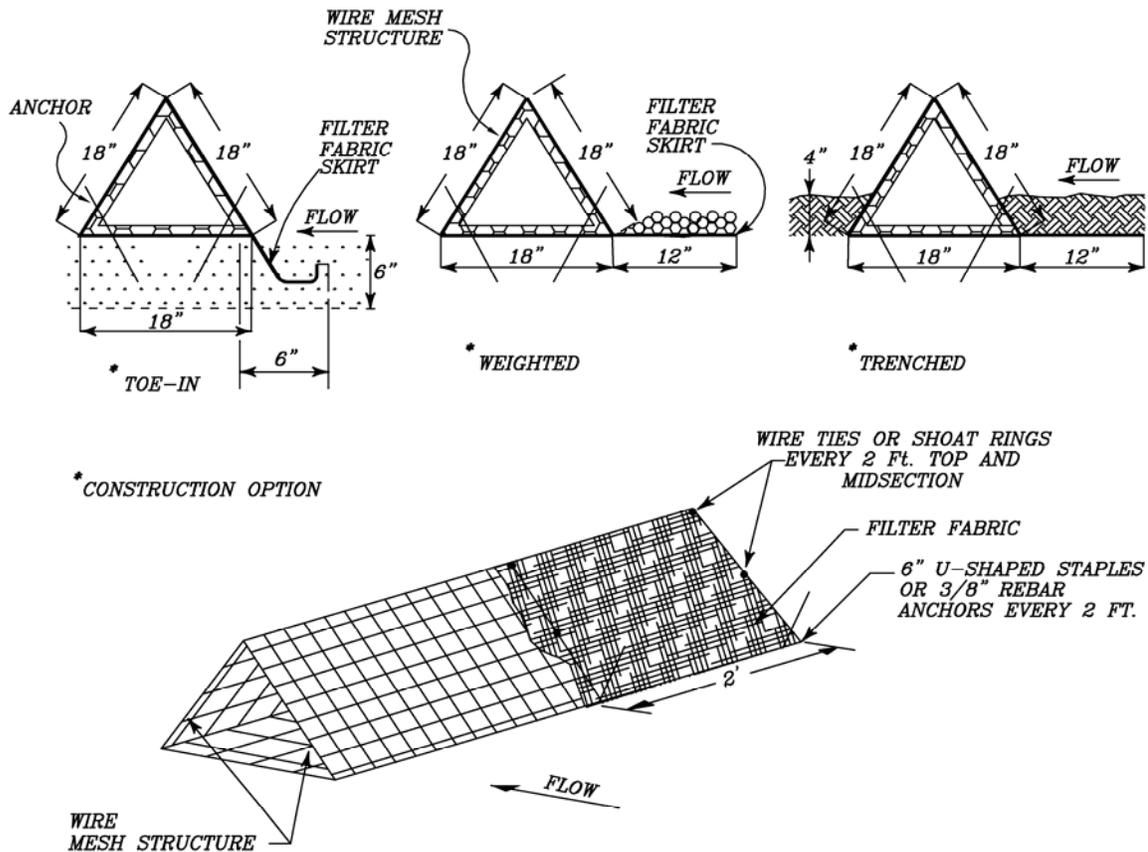
Not to Scale

1. Posts to be set at 3-foot maximum spacing. If factory preassembled fence with support netting is used, spacing of post may be increased to 8 feet maximum.
2. When two sections of filter cloth adjoin each other they should be overlapped 6 inches at the posts, and folded.



FIGURE 4.2-1
BMP 4211
FILTER FABRIC FENCE

TRIANGULAR FILTER FABRIC FENCE



Not to Scale

General Notes:

1. Barrier shall be placed in a row with ends tightly abutting the adjacent barrier.
2. The fabric cover and skirt shall be a continuous wrapping of filter fabric. The skirt shall be a continuous extension of the fabric on the upstream side.
3. The skirt shall be weighed with a continuous layer of 3 to 5 inch open graded rock, or toed in six inches with mechanically compacted material. Otherwise the entire structure shall be trenched in 4 inches.
4. Barrier and skirt shall be securely anchored in place using 6 inch U-shaped wire staples on 2 foot center on both edges or staked using 18 inch long by 3/8 inch rebars with T-ends on same 2 foot spacing.
5. Filter material shall be lapped over ends 6 inches to cover segment joints. Joints shall be fastened with galvanized shoat rings place longitudinal overlap on bottom of triangular filter fabric fence.
6. The barrier structure shall be 6 inches by 6 inches wire mesh, 18 inches on each side of triangle.



FIGURE 4.2-2
BMP 4212
TRIANGULAR FILTER FABRIC FENCE

4.2.2 Hay Bale Fence

A. Definition

A **hay bale fence** is a temporary sediment barrier consisting of a row of entrenched and anchored bales.

B. Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations to prevent sediment from leaving the site.
2. To decrease the velocity of sheet flows.

C. Conditions Where Practice Applies

1. Downslope of disturbed areas where erosion is likely to occur in the form of sheet or rill erosion.
2. Around or downslope of soil piles.
3. Where the maximum size of the drainage area is 0.50 acres per 100 feet of fence length; the maximum length of slope behind the fence is 200 feet; and the maximum gradient behind the fence is 50% (2:1). The maximum slope length is as follows:

Slope (%)	Maximum Slope Length (feet)
<0.2	200
0.2 to 0.5	175
0.5 to 1.0	140
1.0 to 2.0	100
2.0 to 5.0	75
5.0 to 10.0	50
10.0 to 20.0	25
> 20.0	15

4. Hay bales deteriorate with time. They should be utilized for short-term use where pollutant control is needed for less than 3 months. Hay bale fence should be replaced every two months. Filter fabric fences (Section 4.2.1) are preferred over hay bales because durability and maintenance requirements are far less desirable in hay bales.
5. Under no circumstances may hay bale fences be used in streams, swales, ditches, or below ordinary high-water marks along streams.

D. Planning Considerations

1. Under normal conditions, hay bale fences require removal of trapped sediment. If maintenance is difficult due to location or presence of wet soils that prohibit prompt cleaning after runoff events, additional parallel fences should be constructed.
2. Hay bale fences generally are considered less effective than filter fabric fences. However, they may be very useful in situations where removal of a filter fabric fence after the site is stabilized is not practicable.

3. Parallel fences may be used.
4. Hay bale fences will be more effective if runoff from areas upslope of the disturbed area is diverted around the disturbed area.

E. Design Criteria and Construction Requirements

<i>Timing</i>	Hay bale fences shall be installed prior to disturbing the upslope area.
<i>Removal</i>	Hay bale fences shall be removed once final stabilization of the disturbed area is completed.
<i>Placement</i>	Hay bale fences should be placed on the contour to the extent practicable. Hay bale fences may not be placed perpendicular to the contour on slopes of greater than 2%. The ends of the hay bale fence should be turned upslope 1 to 2 feet in elevation to prevent flanking.
<i>Entrenching</i>	The hay bale fence shall be entrenched at least 4 inches. The upslope side of the bale shall be built up an additional 4 inches. See attached drawing.
<i>Abutting</i>	Hay bale fences shall be constructed by tightly abutting ends of adjacent bales. Gaps between bales shall be filled with hay.
<i>Positioning</i>	All bales shall be wither-wire-bound or tied with nylon or polypropylene rope. Jute or cotton binding is not allowed. Hay bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent degradation of the bindings.
<i>Anchoring</i>	Each hay bale should be anchored securely by at least two stakes or rebars driven below the top of the bale and at least 18 inches into the ground. The first stake shall be driven towards the previously anchored bale to help create a tight fit. Exposed rebars should be cut flush to the bales and/or capped to protect against injuries.

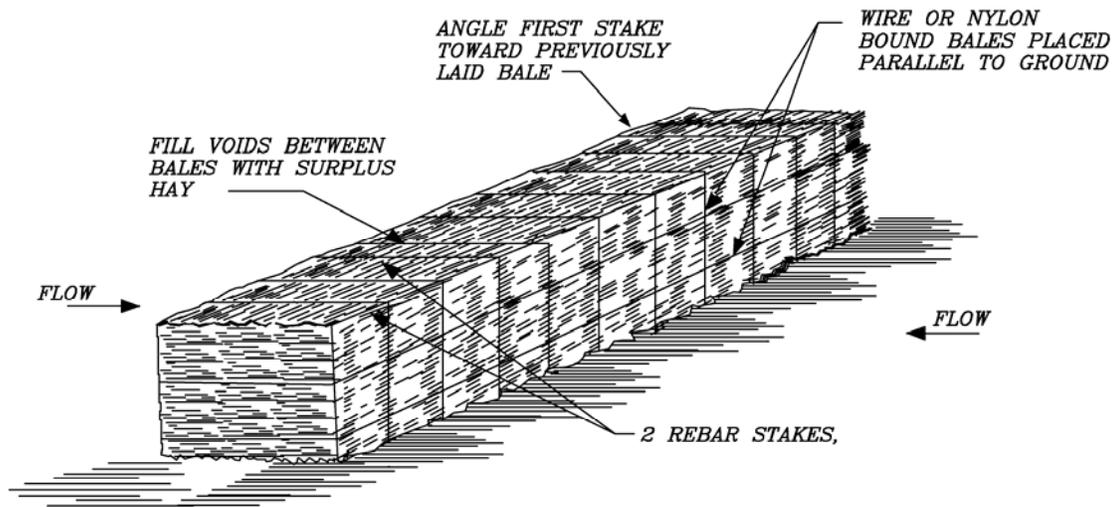
F. Inspection and Maintenance

1. Hay bale fences shall be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.
2. Sediment deposits should be removed after each storm event and before deposits reach one-third the height of the fence.

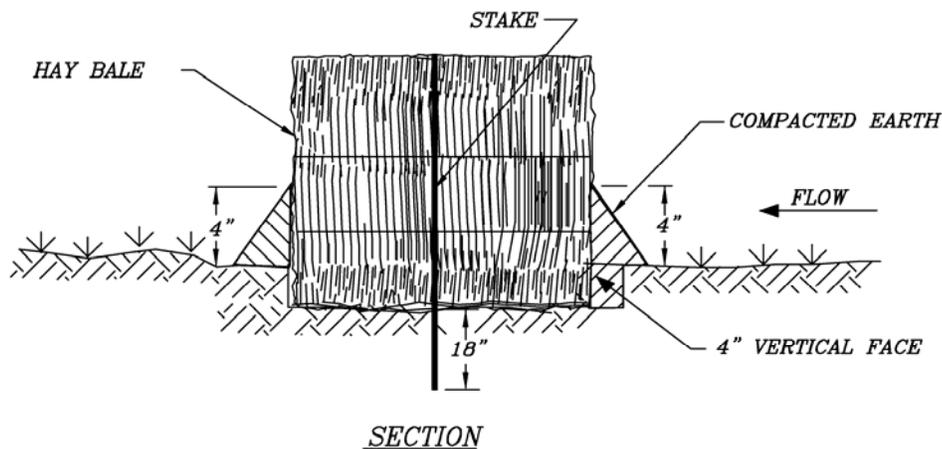
G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4221 Hay Bale Fence

HAY BALE FENCE



HAY BALE FENCE



Not to Scale

General Notes:

1. Bales shall be placed in a row with ends tightly abutting the adjacent bales. Fill the voids between bales with surplus hay. Place bales with binding parallel to ground surface.
2. Where possible each bale shall be embedded in the soil a minimum of 4 inches.
3. Bales shall be securely anchored in place by 2 #3 rebar stakes drives through the bales, a minimum of 18 inches into the ground. The first stake in each bale shall be angled towards the previous bale to force the bales together.
4. Bales shall be bound by either wire or nylon rope tied across the hay bales.
5. Replace with new hay bale fence every two months.



FIGURE 4.2-3
BMP 4221
HAY BALE FENCE

4.2.3 Brush Berm

A. Definition

A **brush berm** is a temporary berm constructed of hand-placed brush from woody plants installed at the toe of a slope or at the perimeter of a developing area. *Machine placement of brush berms is not permitted.*

B. Purpose

The purpose of a brush berm is to intercept sediment-laden water from disturbed areas, detain the sediment, and release the water as sheet flow.

C. Conditions Where Practice Applies

The brush berm is used where:

1. There is an adequate source of woody brush that must be removed during development.
2. There is little or no concentration of water in a channel or other drainageway above the berm, and
3. The contributing drainage area is less than two (2) acres.

D. Design Criteria and Requirements

A brush berm is constructed at the perimeter of a disturbed site within the developing area. It is not to be constructed outside the property lines without obtaining a legal easement from the affected adjacent property owners.

The following criteria shall be observed:

Drainage Area

Less than two (2) acres (recommended)

Maximum Flow Through Rate

40 gallons per minute per square foot frontal area

Height

18 inches minimum height measured from the top of the existing ground at the upslope toe to the top of the berm.

Anchoring

Brush berms shall be secured using wire or nylon rope tied across the berm in crisscross fashion with a minimum tension of 50 pounds. The rope shall be tied securely to 18-inch, 3/8-inch diameter rebar stakes driven into the ground on four-foot (4-foot) centers on both sides of the berm.

Grade

Berms shall be built along contour lines at zero percent grade or as near as possible.

Material

Woody brush and branches, such as juniper, tallow, oak, or pine that are less than two (2) inches in diameter with dense foliage (leaves) on them. All material should be hand-placed and overlap to eliminate channelization. Care should be taken to avoid the incorporation of annual weeds and soil into the brush berm. Filter fabric may be incorporated to increase the effectiveness of sediment trapping. Wrap filter fabric around outside of bermed material before tying down.

Outlet

Runoff shall outfall directly to an undisturbed stabilized area.

E. Inspection and Maintenance

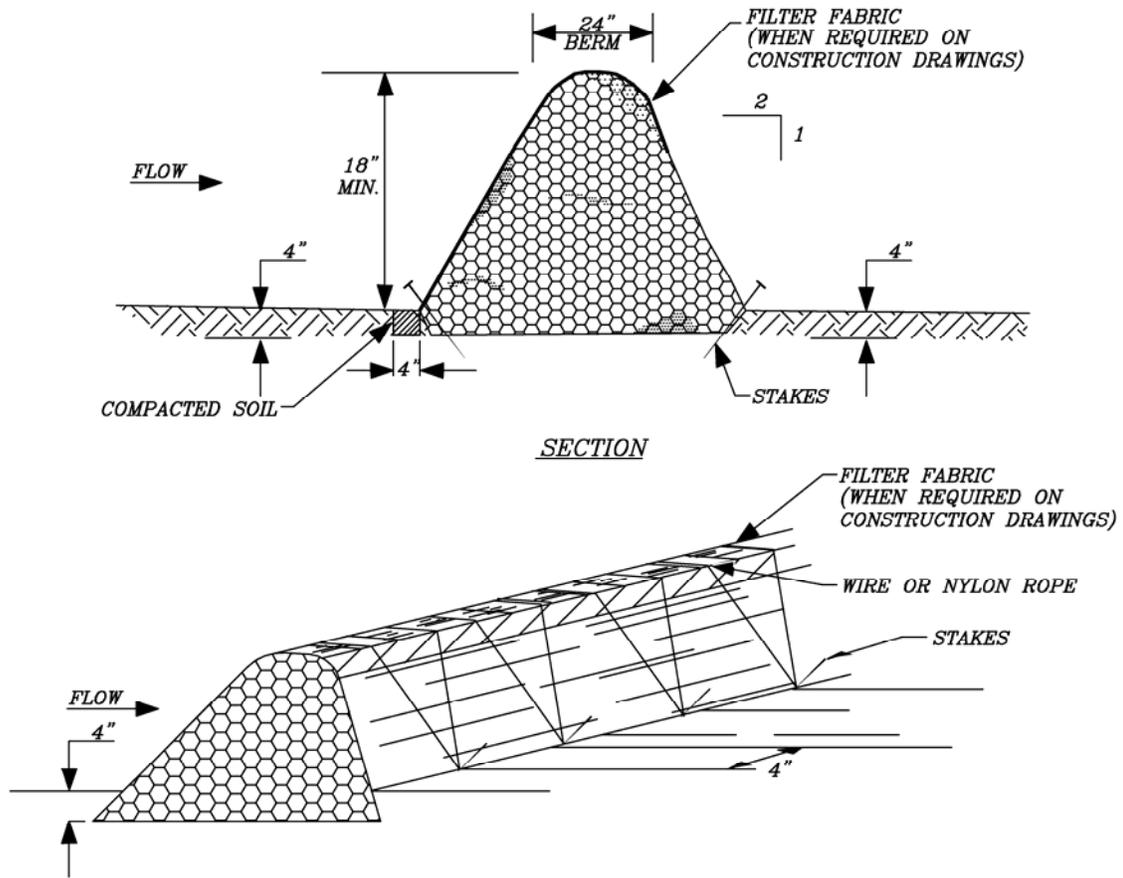
The area upstream from the brush berm should be maintained in a condition which will allow accumulated sediment to be removed following the runoff of a rainfall event. At least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every 7 calendar days, inspections should be made by the responsible party. When sediment reaches a depth equal to 1/3 the height of the berm or one (1) foot, whichever is less, the accumulated sediment should be removed and disposed of at an approved site in a manner that will not contribute to additional sedimentation. The berm and its anchors should be repaired as needed to restore them to their original condition after each inspection. This may require additions to or complete replacement of the berm material, as conditions warrant.

The brush berm shall be left in place until all upstream areas are stabilized and accumulated sediment is removed. Brush shall be replaced every six (6) months or more often if loss of foliage occurs.

F. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4231 Brush Berm

BRUSH BERM



Not to Scale

General Notes:

1. Brush – Woody brush and branches having diameter less than 2 inches should be placed with a 6 inch overlap. Avoid incorporation of annual weeds and soil into brush berm.
2. Height – 18 inches minimum, measured from the top of existing ground at the upslope toe to the berm.
3. Top width – 24 inches minimum.
4. Side slope – 2:1 or flatter.
5. Brush berm shall be constructed along contour lines by hand placing. Machine placement of brush berms is not permitted.
6. The brush berm shall be embedded into the soil a minimum of 4 inches.
7. Brush berms shall be anchored using either wire or nylon rope across the berm with a minimum tension of 50 pounds.
8. The rope shall be tied securely to 18 inch x 3/8 inch diameter rebar stakes driven into the ground on 4 foot centers on both sides of the berm.
9. Maintenance shall be performed as needed.

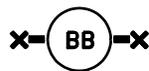


FIGURE 4.2-4
BMP 4231
BRUSH BERM

4.2.4 Hydro-Mulch Seeding

A. Definition

Hydro-mulch seeding is the application of an aqueous mixture of seed, water, fertilizer, mulch, and tackifier to the seedbed that can be used for establishment of temporary or permanent vegetation.

B. Purposes

To stabilize disturbed areas to minimize erosion and to reduce overland flow velocities.

C. Conditions Where Practice Applies

On exposed soils.

D. Planning Considerations

1. The effectiveness of seeding in controlling erosion is increased if drainage from upslope areas is diverted around the exposed areas.
2. Seeding should be used in conjunction with other best management practices such as filter fabric fences.
3. Seeding may not be considered as acceptable vegetative cover until the grasses are established.

E. Design Criteria and Requirements

Use the appropriate criteria of the applicable agency for specific projects. General guidance is provided below.

Seeding shall be applied within seven (7) days of the end of active disturbance of the soil surface. A proper seedbed shall be prepared before seeding. Seeding on all slopes shall be done in conjunction with hydro-mulching.

Seeds shall conform to requirements of U.S. Department of Agriculture Rules and Regulations as set forth in Federal Seed Act and Texas Seed Law. Use seed which has been treated with an approved fungicide. Container labels are to show locality and date of harvest, percent purity and percent germination, and name and type of seed. Planting date, seed type, and rate of application as follows:

SEED	RATE OF APPLICATION IN POUNDS PER ACRE (PURE LIVE SEED)	PLANTING DATE
TYPE 'A'		
Hulled Bermuda Grass	30	October 1 to April 15
Unhulled Bermuda Grass	20	
Annual Rye Grass (Gulf) or KY-31 Tall Fescue	15	
TYPE 'B'		
Hulled Bermuda Grass	60	April 15 to
Foxtail Millet	15	October 1

Fertilizer Provide fertilizer with analysis of 10 percent nitrogen, 20 percent phosphate, and 10 percent potash (10:20:10 N:P:K). Container label to show analysis. Rate of application to be 300 pounds per acre except during the periods of April 15 through June 15, when the rate will be increased to 400 pounds per acre.

Mulch Provide commercial quality wood fiber mulch consisting of wood mulch made from recovered wood materials. Rate of application to be 2,000 pounds per acre.

F. Inspection and Maintenance

All seeding is to be inspected within 24 hours after each rainfall and daily during periods of prolonged rainfall. The hydro-mulch seeding to be watered adequately until established. Once stabilized with vegetation, inspection is to be made at least once a month. Any areas damaged by erosion or do not have an acceptable vegetation should be reseeded.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4241 Hydro-Mulch Seeding

4.2.5 Vegetated Sediment Filter Strips

A. Definition

A **vegetated sediment filter strip** is a continuous strip of land that is either left vegetated with native plant community intact or has been temporarily planted, sodded, or seeded. A vegetated sediment filter strip is not considered stabilized unless the perennial vegetative cover is uniform (evenly distributed without large bare areas) and has a density of at least 70 percent of the natural cover of the native vegetation.

B. Purpose

To reduce storm water runoff velocity as it passes through the vegetated strip and filter out sediment and coarse debris from bare ground of construction areas.

C. Conditions Where Practice Applies

1. Construction site, where physical site conditions preclude installation of any barrier-type erosion control measures to control runoff, erosion, and sedimentation adequately.
2. Along specific internal elements of the construction area such as roads, parking areas, and around buildings.
3. Between a construction area and a critical natural area such as wildlife refuge, wetlands, and drainage corridors (rivers, bayous, streams, channels, and ditches).
4. Areas where sediment can be quickly transported from the construction site such as along existing roadways with nearby storm inlets.

D. Planning Considerations

1. The effectiveness of vegetated sediment filter strips is dependent upon their location relative to drainage flow patterns off the construction site, size of contributing drainage area, the flow velocities, and the erodibility of the soils.
2. Consider diverting drainage from upslope areas around disturbed or exposed areas.

3. Vegetated sediment filter strips shall be used in conjunction with other BMPs, such as filter fabric fences.

E. Design Criteria and Requirements

Drainage Criteria

Area 5 acres or less

Width The vegetated sediment filter strips can be either existing vegetation left undisturbed around the site or planted strips. The recommended width of the vegetated sediment filter strip can vary depending upon the size of the exposed construction site or surface area being drained, what is being protected immediately off-site, access slope, drainage patterns, and soil erodibility.

Adjacent Area	Recommended Strip Width	
	Disturbed Area 1 - 2 Acres	Disturbed Areas 3 - 5 Acres
Critical natural area	50 to 70 feet	70 to 100 feet
Drainage course	25 feet	30 to 50 feet
Roadway with storm inlets	10 feet	15 to 25 feet
Roadway with drainage ditches	10 feet	15 to 25 feet
Existing developed area	10 feet	10 feet

Seeding Temporary erosion control seeding using annual millet, annual rye, and/or covegrass seeding at 3 pounds per 1000 square feet or 35 to 40 pounds per acre of vegetated sediment filter strip area.

- Plant*
- a. Permanent native grass / forb seed mix (see Appendix C, Item 4253, Recommended Plant Species List)
 - b. Plant native grass / forb sprigs
 - c. Plant low ground cover planting such as daylilies, lirope, and fescues.

Turf Sod Turf sod should be a last resort because of water, fertilizer, and mowing requirements and minimum amount of effective sediment control provided. The following turf sod species conserve water, drought-tolerant, and have effective rooting systems to stabilize soil: buffalo grass, bermuda grass, zoysia grass, bahia grass, crested wheat grass, native prairie grass, hard fescue, sheep fescue, tall fescue, red fescue, red top, and timothy.

- Procedure*
- a. Do not clear the entire site at once. Leave undisturbed strips along the perimeter and where needed in the interior area to act as sediment filter. Refer to the table above for recommended strip widths.
 - b. Do not grade the entire site at once. Leave certain high ridges or berm area to act as containment for erosion control. See Figure 4.2-5 (BMP 4251) for recommended berm design.

- c. Preserve continuous strips or larger areas as undisturbed vegetation and integrate into final project landscape.
- d. Establish vegetated strip(s) prior to construction.
- e. Filter strip to be continuous along construction perimeter(s) or downstream of the drainage area.
- f. Establish a small berm between 8 to 12 inches high to assist vegetation in trapping sediment on the construction site.

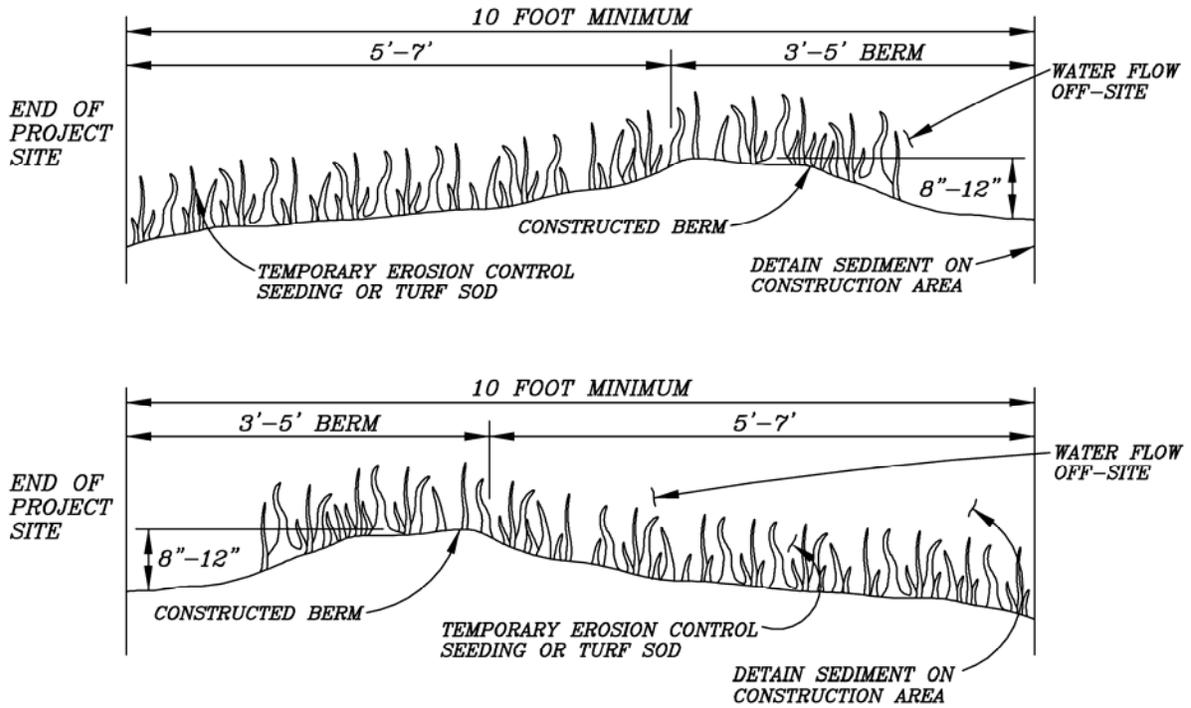
F. Inspection and Maintenance

- 1. Maintain moist soil conditions immediately after seeding and/or sod installation.
- 2. Maintain moist soil conditions throughout vegetation establishment period.
- 3. Apply hay mulch, crimped in, at a rate of 200 pounds per acre.
- 4. Sediment deposits should be removed after each storm event.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4251	Turf Sod Vegetated Sediment Filter Strip
Item No. 4252	Temporary Erosion Control Seeding
Item No. 4253	Permanent Grass Matrix and Forb/Wildflower Seeding
Item No. 4254	Planting and Plant/Seeding Maintenance

VEGETATED SEDIMENT FILTER STRIPS



Not to Scale

VFS

FIGURE 4.2-5
BMP 4251
VEGETATED SEDIMENT FILTER STRIPS
FOR TEMPORARY EROSION CONTROL

4.3 BEST MANAGEMENT PRACTICES FOR TRAPPING SEDIMENT IN CHANNELIZED FLOW

Channelized flow refers to *runoff flowing through depressions, swales or channels*. This section contains BMPs to control or trap sediment carried in channelized flow.

The practices vary by drainage area as follows:

- For drainage areas of less than 2 acres:
 - Diversion dikes and swales* (Section 4.1.1)
 - Reinforced filter fabric barrier* (Section 4.3.1)
 - Sandbag barrier* (Section 4.3.4)
 - Bagged Gravel Barrier* (Section 4.3.5)
- For drainage areas of less than 5 acres:
 - Sediment traps* (Section 4.3.2)
- For drainage areas of 10 or more acres:
 - Sediment basin* (Section 4.3.3).

4.3.1 Reinforced Filter Fabric Barrier

A. Definition

A **reinforced filter fabric barrier** is a temporary sediment barrier used in areas of concentrated flow consisting of a filter fabric stretched across and attached to supporting posts and a wire fence and toed in.

B. Purpose

To cause sediment carried in channelized or concentrated runoff to settle by reducing the flow velocity.

C. Conditions Where Practice Applies

1. Concentrated runoff can carry significant amounts of sediment. The use of reinforced filter fabric barriers should be limited to protection of Stage I inlets, unstabilized minor swales, and ditches or diversions where the maximum contributing area is no greater than 2 acres. For larger contributing areas, sediment traps or sediment basins should be used.
2. Reinforced filter fabric barriers may not be used in intermittent and perennial stream channels.

D. Planning Considerations

1. Under normal conditions, reinforced filter fabric barriers require removal of trapped sediment. If maintenance is difficult due to location or presence of wet soils that prohibit prompt cleaning after runoff events, additional parallel barriers should be constructed.
2. Filter fabrics degrade due to ultraviolet light. Consult the manufacturer's specifications for useful lifetime.
3. Woven and non-woven filter fabrics are available. Strength, permeability, and suitability for various soil textures vary with the type of fabric. Select fabric designated by the manufacturer as filter fabric with openings that are appropriate for the type of soils at the project site.

E. Design Criteria and Requirements

<i>Installation</i>	Reinforced filter fabric barriers shall be installed: <ol style="list-style-type: none">prior to disturbing upslope areas, orwithin 24 hours of constructing Stage I inlets, ditches, diversions or other channels. Stage I inlet is an incomplete inlet before the installation of inlet top. Stage II inlet is a completed inlet prior to completion of the construction.						
<i>Removal</i>	Reinforced filter fabric barriers shall remain in place and be maintained until final stabilization of disturbed upslope areas and channels, ditches, and diversions is completed.						
<i>Shape</i>	When used in swales, ditches, or diversions, the elevation of the barrier at the top of the filter fabric at the flowline location in the channel shall be lower than the bottom elevation of the filter fabric at the ends of the barrier, or the top of bank, whichever is less.						
<i>Height</i>	Reinforced filter fabric barriers shall be at least 18 inches but not more than 36 inches in height.						
<i>Support</i>	The full height of the reinforced filter fabric barrier shall be supported by 2" x 2" wooden posts or steel fence posts (min. of 1.25 lbs. per linear foot and Brinell hardness greater than 140) or equivalent and a wire fence 42 inches in height. The posts shall be driven at least 12 inches into the ground. The maximum spacing of the posts shall be 6 feet. If hot rolled steel posts are used, maximum post spacing shall be 8 feet. The wire fence shall be a minimum of 12.5 gauge galvanized 2" x 4" welded wire.						
<i>Attaching</i>	The wire mesh shall be stapled to the posts on the upslope side with heavy duty staples at least 1 inch long or with wire ties. The filter fabric should be attached to the wire mesh with wire ties.						
<i>Entrenching</i>	The filter fabric shall be anchored by placing 12 inches of the fabric in a 6-inch x 6-inch trench on the upslope side of the barrier as shown in Figure 4.3-1 (BMP 4311). The wire mesh shall extend at least 2 inches into the trench. The trench shall be backfilled and compacted.						
<i>Fabric Specifications</i>	The filter fabric shall meet the following specifications: <table><tr><td>Grab Strength</td><td>100 lb. minimum in any principal direction (ASTM D 4632)</td></tr><tr><td>Apparent Opening Size (specify on construction drawings)</td><td>Between 50 and 140 for soils with more than 15% by weight passing a No. 200 sieve Between 20 and 50 for soils with less than 15 percent by weight passing a No. 200 sieve</td></tr><tr><td>Water Flow Rate</td><td>40 gal/min/ft² along frontal areas. This will also determine permittivity (opening size).</td></tr></table>	Grab Strength	100 lb. minimum in any principal direction (ASTM D 4632)	Apparent Opening Size (specify on construction drawings)	Between 50 and 140 for soils with more than 15% by weight passing a No. 200 sieve Between 20 and 50 for soils with less than 15 percent by weight passing a No. 200 sieve	Water Flow Rate	40 gal/min/ft ² along frontal areas. This will also determine permittivity (opening size).
Grab Strength	100 lb. minimum in any principal direction (ASTM D 4632)						
Apparent Opening Size (specify on construction drawings)	Between 50 and 140 for soils with more than 15% by weight passing a No. 200 sieve Between 20 and 50 for soils with less than 15 percent by weight passing a No. 200 sieve						
Water Flow Rate	40 gal/min/ft ² along frontal areas. This will also determine permittivity (opening size).						

Ultraviolet Ray Inhibitors and Stabilizers Should provide an expected useable life comparable to anticipated construction period. Ultraviolet stability exceeding 70% after 500 hours of exposure (ASTM D 4355). Fabric with support netting shall be reinforced with an industrial polypropylene netting with a 3/4-inch spacing or equivalent. A heavy-duty nylon top support cord or equivalent is required.

Spacing The spacing between barriers shall be determined based on the drainage area and the difference in elevation. For unpaved contributing areas, the contributing drainage area to each filter fabric barrier should not exceed two (2) acres. For paved contributing areas, the contributing drainage area to each filter fabric barrier may not exceed one (1) acre. The difference in elevation between barriers should not exceed 2/3 the height of the filter fabric. (For example, a 3-foot barrier used on a 2% grade with an unpaved contributing area allows the barriers to be placed 100 feet apart provided the contributing area between the barriers does not exceed two (2) acres.)

F. Inspection and Maintenance

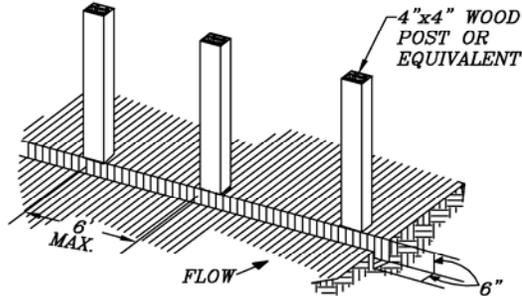
1. Reinforced filter fabric barriers shall be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement shall be made immediately.
2. Sediment deposits should be removed after each storm event and when deposits reach one-third the height of the barrier.

G. Corresponding Technical Specification (Refer to Appendix C)

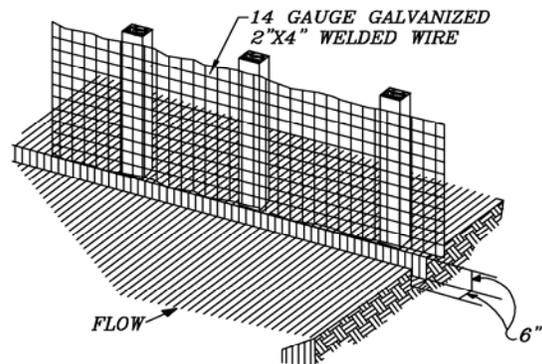
Item No. 4311 Reinforced Filter Fabric Barrier

REINFORCED FILTER FABRIC BARRIER

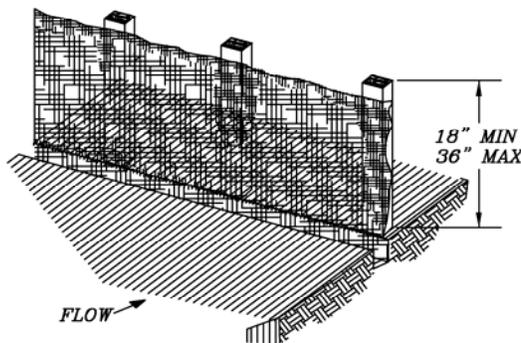
1. SET POSTS AND EXCAVATE 6" x 6" TRENCH UPSLOPE ALONG LINE OF POSTS.



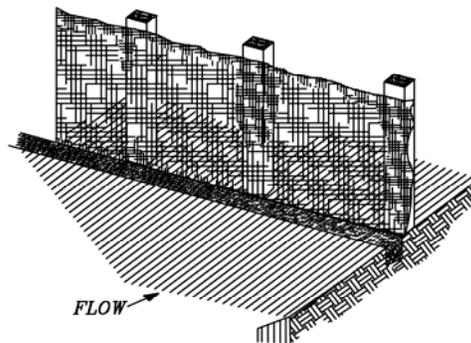
2. SECURE WIRE FENCING TO POSTS



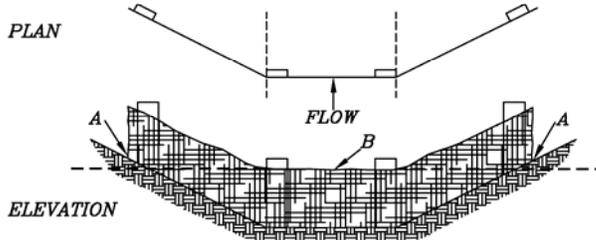
3. ATTACH FILTER MATERIAL TO WIRE FENCE AND EXTEND IT INTO THE TRENCH.



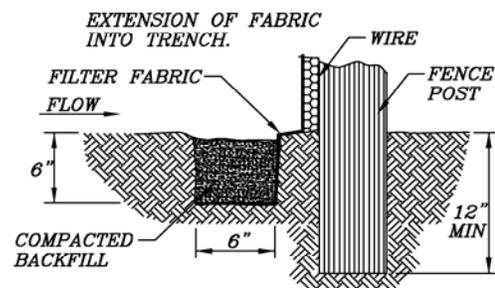
4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



5. PROPER PLACEMENT OF A FILTER BARRIER IN A DRAINAGE WAY



POINTS A SHOULD BE HIGHER THAN POINT B



General Notes:

Not to Scale

1. Woven wire fence to be fastened securely to fence posts with staples or with wires ties.
2. Filter fabric to be fastened securely to woven wire fence, with ties spaced every 24 inches at top and midsection.
3. When two section of filter fabric adjoin each other, they shall be overlapped 6 inches at the posts, and folded.
4. If hot rolled steel posts are used, maximum post spacing can be 6 feet.



FIGURE 4.3-1
BMP 4311
REINFORCED FILTER FABRIC BARRIER

4.3.2 Sediment Traps

A. Definition

A **sediment trap** is a small temporary basin formed by excavation and/or an embankment to intercept sediment-laden runoff and to trap and retain the sediment.

B. Purpose

The purpose of a sediment trap is to intercept sediment-laden runoff and trap the sediment to protect drainageways, properties, and rights-of-way below the sediment trap from sedimentation.

C. Conditions Where Practice Applies

A sediment trap usually is installed at points of discharge from disturbed areas less than 5 acres. If drainage site is larger than 5 acres, multiple sediment traps are recommended or a single large sediment basin is recommended, as appropriate. (For Sediment Basin, see Section 4.3.3).

D. Planning Considerations

The sediment 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.

E. Design Criteria and Requirements

It is recommended that the volume of a sediment trap as measured at the elevation of the crest of the outlet be at least 1,800 cubic feet per acre of drainage area. The trap must be large enough to allow sediment to settle and must have the capacity to store the collected sediment until it is removed. The volume of the trap shall be calculated using standard mathematical procedures.

Excavation operations should be carried out in such a manner that erosion and water pollution will be minimal. Any excavated portion of sediment trap should have 2:1 or flatter slopes. The embankment should be mechanically compacted.

Sediment traps are named according to the type of outlet. Each type has different design criteria and will be discussed separately. The outlets should be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion of the outlet does not occur. A trap may have several different outlets with each outlet conveying part of the flow based on the criteria below, and the combined outlet capacity shall meet that criteria.

A **stone outlet sediment trap** consists of a basin formed by an embankment or excavation and an embankment. The outlet for the trap is over a level stone section. To provide for a ponding area, a triple layer of geotextile fabric-wrapped stone core having a nominal diameter of one (1) foot shall be placed in the outlet structure. The core shall be covered by a minimum of six (6) inches of stone.

The minimum length (feet) of the stone outlet should be equal to six (6) times the drainage area (acres). The crest of the outlet (top of stone) shall be at least one (1) foot below the top of the embankment. Unless otherwise specified, all stone used should be at least three (3) inches thick and shall not exceed 1/2 cubic foot in volume (see drawing for *Stone Outlet Sediment Trap* for details).

An **excavated earth outlet sediment trap** is constructed at an opening or junction point of diversion dikes. A sedimentation area is excavated at this location to pond

runoff, to reduce its velocity, and to cause sedimentation. The crest over which runoff must flow is level with the natural ground, and its length is defined by the width of the excavation. The minimum length of the crest in feet should be equal to four (4) times the drainage area in acres.

An **embankment earth outlet sediment trap** is defined by a crest formed on a dike to allow runoff to be released at that location. The length of the crest (feet) should be equal to four (4) times the drainage area (acres). The embankment at the crest should have a top width of four (4) feet and have 2:1 side slopes. An emergency outlet in the embankment should be provided as shown in Figure 4.3-4, BMP 4323.

Each trap should be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan should have a number, and the numbers should be consecutive.

The following information should be shown for each trap in summary table form on the same trap drawing sheet:

- Type of trap
- Size of outlet
- Trap dimensions
- Embankment height and excavation depth
- Drainage area

F. Inspection and Maintenance

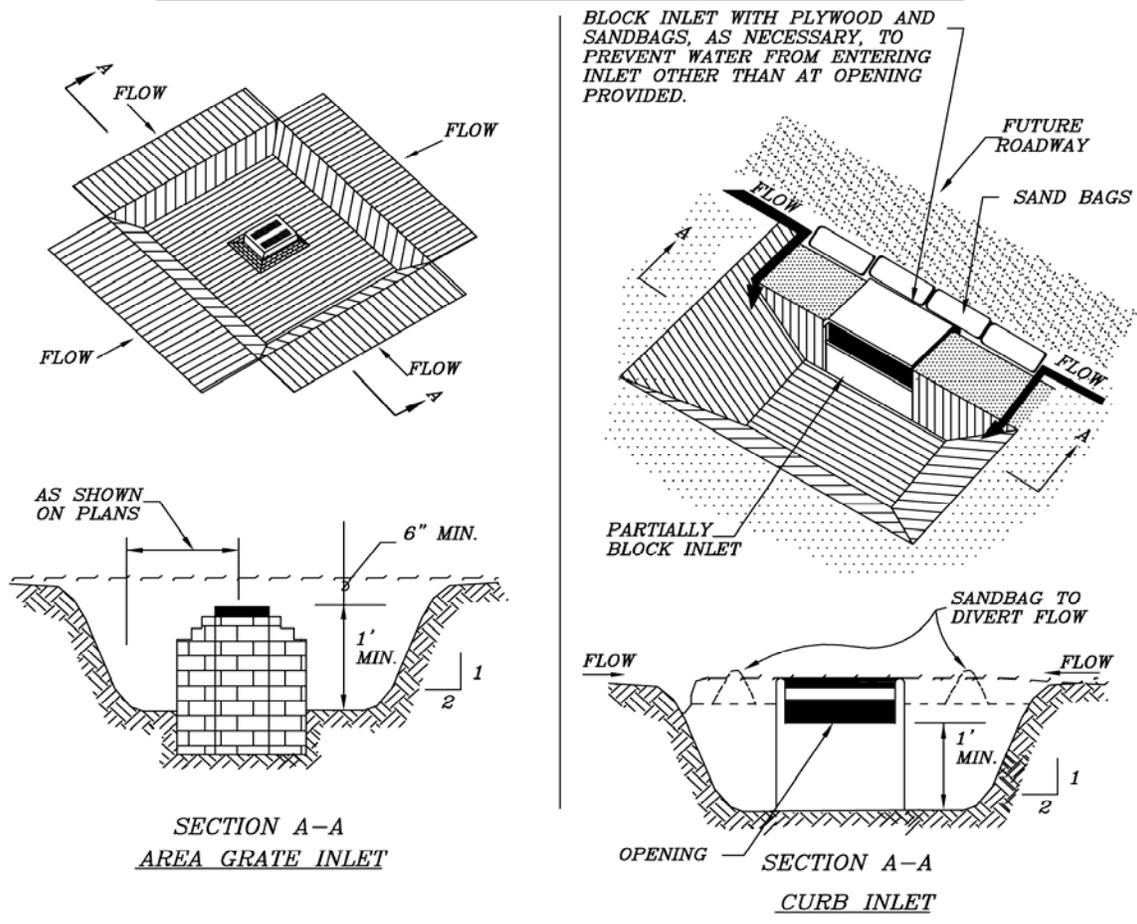
The sediment trap will be inspected once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repairs will be made promptly.

Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to one-third of the design depth of the trap or one (1) foot, whichever is less. Sediment removed from the trap should be deposited in an approved spoil area and in such a manner that it will not cause additional sedimentation.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4321	Stone Outlet Sediment Trap
Item No. 4322	Excavated Earth Outlet Sediment Trap
Item No. 4323	Embankment Earth Outlet Sediment Trap

STORM INLET SEDIMENT TRAPS



NOTE: WHERE CURB IS IN PLACE, PROVIDE A 1' WIDE OPENING IN THE CURB, OR USE A SANDBAG DAM TO FORCE WATER OVER THE CURB TO THE TRAP.

General Notes:

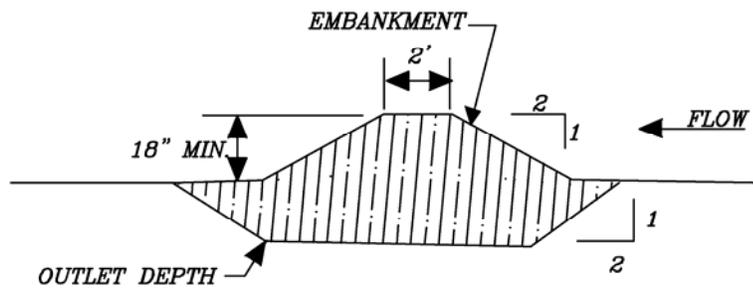
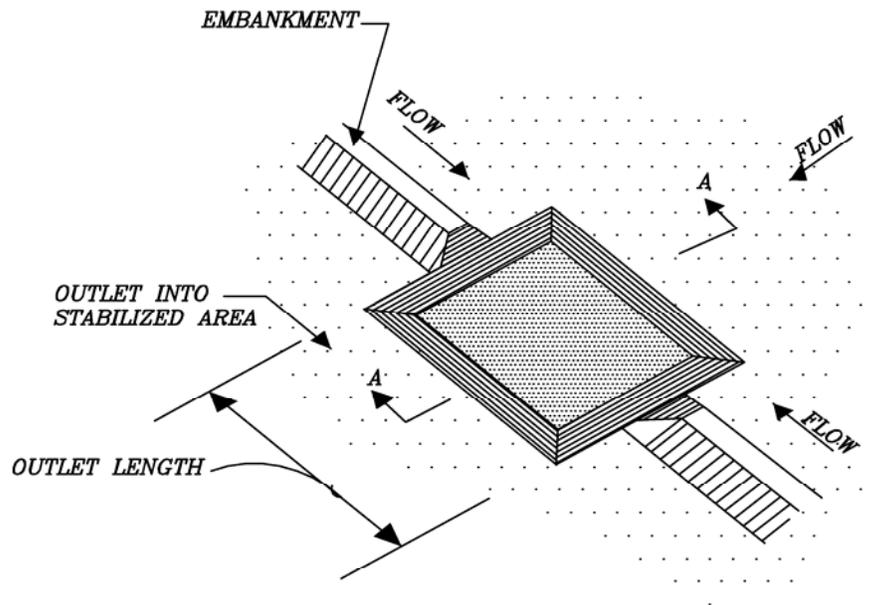
Not to Scale

1. Rock and geotextile fabric shall be as indicated by this specification.
2. Dimension – Limit of excavation and outlet length and height shall be as indicated on the construction drawing.
3. Side slope shall be 2:1 or flatter.
4. Maintain a minimum of 6 inches between top of core material and top of stone outlet, a minimum of 4 inches between bottom of core material and existing ground and a minimum of 1 foot between top of stone outlet and top of embankment.
5. Rock shall be embedded a minimum of 4 inches into existing ground.
6. Core shall be a minimum of 1 foot in height and in width and shall be wrapped in geotextile fabric.
7. Ponding on sediment laden runoff in sediment trap accomplished by embankment or excavation depending on terrain. Reference construction drawings for trap type and dimensions.
8. Outlet into stabilized area.



FIGURE 4.3-2
BMP 4321
STONE OUTLET SEDIMENT TRAP

EXCAVATED EARTH OUTLET SEDIMENT TRAP



SECTION A-A

Not to Scale

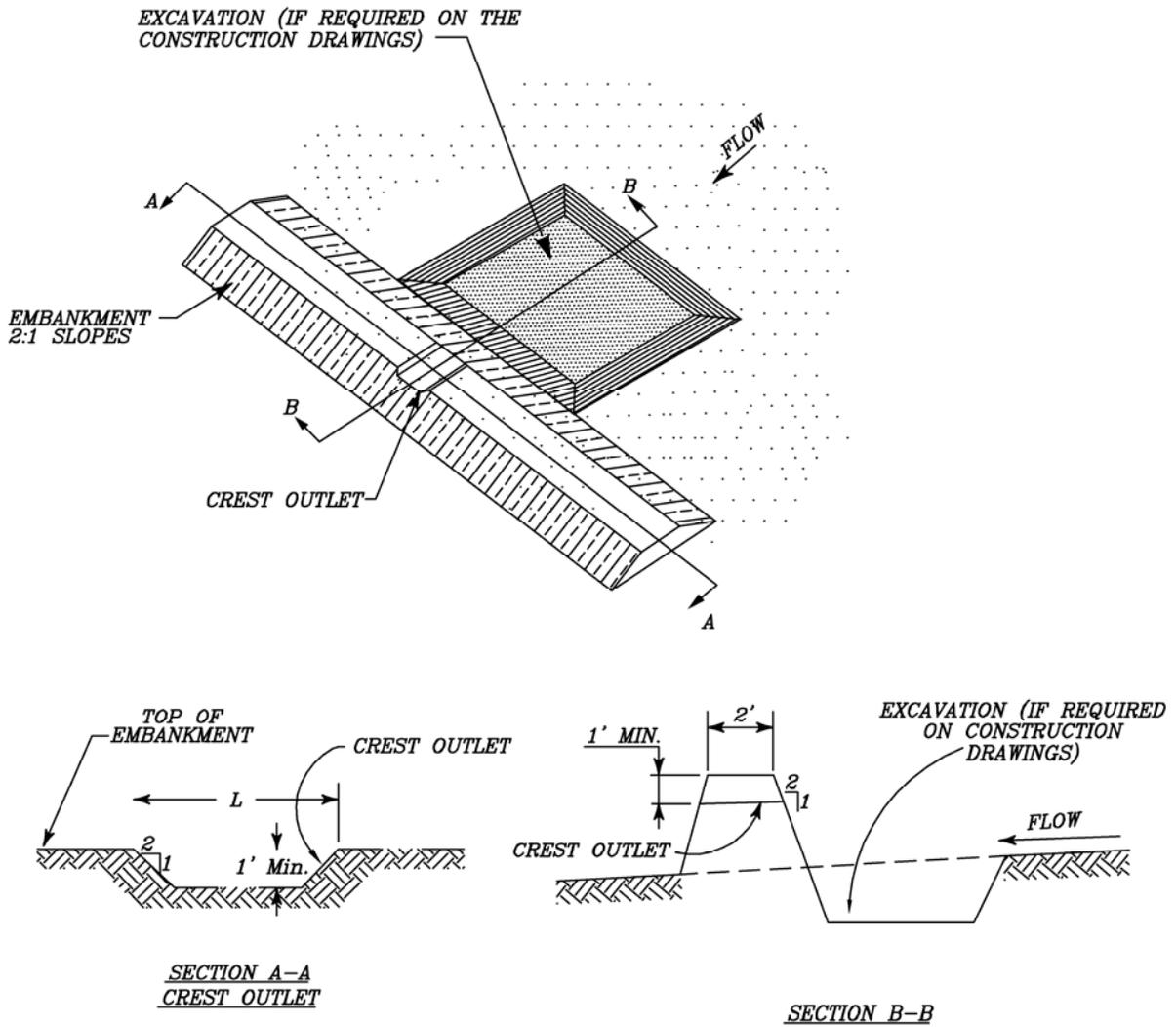
General Notes:

1. Construct the trap in accordance with the dimensions shown on the construction drawings.
2. Top width of embankment shall be 2 feet.
3. Side slopes shall be 2:1 or flatter.
4. Outlet onto stabilized area.



FIGURE 4.3-3
BMP 4322
EXCAVATED EARTH OUTLET
SEDIMENT TRAP

EMBANKMENT EARTH OUTLET SEDIMENT TRAP



Not to Scale

General Notes:

1. Construct the trap in accordance with the dimensions shown on the construction drawings.
2. Top width of embankment shall be 2 feet.
3. Side slopes shall be 2:1 or flatter.
4. Outer crest outlet flowline shall be at least 1 foot below the top of the embankment.
5. Outlet onto stabilized area with level spreader.



FIGURE 4.3-4
BMP 4323
EMBANKMENT EARTH OUTLET SEDIMENT TRAP

4.3.3 Sediment Basin

A. Definition

A **sediment basin** is a temporary basin or dam constructed across a waterway or excavated location to intercept sediment-laden runoff and to trap and retain the sediment.

B. Purpose

The purpose of a sediment basin is to intercept sediment-laden runoff and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity allows the larger particles to settle out in order to protect drainage ways, properties, and rights-of-way below the sediment basin from sedimentation.

C. Conditions Where Practice Applies

A sediment basin applies where physical site conditions or land ownership restrictions preclude installation of barrier-type erosion control measures to control runoff, erosion, and sedimentation adequately. A sediment basin may be used below construction operations which expose critical areas to soil erosion.

D. Planning Considerations

Sediment basins should only be used on sites where failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use of service of public roads or utilities.

For drainage areas serving 10 or more acres, a temporary (or permanent) sediment basin, or equivalent control measures, should be provided where attainable until final stabilization of the site. The sediment basin should provide storage for a calculated runoff volume from a 2-year, 24-hour storm. In Harris County, a 2-year, 24-hour storm results in rainfall of 5.5 inches. Using a runoff coefficient of 0.35, the calculated storage volume for Harris County is 7,000 cubic feet of storage per drained acre. When computing the runoff volume, it is 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. Where a temporary (or permanent) sediment basin or equivalent controls are not attainable, smaller sediment basins and/or sediment traps should be used.

For drainage areas serving less than 10 acres, sediment basins and/or sediment traps may be used. At a minimum, filter fabric fences or equivalent sediment controls are required for all sideslope and downslope boundaries of the construction area unless a sediment basin providing storage for a calculated runoff volume from a 2-year, 24-hour storm (7,000 cubic feet of storage per acre drained) is provided.

E. Design Criteria and Requirements

1. The sediment basin should be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It should be located to minimize interference with construction activities and construction of utilities.
2. Size of the basin: The volume of the sediment basin, as measured from the bottom of the basin to the elevation of the crest of the low-flow riser, should have a storage capacity for a 2-year, 24-hour storm or 7,000 cubic feet per acre

drained. If this storage volume is not attainable, either due to site conditions, area availability, or public safety, then a smaller volume may be provided, but in no case should the volume be less than 1,800 cubic feet per acre drained.

The required basin volume can be calculated as follows:

$$V_{Total} = V_A * DA$$

Where, V_{Total} = Total storage volume, cf

V_A = Required storage volume per acre of drainage area, cubic feet per acre

DA = Drainage area, acres

The basin volume is also based on the length, width, depth, and side slopes. For basins with uniform width, the basin volume is calculated as follows:

$$V_{Total} = rhw^2 + sh^2(1+r)w + \frac{4}{3}s^2h^3$$

Where, r = Ratio of length to width

h = Average basin design depth, feet

s = Side slope in ratio of horizontal to vertical run for all sides of the basin

w = Basin width, feet

Solving for basin width,

$$w = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

Where, $a = rh$

$b = sh^2(1+r)$

$c = 4/3 s^2h^3 - V_{Total}$

The total basin area then can be calculated as:

$$A = rw^2 + 2shw(1+r) + 4s^2h^2$$

Where A = Total basin area at the surface, square feet

The table below shows the minimum basin area required to provide storage volume for 7,000 cubic feet per acre drainage area and the recommended excavation area. The recommended excavation area is based on a minimum basin depth of three (3) feet. The minimum three (3) feet depth accounts for the depth of the inflow channel or pipe. The basin depth is increased to five (5) feet for larger drainage areas to minimize the excavation area needed for the required volume. Assumptions used for the basin dimension table are one (1) foot of freeboard to the crest elevation; 3:1 side slopes; and a length to width ratio of 2:1. This does not include additional area which may be required for a maintenance berm or access.

Drainage Area (acres)	Storage Volume ¹ (cu ft)	Basin Floor Surface Area (acres)	Recom'd. Bottom Width ² (feet)	Recom'd. Bottom Length (feet)	Recom'd Effective Depth ³ (ft)
1	7,000	0.08	25	50	3
5	35,000	0.35	70	140	3
10	70,000	0.45	70	140	5
20	140,000	0.83	105	210	5
50	350,000	1.92	175	350	5
100	700,000	3.60	250	500	5

¹ Values are based on 2-year, 24-hour storm data for Houston/Harris County.

² Values are rounded up to a multiple of 5.

³ Basin shall have at least one foot of freeboard beyond the effective depth shown here.

The basin dimensions necessary to obtain the required basin volume, as stated above, should be shown clearly on the plans to facilitate plan review, construction, and inspection.

3. Riser design: A vertical pipe or box-type riser joined (watertight connection) to a pipe (barrel) should extend through the embankment and outlet beyond the downstream toe of the fill.
 - The minimum size of the barrel should be eight (8) inches in diameter.
 - The riser materials should be either corrugated metal, PVC, HDPE, or other suitable plastic material pipe.
 - Filter fabric shall be as specified in Section 4.2.1 - Filter Fabric Fences.
 - The crest elevation should be at least 18 inches above the top of the riser.
 - The riser should be designed to provide for automatic dewatering following a storm event. This can be achieved by using perforated pipe wrapped with a well-secured filter cloth. Drawdown time should exceed 30 hours.
 - An antivortex device and trash rack should be installed securely on top of the riser.
 - The riser should have a base attached with a watertight connection and should have sufficient strength to prevent flotation of the riser.
 - Antiseep collars shall be required when the soil conditions or length of service make piping through the backfill a possibility.
 - The number of collars shall be determined from the backfill conditions and the length of pipe installed.
 - Cutoff collars will be spaced at not more than 25-foot centers. If only one (1) is used, it should be placed not more than 25 feet from the riser. Collars and their connections to the pipe should be watertight and should be located no closer than two (2) feet to a pipe joint.

There are two types of risers that can be used to control the drawdown time: 1) a perforated riser, and 2) a slotted slow release riser. For a perforated riser the total

area of all holes required to regulate the outflow to achieve the drawdown time can be calculated as follows:

$$A_p = \frac{V}{120.3\Delta t\sqrt{\Delta h}}$$

Where, A_p = Total required perforation area, square inches
 V = Design Storage Volume, cubic feet
 Δt = Drawdown time of 24 hours or greater, hours
 Δh = Effective depth of basin, feet

To obtain the number of 1/2" diameter holes required, divide the area A_p by 0.196. Wrap filter fabric around the riser pipe to prevent clogging. Perforated riser is only recommended for drainage area of 20 acres or more.

The second type of riser for slow release is the slotted slow release riser with a reduced orifice. The slotted slow release riser is more resistant to clogging and is recommended over the perforated riser. The slot may be rectangular or round which allows water to flow in freely. The reduced orifice can either be a plate that controls the discharge or a reducer pipe.

The total orifice area can be calculated by using the following formula:

$$A_o = \frac{A_T \sqrt{\Delta h}}{100.3c\Delta t}$$

Where, A_o = Total required orifice area, square inches
 A_T = Basin area, square feet
 Δh = Effective basin depth, feet
 Δt = Drawdown time, hours
 c = Average orifice discharge coefficient, 0.6

The following table shows the minimum orifice diameter required to provide a 30-hour drawdown time for a storage volume of 7,000 cubic feet per acre.

Drainage Area (acres)	Min. Pipe Size for Perforated Riser (in)	Perforated Area (sq in)	Number of 1/2" holes ¹	Number of 1/2" Holes per Row	Number of 1/2" Rows ²	Orifice Size Diam. ³ (in)
1	8	-	-	-	-	3
5	8	-	-	-	-	5
10	8	-	-	-	-	6
20	8	17	89	25	6	8
50	12	43	222	31	9	12
100	14	87	443	43	19	16

¹ Perforated Riser is not recommended for drainage area of less than 20 acres.

² Rows of 1/2" holes are staggered. Vertical spacing between perforated row (center to center) is 2.5 inches.

³ Vertical spacing between slotted row (center to center) is 2.5 inch.

4. Embankment cross section: The minimum top width shall be four feet. The side slopes should not be steeper than 2:1.

Careful consideration should be given to the design of the embankment height. It should be at least 12 inches higher than the top of the riser pipe and should be low

enough not to cause flooding or backup of the upstream area. Weir structures, check dams, or emergency spillways may be needed.

5. Entrance of runoff into basin: Points of entrance of surface runoff into excavated sediment basins should be protected to prevent erosion. Diversions, grade stabilization structures, or other water control devices should be installed as necessary to assure direction of runoff and to protect points of entry into the basin.
6. Safety: It is recommended that sediment basins be fenced or otherwise made inaccessible to people or animals, unless this is deemed unnecessary due to the remoteness of the site or other circumstances.
7. Information to be considered in design:

Sediment basin design and construction plans should be done in accordance with local entity criteria and submitted for review, and should include the following:

- Specific location of basin
- Geotechnical information
- Plan view of dam and storage basin
- Cross section of dams and riser
- Details of pipe connections, riser to pipe connection, riserbase, trash rack, antivortex device and when required, antiseep collars
- Runoff calculations for the 2-year 24-hour storm. If this calculation is not performed, use 7,000 c.f./acre
- Storage computation:
 - Total drainage volume required.
 - Total required (2-yr., 24-hr. volume or total drainage area x 7,000 c.f./ac.).
 - Total available (calculated volume of basin).
 - Level of sediment at which cleanout shall be required; to be stated a distance from the riser crest to the sediment surface (elevation below which volume represents one third of basin volume).
- Calculations showing design of piping, including perforated or slotted holes.
- Other information deemed necessary by the reviewing public entity.

F. Inspection and Maintenance

The sediment basin should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.

The sediment basin should be cleaned out when the volume as described above is reduced by one-third, except in no case should the sediment level be permitted to build up higher than one (1) foot below the principal spillway crest. This cleanout should restore the original design volume to the sediment basin. The elevation corresponding to the maximum allowable sediment level should be determined

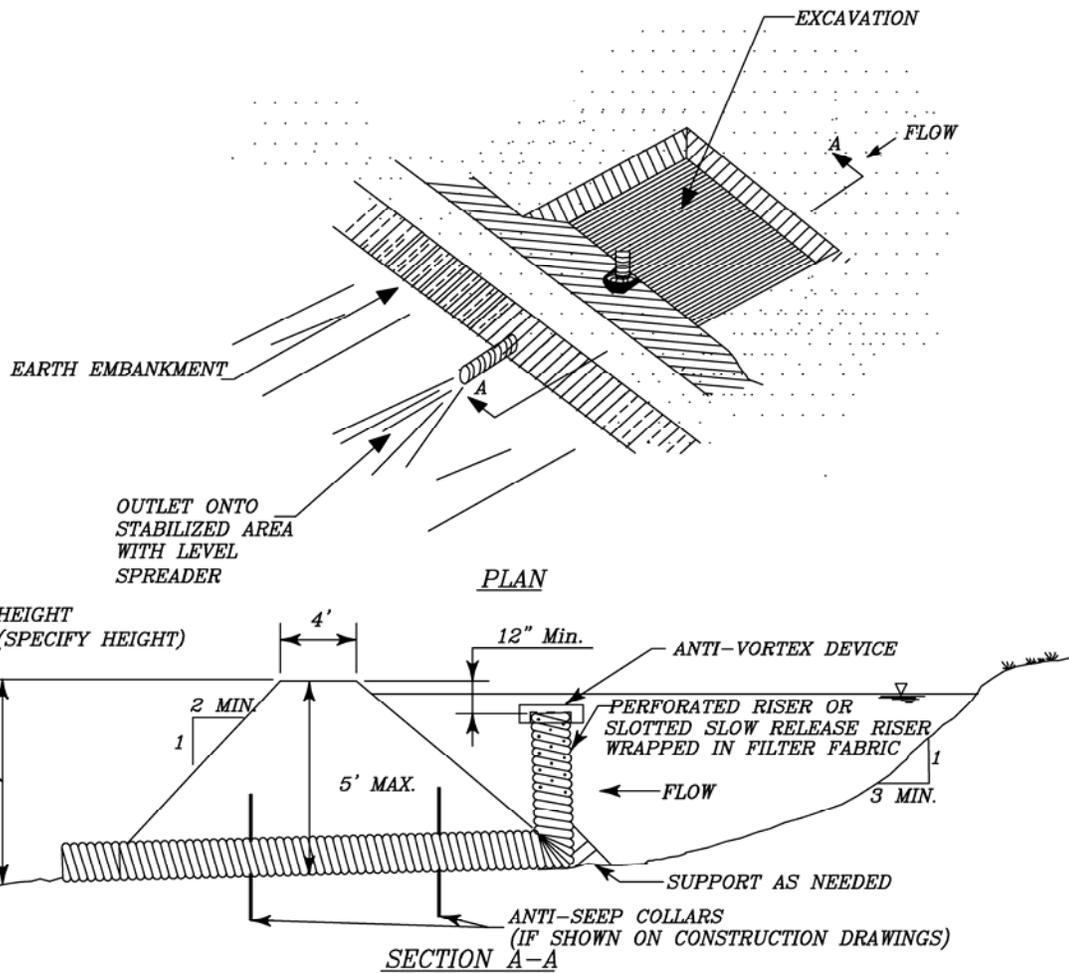
during the design of the basin and should be stated on the final plans as a distance below the top of riser and should be clearly marked on the riser.

The disposed sediment should be placed in an approved spoil disposal site.

G. Corresponding Technical Specifications (Refer to Appendix C)

- Item No. 4331 Sediment Basin with Pipe Outlet
- Item No. 4332 Sediment Basin with Stone Outlet

SEDIMENT BASIN WITH PIPE OUTLET



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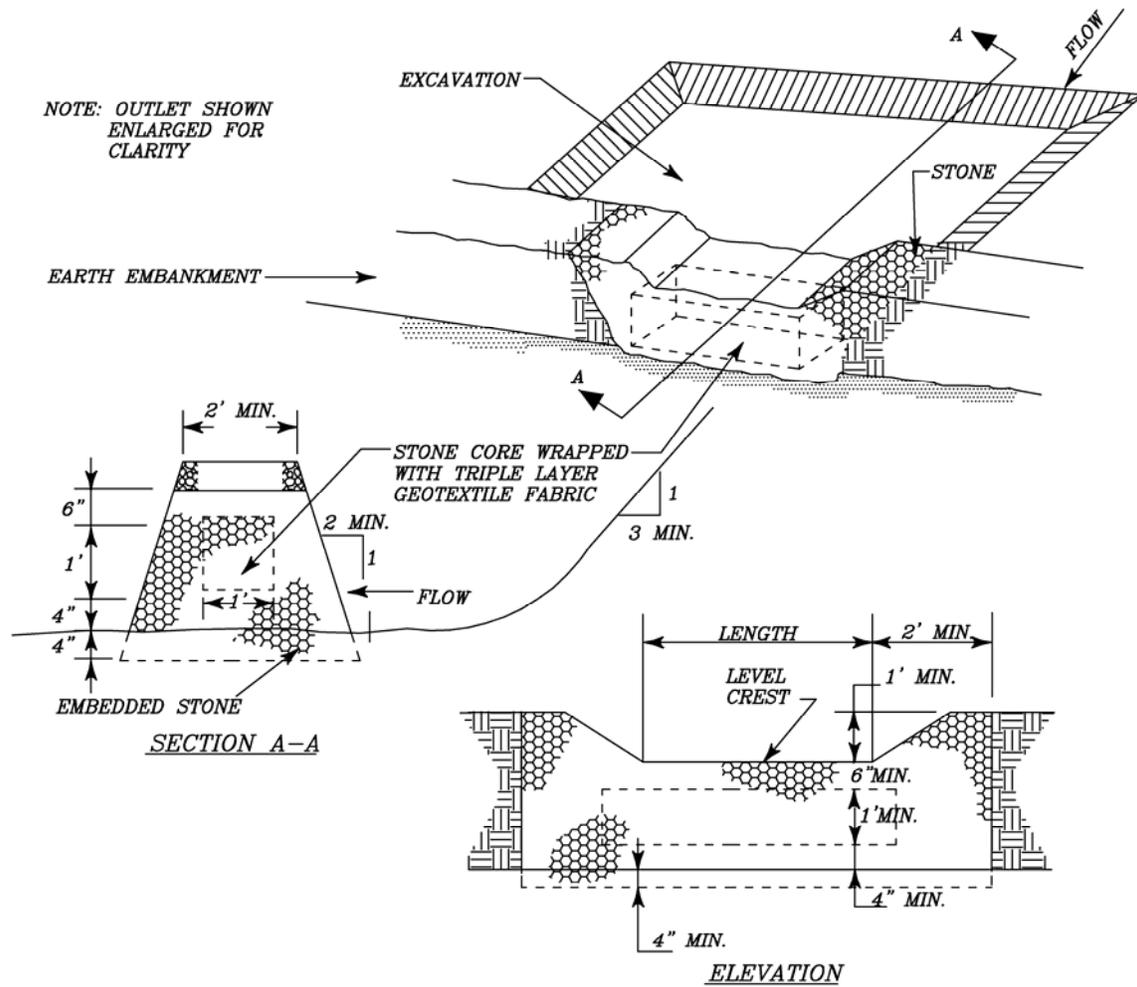
General Notes:

1. Pipe material – corrugated metal pipe, PVC, HDPE, or other plastic material.
2. Filter fabric – see Item 4211.
3. Dimensions – (specify limit of excavation and pipe diameter on this or on the construction drawings.)
4. Riser perforation or slots – (here or on the construction drawings.)
5. All pipe connections shall be watertight.
6. Fill material around pipe shall be compacted in 4 inch lifts. A minimum of 2 feet of compacted backfill shall be placed over the pipe before crossing it with construction equipment.
7. Ponding of sediment laden runoff in sediment basin accomplished by embankment or excavation depending on terrain. Show on this drawing or reference construction drawing for basin type and dimensions.
8. Side slopes shall be 2:1 or flatter.



FIGURE 4.3-5
BMP 4331
SEDIMENT BASIN WITH PIPE OUTLET

SEDIMENT BASIN WITH STONE OUTLET



Not to Scale

General Notes:

1. Specify dimensions limit of excavation and outlet length and height on this or on the construction drawings.
2. Filter fabric – see Item 4211.
3. Maintain a minimum of 6 inches between the top of the core material and the top of the stone outlet, a minimum of 4 inches between bottom of core material and existing ground and a minimum of 1 foot between the top of stone outlet and the top of embankment.
4. Rock shall be embedded a minimum of 4 inches into the existing ground.
5. Core shall be a minimum of 1 foot in height and in width and shall be wrapped in a triple layer of geotextile fabric.
6. Ponding of sediment laden runoff in sediment basin accomplished by embankment or excavation depending on terrain. Show on this or reference construction drawings for basin type and dimension.
7. Outlet onto stabilized area.
8. Side slopes shall be 2:1 or flatter.



FIGURE 4.3-6
BMP 4332
SEDIMENT BASIN WITH STONE OUTLET

4.3.4 Sandbag Barrier

A. Definition

A **sandbag barrier** is a temporary sediment barrier constructed of stacked sandbags installed across a channel or right of way in a construction or disturbed area.

B. Purpose

To intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment and release water in sheet flow.

C. Condition Where Practice Applies

Sandbag barriers are used during construction activities in unstabilized minor swales, ditches, or streambeds when the contributing drainage area is no greater than 2 acres. For larger contributing areas, sediment traps or sediment basins should be used.

D. Planning consideration

Under normal conditions, sandbag barriers require removal of trapped sediment. If maintenance is difficult due to location or presence of wet soils that prohibit prompt cleaning after runoff events, additional parallel barriers should be constructed.

E. Design Criteria and Requirements

A detailed design is not required for installation of a sandbag berm; however, the following criteria shall be observed:

Drainage Area Less than two (2) acres.

Sandbag Size Length 18 to 24 inches, width 12 to 18 inches, and thickness six (6) to eight (8) inches. Weight approximately 40 to 50 pounds, not to exceed 75 pounds.

Fabric Specification Material

Sandbag Material shall meet the following specifications:
Polypropylene or polyethylene woven fabric, minimum unit weight of four (4) ounces per square yard, minimum grab strength of 100 psi in any principal direction (ASTM D 4632), puncture strength exceeding 300 psi (ASTM D 4833), and ultraviolet stability exceeding 70 percent after 500 hours of exposure (ASTM D 4355).

Sand Grade Coarse sand.

F. Inspection and Maintenance

1. Sandbag barrier shall be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement shall be made immediately.
2. Sediment deposits should be removed after each storm event and no later than at such time as deposits reach one-third the height of the barrier.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4312 Sandbag Barrier

4.3.5 Bagged Gravel Barrier

A. Definition

A **bagged gravel** is a temporary sediment barrier constructed of stacked bags of gravel installed across a channel or right of way in a construction or disturbed area.

B. Purpose

To intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment and release water in sheet flow.

C. Condition Where Practice Applies

Bagged gravel barriers are used during construction activities in unstabilized minor swales, ditches, or streambeds when the contributing drainage area is no greater than 2 acres. For larger contributing areas, sediment traps or sediment basins should be used.

D. Planning consideration

Under normal conditions, bagged gravel barriers require removal of trapped sediment. If maintenance is difficult due to location or presence of wet soils that prohibit prompt cleaning after runoff events, additional parallel barriers should be constructed.

E. Design Criteria and Requirements

A detailed design is not required for installation of a bagged gravel berm; however, the following criteria shall be observed:

Drainage Area Less than two (2) acres.

Bag Size Length 18 to 24 inches, width 12 to 18 inches, and thickness six (6) to eight (8) inches. Weight not to exceed 75 pounds.

Fabric Specification Material

Bag Material shall meet the following specifications:

Polypropylene or polyethylene woven fabric, minimum unit weight of four (4) ounces per square yard, minimum grab strength of 100 psi in any principal direction (ASTM D 4632), puncture strength exceeding 300 psi (ASTM D 4833), and ultraviolet stability exceeding 70 percent after 500 hours of exposure (ASTM D 4355).

Gravel Aggregates are to consist of gravel composed of clean, hard, durable materials free from adherent coatings, salts, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic or injurious matter.

F. Inspection and Maintenance

1. Bagged gravel barrier shall be inspected within 24 hours after each rainfall of 0.5 inches or greater, daily during periods of prolonged rainfall, and minimally, at least once every 14 calendar days. The SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. Repair or replacement shall be made immediately.
2. Sediment deposits should be removed after each storm event and no later than at such time as deposits reach one-third the height of the barrier.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4351 Bagged Gravel Barrier

4.4 BEST MANAGEMENT PRACTICES FOR ESTABLISHING PERMANENT DRAINAGEWAYS

Site modifications change local drainage patterns, resulting in increased runoff in existing or new drainageways. This occurs during and after construction. Planned permanent drainageways, whether existing or new, require careful design to provide proper conveyance without causing erosion and to improve water quality during and after construction. This practice applies to channels, including ditches, swales and diversions, constructed as part of a development to transport surface runoff. This does not apply to major, continuously flowing natural streams. This section focuses on considerations related to erosion and sedimentation control. The Best Management Practices (BMPs) shown were taken from various sources. Applicable design criteria for the appropriate agency should be consulted for evaluation of shape, depth, and capacity of permanent drainage channels.

Drainageway practices include:

- Vegetated channels:
 - Sodding* (Section 4.4.2)
 - Grassed waterway* (Section 4.4.3)
 - Reinforced grassed waterway* (Section 4.4.4)
- Lined Channels:
 - Riprap* (Section 4.4.5)
 - Lined waterways* (Section 4.4.6)

4.4.1 Permanent Drainageway Considerations

The two primary elements in drainageway design are cross-section shape and lining. The two main design considerations are capacity and erosion resistance, which require evaluation of flow volume and velocity.

A. Cross-Sections

Use the local public entity's design criteria for cross-sectional geometry. Three typical cross-sections are:

Triangular (V-shaped): For relatively small flows, such as along roadsides. Flow velocities may range from low to high, depending on channel slope and lining.

Parabolic: For larger flows and where space is available for a wide, shallow channel with low-velocity flow.

Trapezoidal: For large flows and relatively high velocities. Lining typically is concrete or riprap.

B. Capacity

The capacity of a permanent drainageway should be evaluated using local public entity's design criteria.

C. Velocity

Drainageways should be designed so that the expected flow velocity from the design storm does not exceed the permissible velocity for the type of lining used.

Outlets should be checked for stability. Excessive velocities or grade changes may require protective or stabilizing structures, transition sections, or energy dissipators to prevent erosion or scour.

Velocities also can be controlled by using sod or seed and mulch practices on contributing land surfaces to reduce entering discharges and velocities.

D. Lining

Lining is determined by erosion resistance and drainage requirements. All-vegetated linings are appropriate for low velocities. See the following sections for discussion of grass-lined channels. Riprap, properly sized and graded, may be used for low to high velocities. Gabions have design stability limits. Concrete linings have no specific velocity limit, but velocities in concrete channels must not exceed the permissible velocity of the receiving channel.

4.4.2 Sodding

A. Definition

Sodding is the application of sod rolls or mats to rapidly establish a permanent grass cover to stabilize disturbed areas.

B. Purpose

Used to prevent channel erosion by protecting soil surfaces and decreasing flows and velocities, through in-channel and upland flow retardance and infiltration. Stabilizes disturbed areas to minimize erosion by decreasing the velocity of sheet flow.

C. Conditions Where Practice Applies

Sodding may be used where initial flow velocity is low to moderate.

Sodding can be applied to unstabilized swales, ditches, or diversions where flow velocities are less than five (5) feet per second. For greater velocities, see Section 4.4.4 Reinforced Grass Waterways.

Sodding is also applicable to any disturbed area with overland flow runoff.

D. Planning Considerations

Sod may provide more permanent cover than seeding or mulching.

Sodding also includes sod ditch checks.

E. Design Criteria and Requirements

1. Preparation:

Test the soil to determine soil additive and fertilizer requirements. Additives should be spread evenly over the area and incorporated into the top 4 to 8 inches of soil. Topsoil may be used.

Before laying the sod, clear the soil surface of stones, debris sticks and clods larger than 2 inches in diameter. Grade the surface, filling or leveling to avoid standing water, and to achieve a level final grade.

Firm the soil by rolling or cultipacking. Avoid excessive compaction from the use of heavy equipment on the area.

2. Installation:

Install the sod no later than 7 days after final grading of the channel or area.

The sod must be moist, and installation should be completed within 2 days of harvest.

Begin placement downslope, and progress upslope. Placement shall be in staggered rows, as in laying bricks, at right angles to the direction of flow.

For grassed waterways, edges should butt tightly together. Extend the sod sideward from the channel centerline to a point at least 1 foot in elevation above the flowline elevation. Along the perimeter of the sodded area, one strip of sod should be extended outward a minimum of 30 inches beyond others at 8-foot intervals or closer.

On slopes of 3:1 or greater, or wherever erosion may be a problem, secure the sod with stakes or staples. In critical areas, secure sod with netting and staples.

Roll newly installed sod to establish firm contact between roots and soil.

Irrigate well after rolling. Keep the sodded areas moist until the grass takes root.

3. Sod Checks For Channels:

Sod checks are rows of sod laid laterally from berm to berm across a swale or ditch to decrease flow velocity and should be 6 feet wide and placed at increments of:

$$\frac{1}{\text{channel slope}} * 1 \text{ foot}$$

For example, sod checks shall be placed every 50 feet along a channel with a slope of 0.02.

F. Inspection and Maintenance

After the first week, water as needed to maintain adequate moisture in the root zone and to prevent dormancy of the sod.

Mow only after the sod is firmly rooted, usually in about 2 to 3 weeks. Do not remove more than 1/3 of the shoot during mowing.

Maintain grass height between 2 to 3 inches unless otherwise specified.

Inspect sod within 24 hours after each rainfall or daily during periods of prolonged rainfall. Damaged sod should be repaired or replaced immediately.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4421 Sodding

4.4.3 Grassed Waterways

A. Definition

A **grassed waterway** is a constructed drainageway or channel with vegetated lining established by sodding or seeding.

B. Purpose

To prevent channel erosion by providing a protective cover and decreasing velocity through retardance.

C. Conditions Where Practice Applies

Grassed waterways may be used to convey flows with velocities of no more than 5 ft/sec. Grass type, slope and soil conditions will determine final allowable velocities

D. Planning Considerations

Permissible 25-year velocities and Manning’s “n” values are on the table below.

MANNING’S “n” VALUES AND ALLOWABLE 25-YEAR VELOCITIES FOR CHANNEL DESIGN			
Channel Description	Roughness Coefficient or Manning’s “n” Value	Average Velocity (feet per second)	Maximum Velocity (feet per second)
Grass Lined: Predominately Clay	0.04	3.0	5.0
Predominately Sand	0.04	2.0	4.0

Source: *Harris County Flood Control District, Criteria Manual for the Design of Flood Control and Drainage Facilities.*

Channels should be located to conform with and use the natural system. The channel course should avoid sharp changes in direction or grade.

Grass-lined channels must not be subject to sedimentation from disturbed areas. Sediment traps may be needed at channel inlets and outlets.

Grass-lined channels should be constructed early in the project before grading and paving increase runoff rates so that dense, resistant vegetation can be established before use of the channel. Temporary water diversions may be needed until the vegetation is established.

Protective liners, such as geotextiles or special mulch protection, may be needed until the vegetation is established. If design velocities exceed 2 ft/sec for bare soil conditions, these protections must be used for seeding practices, or sodding must be used.

E. Design Criteria and Requirements

Timing Vegetation and any protective materials shall be installed within 7 days of final channel grading.

Capacity The capacity of the channel and the required width and depth dimensions should be evaluated in accordance with existing regulatory entity’s design criteria.

Outlets All grassed waterways shall have a stable outlet with adequate capacity, and designed and built to prevent erosion of channels and banks.

F. Inspection and Maintenance

Grassed waterways should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. During the initial establishment period, repairs and replacements should be made immediately.

After the grass has become established, the channel should be checked periodically. All repairs or replacement should be made as soon as possible. If the channel is to be mowed, it should be done in a manner that will not damage the grass. No more than 1/3 of the shoot should be removed with any mowing.

4.4.4 Reinforced Grassed Waterways

A. Definition

Reinforced grassed waterways are waterways with vegetated linings that are reinforced with a structural or fabric matrix, or include reinforced sections, for higher velocity conveyance, erodible soils, or baseline flow.

B. Purpose

To prevent channel erosion by providing a protective cover, and decreasing flows and velocity through retardance and infiltration.

C. Conditions Where Practice Applies

Waterways with grass linings may be used to convey flows with velocities of no more than 6 ft/sec. Reinforcement matrices allow higher velocities, or use with less resistant soils.

Rock or concrete centers are suitable where there are high velocity permanent baseline flows.

D. Planning Considerations

Where stone pavers, grid pavers or other erosion-resistant material are used to supplement the vegetation, velocities can be increased by 2.0 ft/sec.

Stone or riprap centers are subject to clogging from sediment. Proper rock size for stone centers can be determined from Figure 4-1 in Section 4.4.5.

Geotextile reinforced grassed waterways are a relatively new practice for stabilizing vegetated channels, and require careful engineering analysis and design.

Temporary sediment control measures such as mulching and filter fabric barriers may be needed in conjunction with the geotextile matrix.

E. Design Criteria and Requirements

Timing Vegetation and any protective materials should be installed within seven (7) days of final channel grading.

Capacity The capacity of the channel and the required width, depth and other dimensions should be evaluated in accordance with existing regulatory entity design criteria.

Energy Dissipation

Riprap or gabions should be placed for a length of at least 20 feet from storm sewer outfalls and other conveyance structures to dissipate energy associated with turbulent flow.

Outlets

All grassed waterways should have a stable outlet with adequate capacity, and designed and built to prevent erosion of channels and banks.

Placement of Reinforcement Material

Materials shall be placed and anchored to the manufacturers' specifications.

Geotextile matrices may be utilized as root-reinforcement, and shall extend up the side slope.

F. Inspection and Maintenance

Grassed waterways should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days until the vegetation is well established. During the initial establishment period, repairs and replacements should be made immediately.

After the grass has become established, the channel should be checked periodically. All repairs or replacement should be made as soon as possible. If the channel is to be mowed, it should be done in a manner that will not damage the grass. No more than one-third of the shoot should be removed with any mowing.

Riprap should be checked periodically for dislodged stones and to assure that scour does not occur beneath the riprap layer.

4.4.5 Riprap

A. Definition

Riprap is a layer of crushed concrete, loose rock, or aggregate placed over an erodible soil surface.

B. Purpose

Riprap protects the soil surface from the erosive forces of water and allows some infiltration.

C. Conditions Where Practice Applies

Riprap may be used for soil-water interfaces where the soil conditions, water turbulences and velocity, expected vegetative cover, and ground water conditions are such that the soil may erode under design flow conditions.

Specific locations include channels, ditches, and diversions with permanent frequent low-flow or dry weather discharge.

Riprap also may be used as an erosion protection practice for storm drain outlets, drop structures, and shorelines.

D. Planning Considerations

Riprap may be unstable on very steep slopes, especially when rounded rock is used. For slopes steeper than 2:1, consider using materials other than riprap for erosion protection. Geotextiles or other filter medium may be required for erodible soils.

E. Design Criteria and Requirements

Size Riprap linings can be designed to withstand most flow velocities. The following chart gives stable stone sizes for flow velocities up to 17 ft/sec.

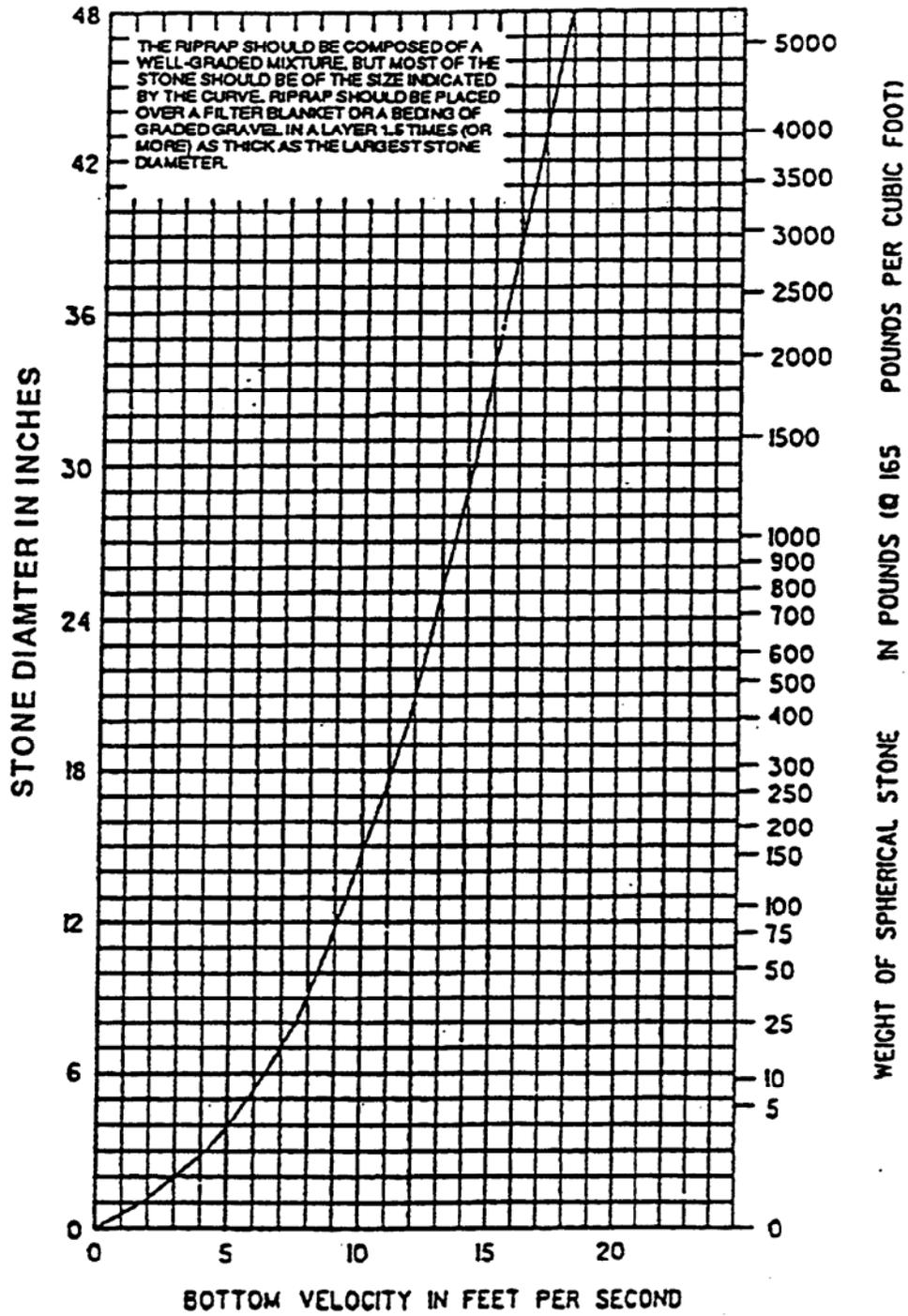
Placement Riprap should be designed in accordance with existing regulatory entity criteria.

F. Inspection and Maintenance

Lined waterways shall be inspected weekly for 3 months after installation.

Riprap should be checked periodically for dislodged stones and to assure that scour does not occur beneath the riprap layer. Repairs should be made immediately.

**FIGURE 4-1
DESIGN CHART FOR RIPRAP LININGS**



4.4.6 Lined Waterways

A. Definition

Lined waterways are channels with erosion-resistant linings paved with concrete, flagstone, gabions, or similar materials.

B. Purpose

Pavement protects the soil surface from the erosive forces of water.

C. Conditions Where Practice Applies

Paved linings may be used for soil-water interfaces where the soil conditions, water turbulence and velocity, expected vegetative cover, and groundwater conditions are such that the soil may erode under design flow conditions. Generally, velocities over five (5) feet per second will require lined waterways.

D. Planning Considerations

Rigid liners such as concrete or flagstone can carry large volumes of water without eroding. Unlike riprap—which can adjust to foundation conditions without failure—concrete and flagstone are less forgiving of foundation conditions. Flows and velocities in paved channels introduce high energies that must be controlled and dissipated to avoid damage to channel outlets and receiving streams.

Gabions, which are coated steel basket matrices enclosing rock, are slightly more flexible than pavement, but allow similar high velocities due to relatively low roughness.

Channels with smooth pavement such as concrete or flagstone usually are not limited by velocity, take up less land area, and can be constructed to limited site conditions compared to channels with other linings. Additionally, they provide a formal definition of water conveyance and may require less maintenance.

Foundation and hydraulic design must be executed competently to assure structural stability and adequate function. Appropriate measures are needed to reduce exit velocities to protect receiving waters and outlets.

E. Design Criteria and Requirements

Timing Permanent materials must be installed within 14 days after final channel grading.

Velocity Manning's "n" values for concrete and flagstone are given below. When the Froude Number approaches critical (between 0.7 and 1.3), channel flows may become unstable, and the designer should consider modifying the channel slope. Reaches for supercritical flow should be straight unless special design features are used.

Lining Material	Manning's "n"
Concrete:	
Trowel Finish	0.012-0.014
Float Finish	0.013-0.017
Guniting	0.016-0.022
Flagstone	0.020-0.025
Gabion	0.025-0.030

Cross-Section Shape

Cross-sections may be triangular, parabolic, or trapezoidal. Reinforced concrete- or gabion-lined channels may be rectangular.

Design Thickness

Concrete for linings should be a dense durable product, plastic enough for thorough consolidation but stiff enough to stay in place on side slopes. Minimum concrete thickness and minimum strength should be in accordance with existing public design criteria. Flagstone thickness should be a minimum of 4 inches including the mortar.

Gabion thickness depends on manufacturer specifications and stone sizes, which may range from 4 to 8 inches. Gabion weirs should be founded on a gabion apron which extends downstream. The apron length will depend on hydraulic and soils conditions, but in no case shall extend downstream less than the minimum lengths given in the following table:

Apron Length	
Gravel	6 Feet
Coarse or medium sand	9 Feet
Fine or silty sand	12 Feet
Clay	9 Feet

Source: *City of Austin Environmental Handbook*

Cutoff Cutoff walls are needed at the beginning and end of paved channels to protect against undercutting. Additional cutoff walls, transverse joints, and expansion joints may also be needed.

Depth The depth of the channel should be evaluated in accordance with existing regulatory entity design criteria.

Outlets All channels should have a stable outlet with adequate capacity, and should be designed and built to prevent erosion of channels and banks.

F. Inspection and Maintenance

Lined waterways shall be inspected weekly for 3 months after installation. Afterwards, inspect channels at regular intervals as well as after major rains. Make repairs promptly.

Concrete-lined channels should be inspected periodically to assure that there is no undermining.

Outlets should be checked for scour. If there is scour, appropriate energy dissipation measures shall be taken.

Carefully check road crossings for indications of bank failures, scour holes, and piping; make repairs immediately.

4.5 BEST MANAGEMENT PRACTICES FOR PROTECTING INLETS

Because the best management practices to minimize the movement of pollutants from the site can never be 100% effective, there remains a need to prevent pollutants from entering inlets, catch basins, culverts and other conveyance structures to prevent pollutants from reaching receiving waters.

All storm sewer inlets that are made operable during construction should be protected so that storm water runoff will not enter without first being filtered or otherwise treated to remove sediment. It is not practical to control drainage areas larger than one acre with this measure alone. Erosion control on the exposed land is also needed to limit the sediment movement. The measure should be left in place until adequate cover is established.

It is critical that storm sewer inlets not be completely blocked. Blocking an inlet can cause streets to flood, sediment to build up and become a hazard, and public safety may be impaired.

Best management practices include:

Inlet protection barriers (Section 4.5.1)

Drop inlet insert basket (Section 4.5.2)

Storm inlet sediment trap (Section 4.5.3)

4.5.1 Inlet Protection Barriers

A. Definition

An **inlet protection barrier** is a temporary barrier constructed around a storm drain inlet, catch basin or culvert.

B. Purpose

To prevent sediment and other pollutants from entering conveyance systems.

C. Conditions Where Practice Applies

At the location where runoff enters conveyance system structures such as curb inlets, drop inlets and culverts.

D. Planning Considerations

This best management practice uses many of the design criteria and requirements of Section 4.3.1 Reinforced Filter Fabric Barriers, Section 4.2.2 Hay Bale Fences, and Section 4.3.5 Bagged Gravel Barrier.

E. Design Criteria and Requirements

Timing The inlet protection barrier should be installed before the drainage area is disturbed.

Removal The inlet protection barrier shall remain in place and be maintained until the disturbed area is stabilized by permanent best management practices.

Placement The inlet protection barrier shall surround the inlet. Where the elevation of curbs or adjacent ground surfaces are higher than the top of the inlet structure, a storm inlet sediment trap may be used as discussed in Section 4.5.3.

Stage I inlet protection barriers on soil

Reinforced filter fabric barriers, and hay bale fences constructed on soil shall meet the following requirements:

Reinforced filter fabric barrier

The design criteria and requirements and maintenance requirements contained in Section 4.3.1 shall be used for all reinforced filter fabric barriers used for Stage I inlet protection with the posts located at all corners or approximately every 90 degrees and beams to connect the posts.

Hay bale fence

The design criteria and requirements and maintenance requirements contained in Section 4.2.2 shall be used for all hay bale fences used for inlet protection with the posts located at all corners or approximately every 90 degrees and beams to connect the posts.

Stage I inlet protection barriers on paved surfaces

Reinforced filter fabric barriers on paved surface shall be constructed to meet the design criteria and requirements and maintenance requirements contained in Section 4.3.1 except for the following:

- a. Support for the filter fabric shall be provided by a heavy gauge welded fence, or 2 or 3 layers of 8-inch cement blocks.
- b. The filter fabric shall extend outward away from the reinforced filter fabric barrier along the pavement for at least 12 inches and be covered with at least 4 inches of gravel or nylon gravel-filled bags.
- c. The filter fabric shall be wired to the welded support structure or cement blocks or weighted down by an additional layer of cement blocks.
- d. When installed in vehicular traffic areas, adjacent to such areas, or where vehicular traffic hazards exist (e.g. parking lots, roadways, etc.) orange filter fabric material (or another high-visibility color) should be used.

Hay Bale Fences

Hay bale fence on paved surface shall be constructed to meet the design criteria and requirements contained in Section 4.2.2, except that the bales can be weighted down with sandbags in lieu of rebar stakes.

Stage II inlet protection barriers on paved surfaces

Protection for Stage II inlets with completed pavement surfaces can also be provided by the following method.

Bagged gravel barriers, constructed in accordance with Section 4.3.5, can be placed in the gutter on each side along the back-end of a curb inlet to pond water and cause sedimentation in the gutter.

F. Inspection and Maintenance

1. Inlet protection barriers should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.
2. Sediment deposits should be removed after each storm event and no later than at such time as deposits reach one-third the height of the fence or barrier.

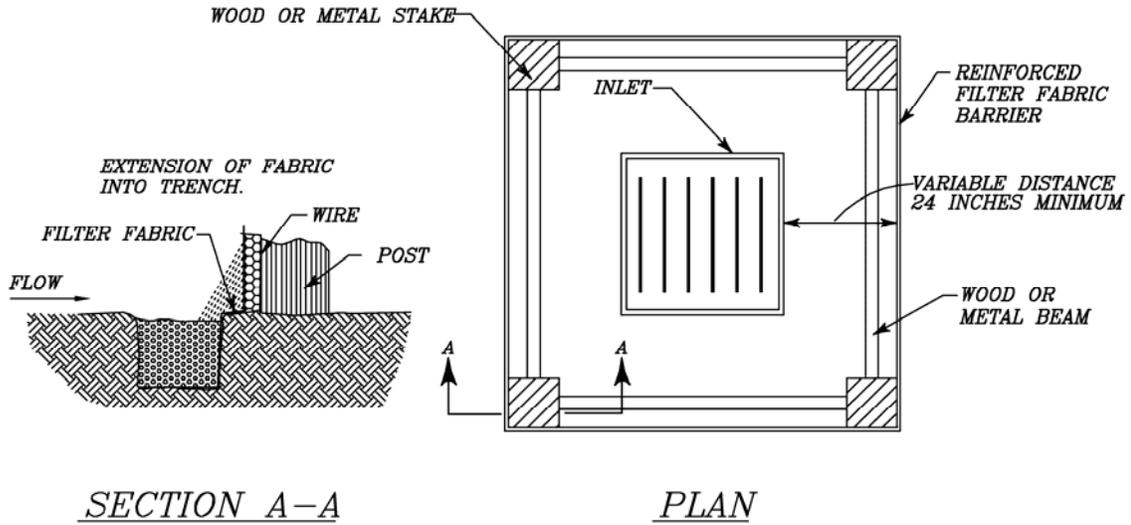
G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4311	Reinforced Filter Fabric Barrier
Item No. 4351	Bagged Gravel Barrier
Item No. 4511	Inlet Protection Barriers

INLET PROTECTION BARRIER

(FOR STAGE I INLETS)

REINFORCED FILTER FABRIC BARRIER



Not to Scale

General Notes:

See Figure 4.3-1 for Reinforced Filter Fabric Barrier

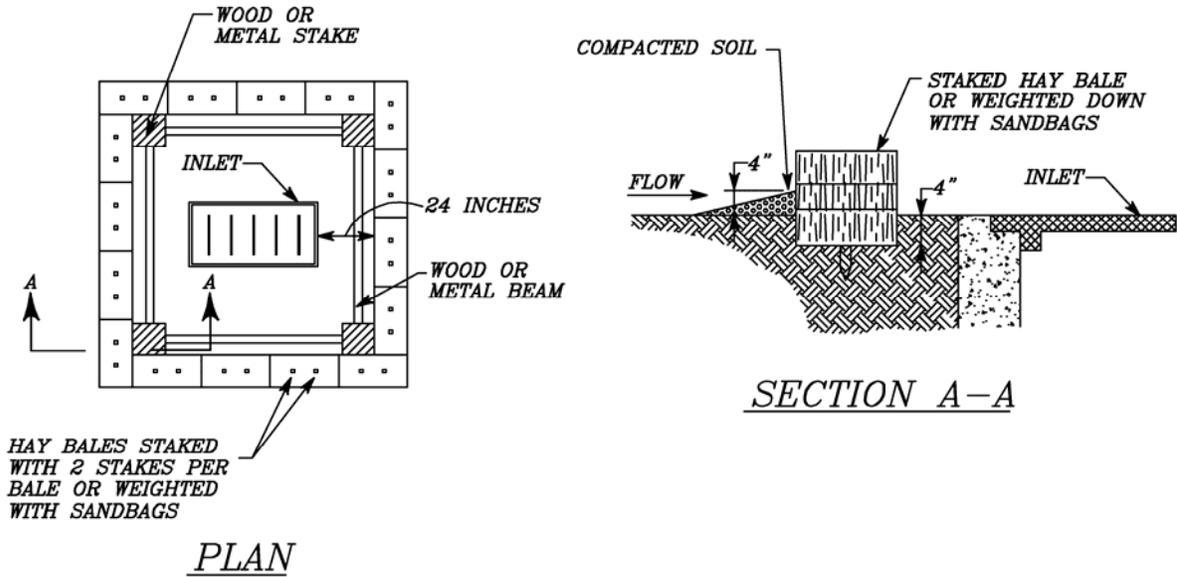
IPB

FIGURE 4.5-1a
BMP 4511
*INLET PROTECTION BARRIERS FOR
STAGE I INLETS*

INLET PROTECTION BARRIER

(FOR STAGE I INLETS)

HAY BALE



Not to Scale

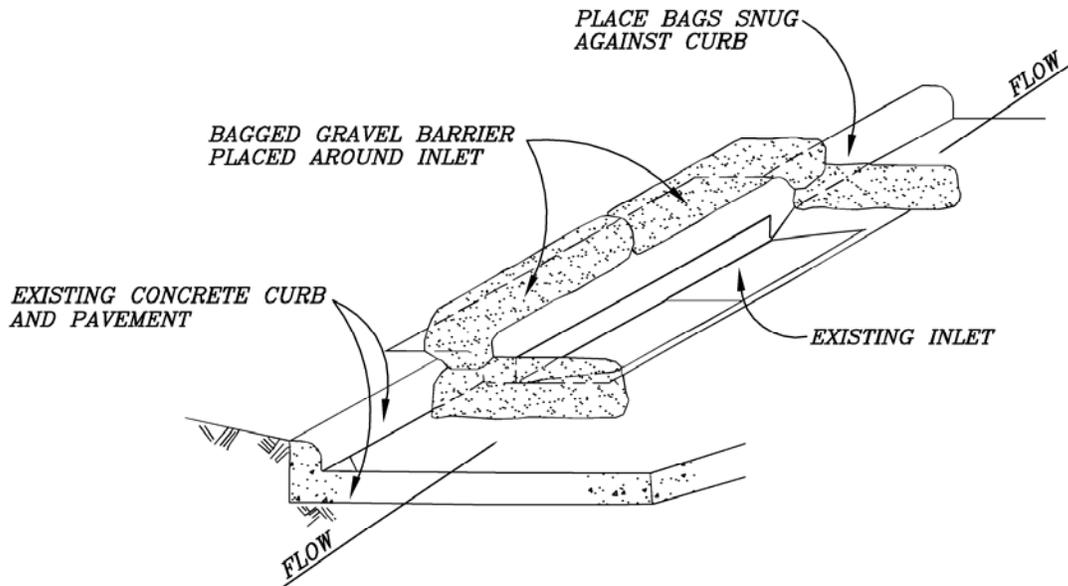
General Notes:

See Figure 4.2-3 for Hay Bale Fence

IPB

FIGURE 4.5-1b
BMP 4511 (CONT.)
INLET PROTECTION BARRIERS
FOR STAGE I INLETS

INLET PROTECTION BARRIER
(FOR STAGE II INLETS)
BAGGED GRAVEL BARRIER



Not to Scale

IPB

FIGURE 4.5-2
BMP 4511 (CONT.)
INLET PROTECTION BARRIERS
FOR STAGE II INLETS

4.5.2 Drop Inlet Insert Basket

A. Definition

A **drop inlet insert basket** is a temporary barrier placed within a storm drain inlet consisting of a filter fabric supported by a metal framework.

B. Purpose

To prevent sediment and other pollutants from entering conveyance systems.

C. Conditions Where Practice Applies

1. At the location where runoff enters conveyance system structures such as drop inlets.
2. Where the disturbed area within the drainage area is less than 0.25 acres per inlet.

D. Planning Considerations

This method has been developed to provide a barrier where a barrier surrounding the inlet is not practical or safe.

E. Design Criteria and Requirements

Timing The drop inlet insert basket or equivalent measure should be installed before the drainage area is disturbed. An inlet insert basket can be used after upper portion (Stage II) construction of drop inlets to replace another measure used to protect the lower portion (Stage I) drop inlet.

Removal The inlet insert basket should remain in place and be maintained until the disturbed area is stabilized by permanent best management practices.

Placement The inlet insert basket should fit into the drop inlet without gaps around the insert.

Basket Design

The support for the inlet insert basket should consist of fabricated metal as illustrated in the drawings. The basket shall be approximately 14 inches in depth.

The top frame of the basket shall be constructed with two short sides of 2-inch x 2-inch and a single long side of 1-inch x 1-inch, 1/8-inch angle iron.

The basket hangers shall be constructed of 2-inch x 1/4-inch iron bars.

The bottom frame shall be constructed of 1-inch x 1/4-inch iron bar of 1/4-inch plate with center 3 inches removed.

The sides of the inlet basket shall be a minimum 1/4-inch diameter iron rods or equivalent. A minimum of 14 rods shall be welded in place between the top frame/basket hanger and the bottom frame.

Fabric Placement

The filter fabric shall be pushed down and formed to the shape of the basket. The sheet of fabric shall be large enough to be supported by the basket frame when holding sediment and extend at least 6 inches past the frame. Slits shall be cut in the fabric near the top of the

frame for high-flow events, as shown in the drawings. The inlet grate shall be placed over the basket/frame to serve as a fabric anchor.

Fabric Specifications

The filter fabric shall meet the following specifications:

Grab strength: 100 lb. minimum in any principal direction (ASTM D 4632)

Puncture Strength: Minimum 200 psi (ASTM D 4833)
The fabric shall have an opening such that 15% by weight of soils will pass through.

Water Flow Rate Approximately 120 gal/min/ft²

Ultraviolet Ray Inhibitors and Stabilizers Should provide an expected useable life comparable to the anticipated construction period, at least 50% after 500 hours (ASTM D 4355).

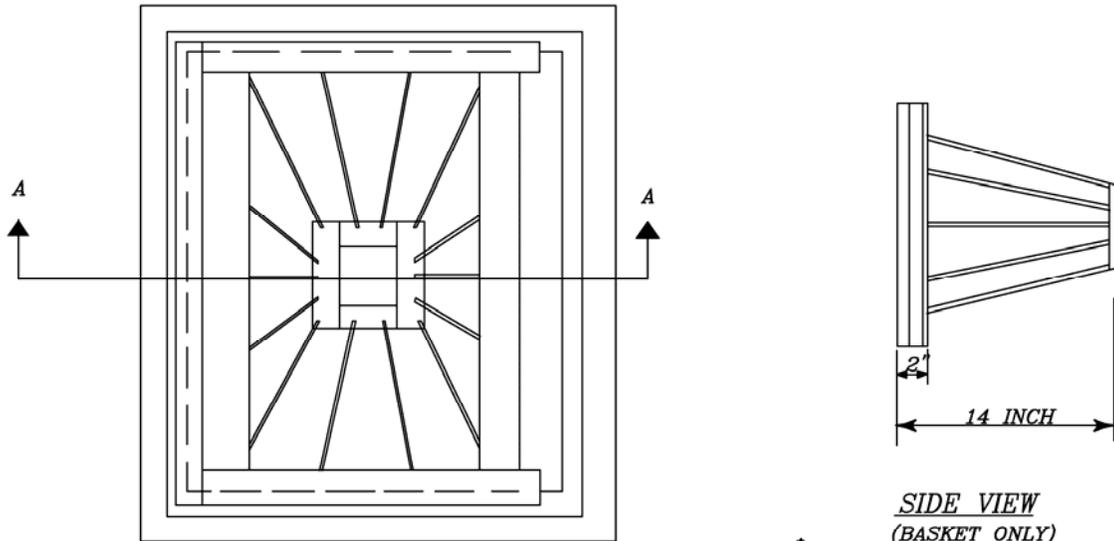
F. Inspection and Maintenance

1. Drop inlet insert baskets should be inspected at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replacement should be made immediately.
2. Sediment deposits should be removed after each storm event and no later than at such time as deposits reach one third the depth of the basket.

G. Corresponding Technical Specification (Refer to Appendix C)

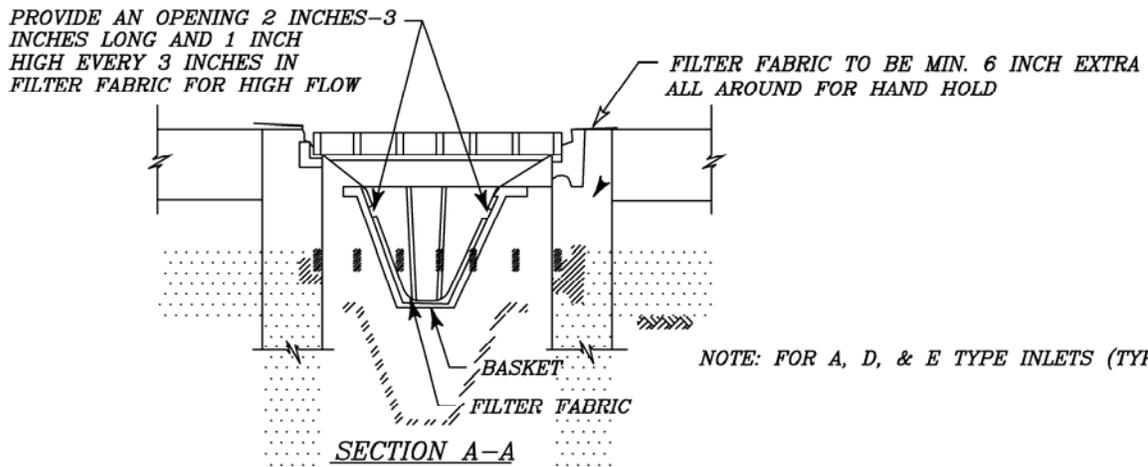
Item No. 4521 Drop Inlet Insert Baskets

DROP INLET INSERT BASKET



PLAN
(WITH FILTER FABRIC AND GRATE REMOVED)

SIDE VIEW
(BASKET ONLY)
* MAY BE DECREASED IF INLET IS OF INSUFFICIENT DEPTH.

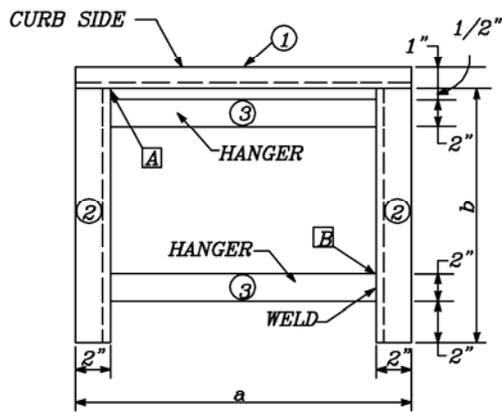


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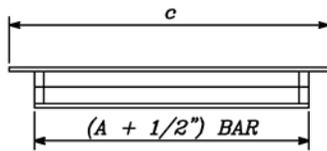
DIB

FIGURE 4.5-3a
BMP 4521
DROP INLET BASKET (DRAWING A)

DROP INLET INSERT BASKET



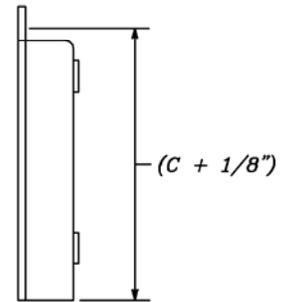
PLAN



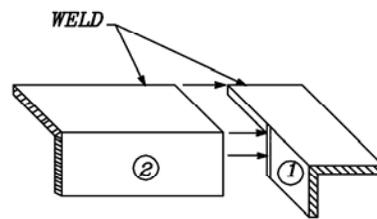
FRONT VIEW

BAR SCHEDULE

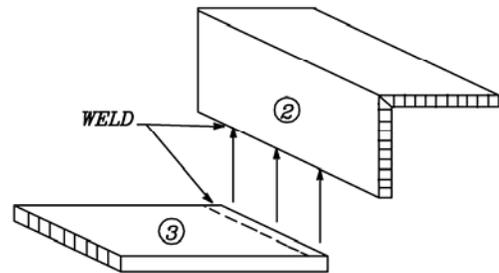
NO.	SNAPS	SIZE	THICKNESS	LENGTH*	QUANTITY
1	ANGLE	1"X1"	1/8"	a	1
2	ANGLE	2"X2"	1/8"	b	2
3	BAR	2"	1/4"	c	2



SIDE VIEW



CONNECTION - A
TOP FRAME



CONNECTION - B
BASKET HANGER
TO TOP FRAME

*LENGTH AS NECESSARY TO
FIT AREA STORM SEWER INLET
TYPE TO BE PROTECTED.

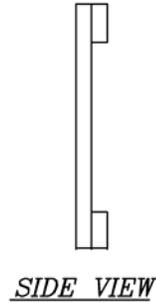
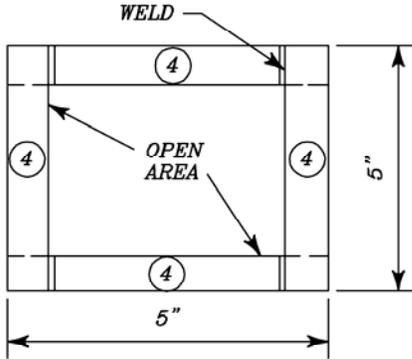
Not to Scale

DIB

FIGURE 4.5-3b
BMP 4521 (CONT.)
DROP INLET BASKET (DRAWING B)

DROP INLET INSERT BASKET

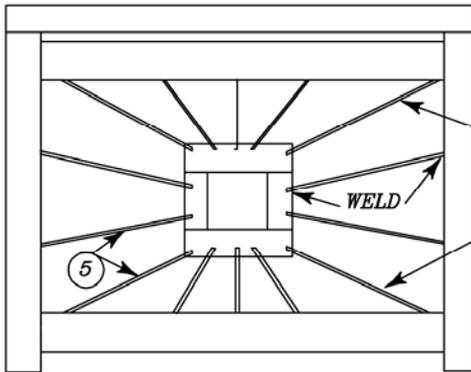
BOTTOM FRAME



BAR SCHEDULE

NO.	SNAPS	SIZE	THICKNESS	LENGTH	QUANTITY
④	BAR	1"	1/4"	5"	4

ROD PLACEMENT



ROD SCHEDULE

NO.	SHAPE	SIZE	THICKNESS	LENGTH	QUANTITY
⑤	ROD	1/4" MIN.	-	(CUT TO FIT)	14

WELD FOUR CORNER
BARS FIRST

Not to Scale

DIB

FIGURE 4.5-3c
BMP 4521 (CONT.)
DROP INLET BASKET (DRAWING C)

4.5.3 Storm Inlet Sediment Traps

A. Definition

A **storm inlet sediment trap** is a temporary sediment trap used to collect sediment around a curb inlet or yard drain.

B. Purpose

To prevent sediment and other pollutants from entering conveyance systems.

C. Conditions Where Practice Applies

At the locations where runoff enters conveyance system structures such as curb inlets and drop inlets.

D. Planning Considerations

Timing The storm inlet sediment trap should be installed before the drainage area is disturbed.

Removal The storm inlet sediment trap should be removed prior to placement of pavement surface at curb inlets. Storm inlet sediment traps used with area inlets and yard drains may be removed once the adjacent disturbed area has been stabilized.

Roadways The storm inlet sediment trap can be used in roadways. Install the trap on the opposite side of the opening and divert water (through a temporary curb opening or other means) from the roadway to the trap to prevent interference with traffic.

E. Design Criteria and Requirements

1. Install either a yard drain inlet or curb drain inlet sediment trap as specified on plans.
2. The depth of the trap should be at least two (2) feet to minimize resuspension of sediment. The minimum surface area of the sediment trap should be 625 square feet for every acre of drainage area. Side slopes should be 2:1 or flatter.

F. Inspection and Maintenance

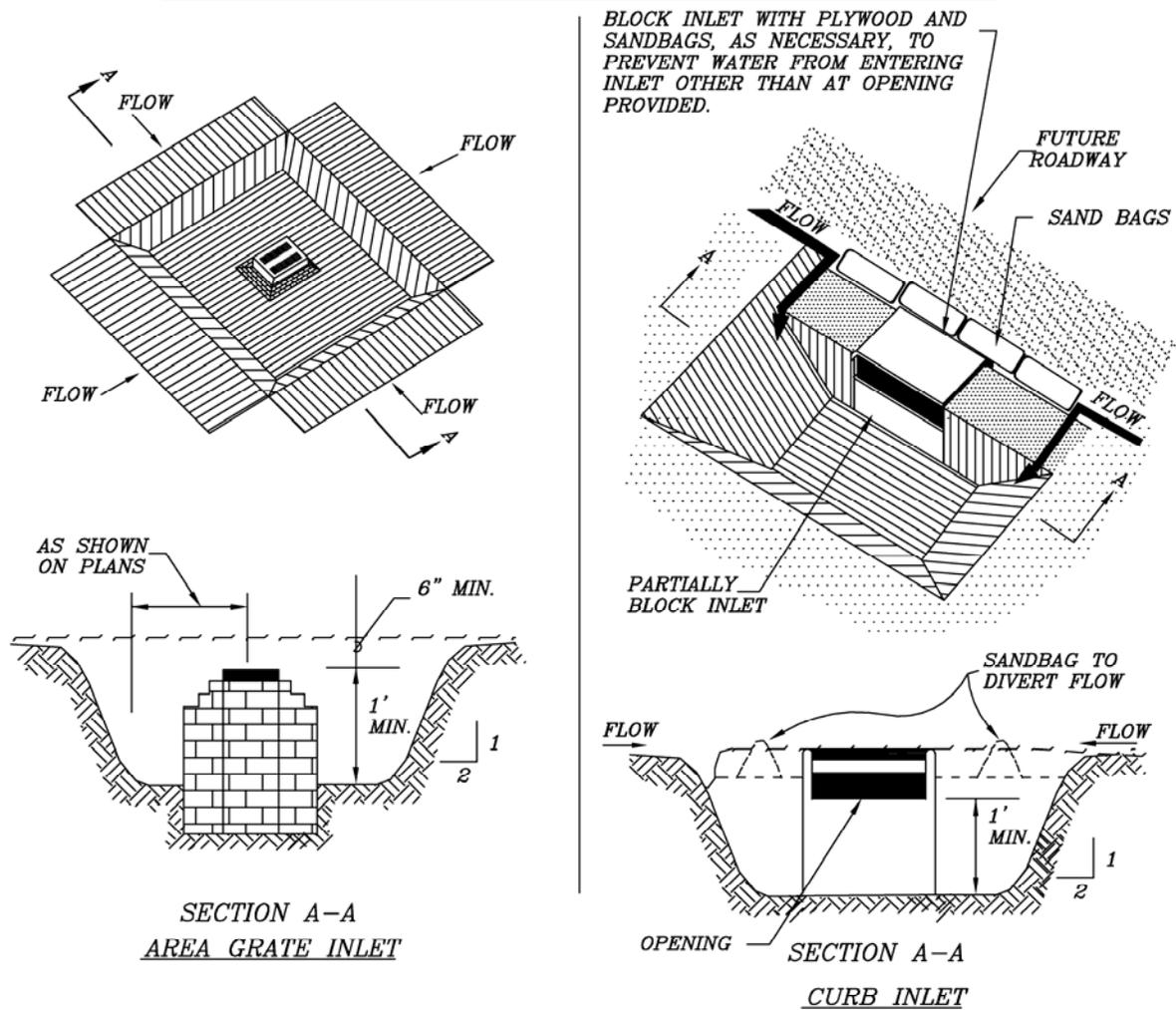
Inspect sediment traps at least once every 14 calendar days and within 24 hours of the end of storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged trap components immediately to restore the requirements of this item.

Remove sediment deposit and restore traps to original dimensions when the sediment has accumulated to one-half the design depth of the trap or one foot, whichever is less.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4531 Storm Inlet Sediment Trap

STORM INLET SEDIMENT TRAPS



Not to Scale

General Notes:

1. Install either a grate inlet or curb inlet sediment trap as shown by the construction drawings.
2. The limits of excavation shall be as shown by the construction drawings.
3. Side slope shall be 2:1, or flatter.
4. Maintain a minimum of 1 foot measured vertically from the bottom of excavation for inlet opening.
5. When the inlet is in a roadway, install the trap on the opposite side of the opening and divert water from the roadway to the trap.

IST

FIGURE 4.5-4
BMP 4531
STORM INLET SEDIMENT TRAPS

4.6 BEST MANAGEMENT PRACTICES FOR TRAPPING SEDIMENT DURING SITE DEWATERING

Pumping of suspended or resuspended sediment can cause substantial amounts of pollutants to leave a construction site and enter lakes, streams, and wetlands.

Water pumped from the site should be treated by one of the following:

Dewatering settling basins (Section 4.6.1)

Portable Sediment tank (Section 4.6.2)

Sediment sump pit (Section 4.6.3)

Dewatering bag (Section 4.6.4)

4.6.1 Dewatering Settling Basins

A. Definition

A **dewatering settling basin** is a temporary basin designed and constructed to control sediment contained in water pumped in the process of dewatering a site.

B. Purpose

To detain sediment-laden discharge from dewatering a site for sufficient time to allow the majority of the sediment to settle out.

C. Design Criteria and Requirements

Basin Area The minimum area of the settling basin in square feet shall be determined as shown below where the peak discharge is the flow into the basin based on the 2-year storm

$$\text{Area basin (ft}^2\text{)} = 240 \times \text{peak discharge (cfs)}$$

Basin Structure

The basin shall consist of an excavated basin and a filter fabric fence or a reinforced filter fabric barrier. The basin shall be constructed and maintained in accordance with the following practices:

- 4.2.1 Filter Fabric Fences
- 4.3.1 Reinforced Filter Fabric Barrier
- 4.3.2 Sediment Traps
- 4.3.3 Sediment Basins

Outlet Protection

The basin shall discharge to a vegetated or otherwise stabilized area.

D. Maintenance

The dewatering settling basin shall be maintained at all times the site is being dewatered.

E. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4211	Filter Fabric Fences
Item No. 4311	Reinforced Filter Fabric Barrier
Item No. 4321	Stone Outlet Sediment Trap
Item No. 4322	Excavated Earth Outlet Sediment Trap
Item No. 4323	Embankment Earth Outlet Sediment Trap

Item No. 4331	Sediment Basin with Pipe Outlet
Item No. 4332	Sediment Basin with Stone Outlet

4.6.2 Portable Sediment Tank

A. Definition

A portable **sediment tank** is a fabricated tank constructed from steel drums or other type of tank used to trap and filter sediment from water pumped from excavated areas.

B. Purpose

A portable sediment tank traps and retains sediment from water being pumped from excavated areas.

C. Conditions Where Practice Applies

Portable sediment tanks are generally used to treat water from deep excavations where space is limited.

D. Design Criteria and Requirements

The location of the portable sediment tank should be convenient for clean out and disposal of the trapped sediment and should minimize the interference with construction activities. The size of the tank can be estimated from the formula indicated below where the pump discharge is the flow pumped into the tank.

Storage (cubic foot) = 16 x pump discharge (gallons per minute).

The attached drawing provides an illustration of a portable sediment tank. Alternative container designs can be used if the storage volume is adequate.

If recycled 55-gallon steel drums are used, they must be made free of chemical contamination, prior to use.

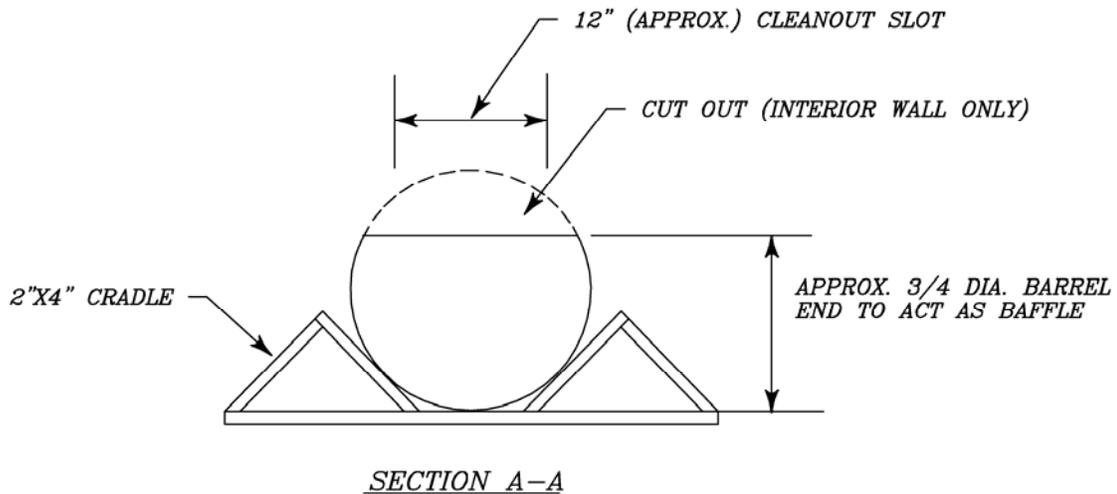
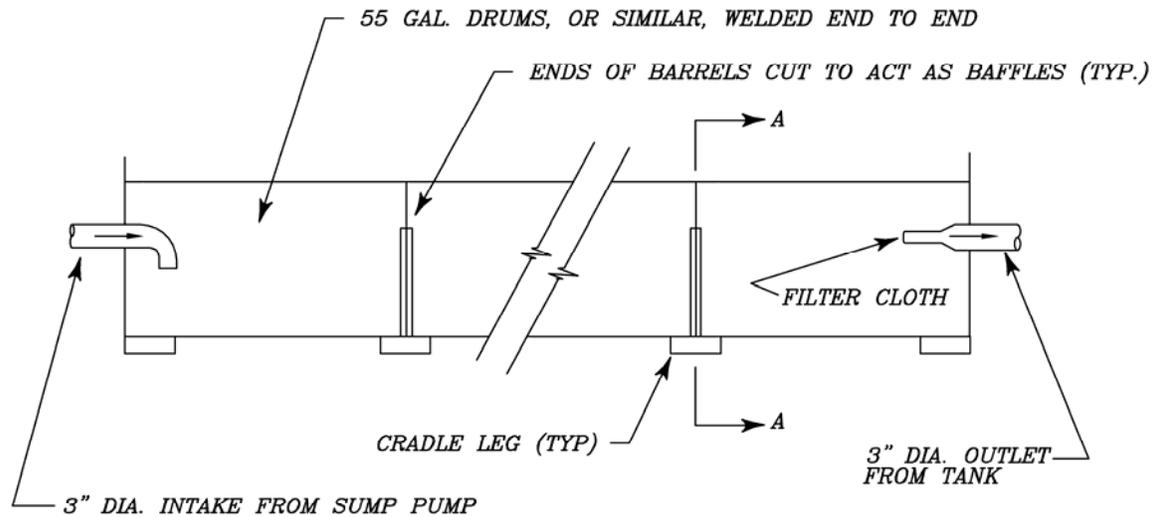
E. Inspection and Maintenance

Inspection should be made periodically during pumping and after each pumping. The tank should be cleaned out when one-third of the portable sediment tank is filled with sediment. Sediment collected in the tank should be disposed of at an approved site in a manner that will not contribute to additional sedimentation.

F. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4621	Portable Sediment Tank
---------------	------------------------

PORTABLE SEDIMENT TANK



Not to Scale

General Notes:

1. Steel drums or other type of tanks may be used, providing that the volume requirements are met.
2. Inspection shall be made after each pumping, and when one-third (1/3) of the portable sediment tank is filled with sediment, clean out the tank.
3. Sediment collected in the tank to be disposed of at an approved site, as directed by the Owner.
4. The portable sediment tank to be removed when the construction is completed.

ST

FIGURE 4.6-1
BMP 4621
PORTABLE SEDIMENT TANK

4.6.3 Sediment Sump Pit

A. Definition

A **sediment sump pit** is a temporary pit with a discharge standpipe which is constructed to trap and filter sediment from water pumped from excavated areas.

B. Purpose

A sediment sump pit collects water retained in excavated areas and removes sediment before the water is pumped from the site.

C. Conditions Where Practice Applies

Sump pits are constructed for collecting water during construction and are particularly useful during excavation for building foundations.

D. Design Criteria and Requirements

A perforated standpipe made from 12- to 24-inch diameter corrugated steel pipe or PVC pipe should be placed in the center of the pit to collect filtered water. The standpipe should extend 12 to 18 inches above the lip of the pit. A base of two-inch (2-inch) aggregate shall be placed in the pit to a depth of 12 inches. The pit surrounding the standpipe should be backfilled with two-inch (2-inch) aggregate after installing the standpipe. Discharge of water pumped from the standpipe shall be conveyed to a sediment trapping device such as a rock berm, brush berm, stone outlet structure, sediment trap, sediment basin, or other appropriate device or to an area protected by any of these devices. The number of sump pits and their locations shall be determined by an engineer.

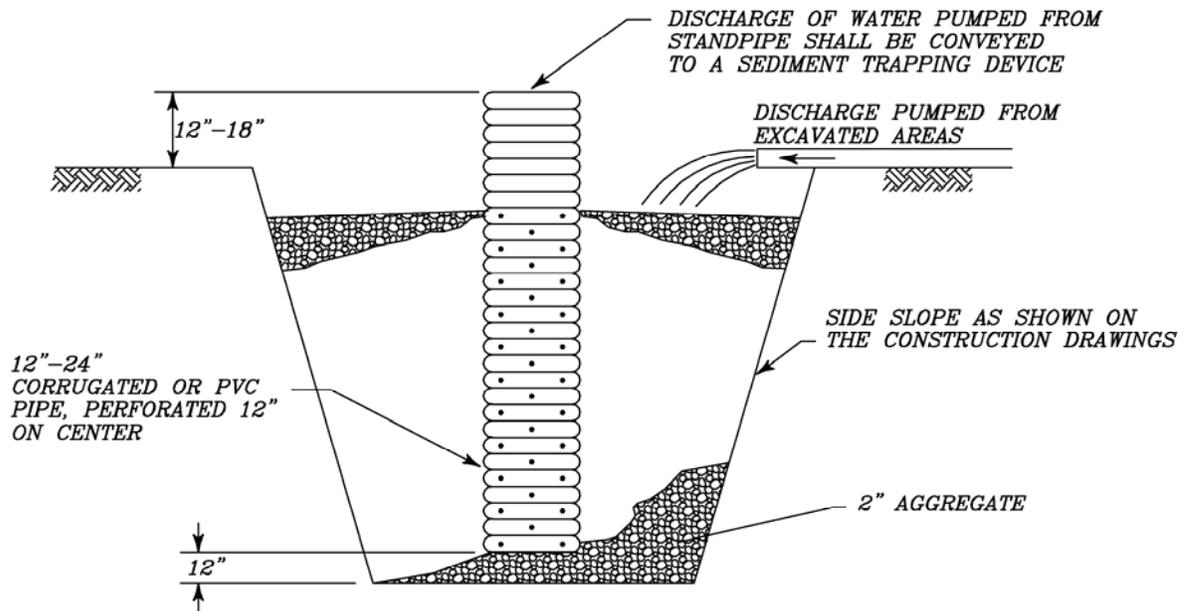
E. Inspection and Maintenance

Sediment sump pits should be inspected daily during periods of pumping. Sediment sump pits may be used for excavation pumpage with minimal maintenance. Sediment deposits in standpipe may limit effectiveness and need to be removed. The sites of sump pits should be restored to stabilized condition when the construction is complete.

F. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4631 Sediment Sump Pit

SEDIMENT SUMP PIT



Not to Scale

General Notes:

1. Dimensions as shown on construction drawings.
2. The standpipe should be constructed by perforating a 12" - 24" diameter corrugated or PVC pipe.
3. The standpipe should extend 12" - 18" above the lip of the pit.
4. Discharge of water pumped from the standpipe shall be conveyed to a sediment trapping device such as a rock berm, brush berm, stone outlet structure, sediment trap, or sediment basin, or to an area protected by any of these devices.
5. The sites of sump pits shall be restored to a stabilized condition when construction is completed.
6. Maintenance will be performed as needed.



FIGURE 4.6-2
BMP 4631
SEDIMENT SUMP PIT

4.6.4 Dewatering Bag

A. Definition

A **dewatering bag**, also referred to as a **gravity bag**, typically is a square or rectangular device made of non-woven geotextile fabric that filters the sediment contained in pumped water. Untreated water is pumped into one side of the bag and seeps through the bottom and sides of the bag.

B. Purpose

To filter and collect sediment (gravel, sand and silt) while dewatering a site.

C. Design Criteria and Requirements

A secondary filter, such as a rock filter bed, is placed beneath and beyond the edges of the bag to increase filtration efficiency.

When installing the dewatering bag on a slope, care should be taken to minimize erosion on the receiving field. In addition, the flow from the dewatering bag shall be discharged to a vegetated or otherwise stabilized area.

The dewatering bag size should be chosen based on the type and amount of sediment discharged into the bag, the type of ground, rock or other substance under the bag, and the degree of the slope on which the bag lies.

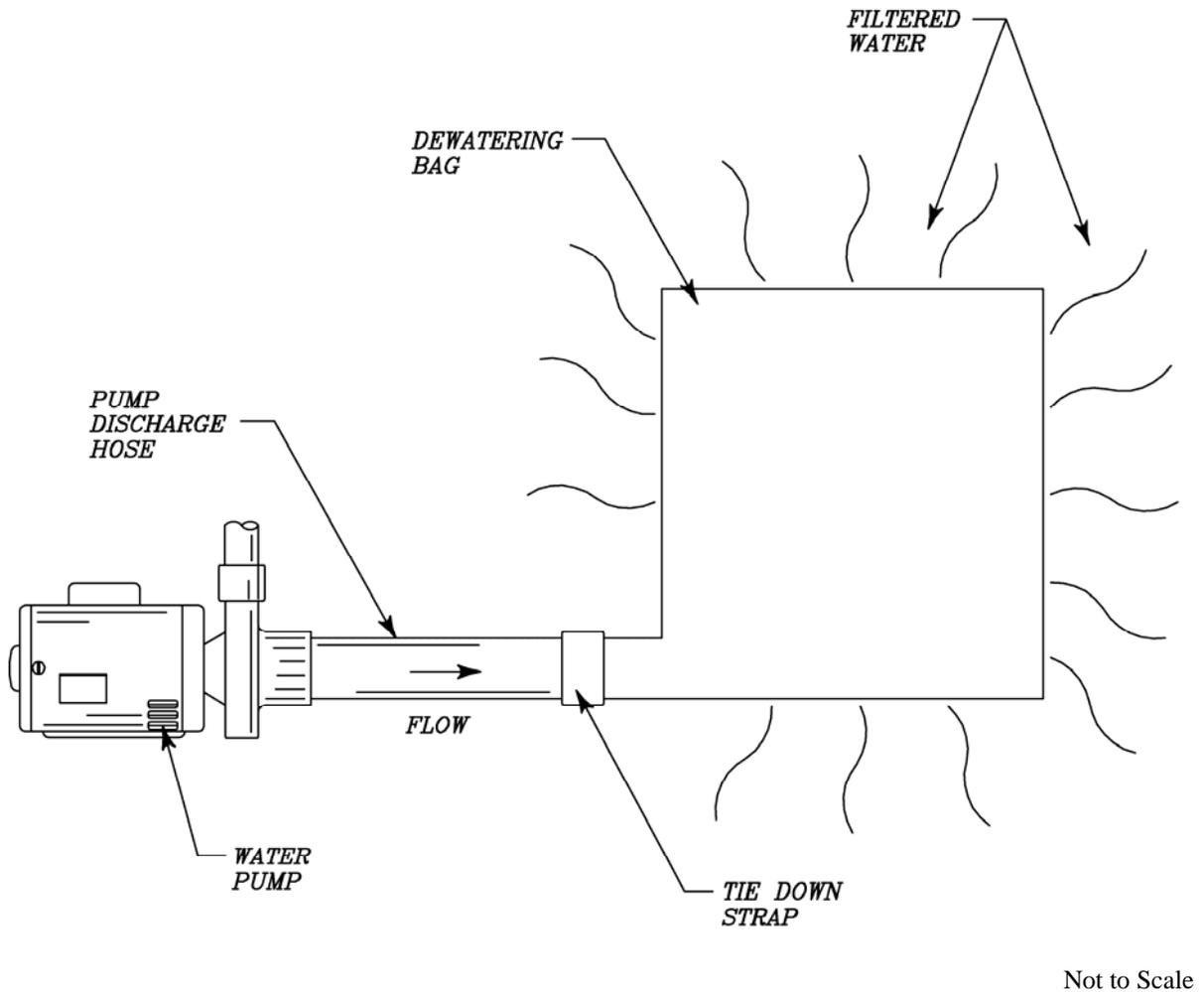
D. Maintenance

Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier should be made periodically during pumping and after each pumping. The dewatering bag shall be replaced when sediment has reduced flow rate to an impractical rate or it no longer can efficiently filter sediment. When construction is completed or the bag is replaced, remove and dispose of the bag offsite or onsite as directed by the Owner.

E. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4641 Dewatering bags

DEWATERING BAG



Not to Scale

General Notes:

1. When installing the dewatering bag on a slope, care should be taken to minimize erosion on the receiving field.
2. When sediment has reduced flow rate to impractical levels, replace the dewatering bag.
3. Sediment collected in the bag shall be disposed offsite or onsite as directed by the Owner. Dispose in a manner that does not contribute to additional sedimentation.
4. The dewatering bag shall be removed when construction is completed.

DB

FIGURE 4.6-3
BMP 4641
DEWATERING BAG

4.7 BEST MANAGEMENT PRACTICES FOR PREVENTING TRACKING

Sediment reaching streets generally has a clear path of conveyance to lakes, streams, and wetlands. Control of this source of pollutants is approached in two ways. First, best management practices are identified to minimize the amount of sediment being tracked onto streets. Second, cleanup of the sediment that reaches the street is required.

Required elements:

- Each site should have graveled roads, access drives, and parking areas of sufficient width and length to prevent sediment from being tracked onto public and private roadways.
- Sediment stuck to vehicle tires, axles, and other under carriage components should be removed from vehicles before they exit the construction site.
- Any sediment reaching a public or private road should be removed by street cleaning (not flushing) before the end of each workday.
- If the site is one acre or less and construction of stabilized access road is not feasible, use of street cleaning, such as sweeping or vacuuming, is an acceptable alternative to constructing a stabilized access road.

The section contains the design criteria and requirements for temporary gravel site roads and parking areas and street cleaning.

4.7.1 Stabilized Access Roads and Parking Areas

A. Definition

A **stabilized access road and parking area** is a gravel-stabilized pad located at points of vehicular access and parking on the construction site.

B. Purpose

To reduce the amount of sediment transported onto public roads.

C. Conditions Where Practice Applies

At access points to the construction sites.

D. Planning Considerations

The amount of sediment being transported from the site can also be reduced by using other best management practices.

E. Design Criteria and Requirements

<i>Timing</i>	The stabilized access shall be installed as soon as practicable before the start of site disturbance.
<i>Removal</i>	The stabilized access shall remain in-place and be maintained until the disturbed area is stabilized by permanent best management practices.
<i>Location</i>	The stabilized access shall be located to provide maximum use by all construction vehicles.

Dimensions The stabilized access shall consist of at least 8 inches of 2 to 3 inch aggregate or crushed concrete; 50 feet in length or the distance from the road to the specific construction area, whichever is less; and at least 7 feet in width. The width shall be 14 feet if it is necessary to have vehicles pass on the site.

Stabilized Access Pad Alternative Materials

Suggested materials for use in construction of access pads shall include the following:

Gravel Coarse gravel of 2-inch or larger aggregate applied on top of existing soil in an application thickness of at least 8 inches. This depth should be monitored and maintained throughout construction. A separation geotextile fabric should be provided as a permeable separator to prevent mixing of coarse aggregate with underlying soil.

Cement Stabilized Soil Compacted, cement stabilized soil, limestone aggregate or other fill material in an application thickness of at least 8 inches.

Wood Mats

Mud Mats Oak or other hardwood timbers placed edge to edge and across support wooden beams which are placed on top of existing soil in an application thickness of at least 6 inches.

Steel Mats Perforated mats placed across perpendicular support members.

Sediment Removal Techniques

Suggested methods for removal of large accumulations of sediment on vehicle tires, axles, and other undercarriage components should include the use of high pressure water hoses to wash off under carriages. Water and sediment should be filtered to avoid sediment from running into watercourses, wetlands, or storm water conveyance systems.

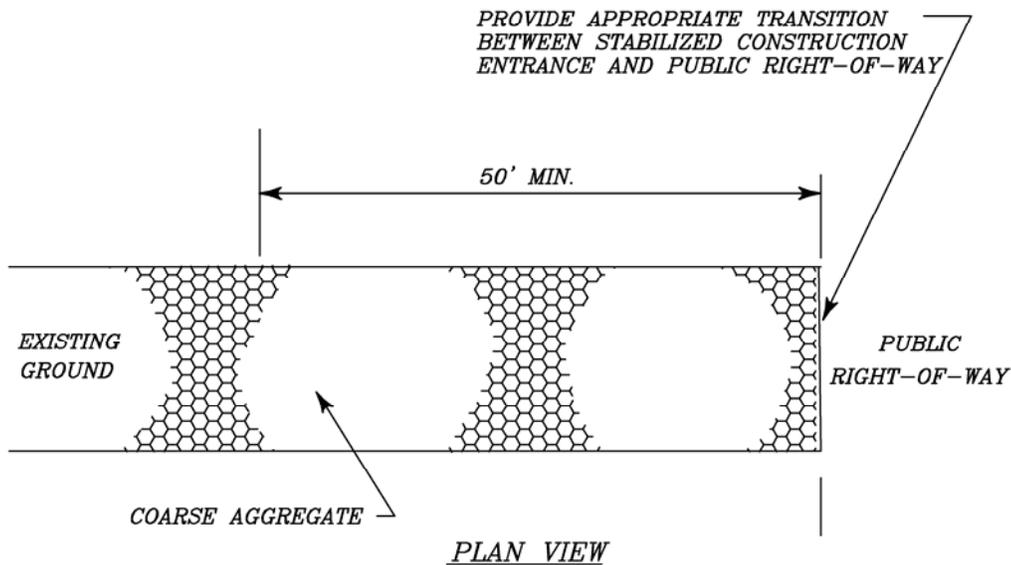
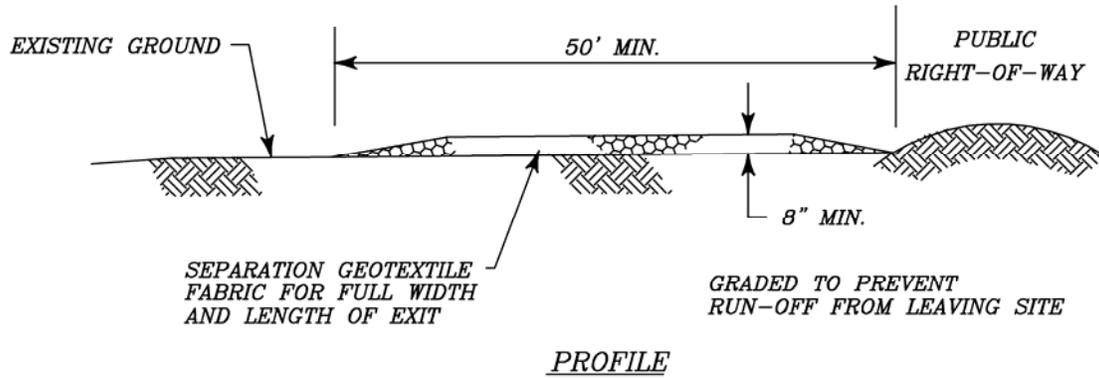
F. Inspection and Maintenance

The stabilized access shall be inspected daily. Areas not meeting the design criteria and requirements shall be repaired or replaced immediately.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4711 Stabilized Construction Exit

STABILIZED CONSTRUCTION EXIT



General Notes:

Not to Scale

1. Length shall be as shown on the construction drawings, but not less than 50 feet.
2. Thickness shall not be less than 8 inches.
3. Width shall be not less than full width of all points of ingress or egress.
4. Stabilization for other areas shall have the same aggregate thickness and width requirements as the stabilized construction exit, unless otherwise shown on the construction drawings.
5. Stabilized area may be widened or lengthened to accommodate a truck washing area, when shown on the construction PLANS. An outlet sediment trap must be provided for the truck washing area.

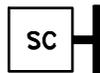


FIGURE 4.7-1
BMP 4711
STABILIZED CONSTRUCTION EXIT

4.7.2 Street Cleaning

A. Definition

Street cleaning is the removal of tracked sediment from public or private roads.

B. Purpose

To reduce the amount of sediment tracking into roadways from construction traffic.

C. Conditions Where Practice Applies

On streets adjacent to the construction site. May be used on small sites where stabilized construction exit is not feasible.

D. Planning Considerations

Use street cleaning to remove sediment that has tracked onto public and private roadways from the construction area. Street cleaning is to be used to supplement stabilized access road and parking areas. For construction sites with areas of one acre or less, street cleaning can be used in lieu of constructing the stabilized exit. Use of other best management practices is required to reduce the amount of sediment being transported from the site during period of rains and non-working hours. The frequency of cleaning will depend on the frequency and intensity of construction activity, vehicle movement, and storm events.

E. Design Criteria and Requirements

<i>Timing</i>	Use daily during construction.
<i>Location</i>	Clean all streets adjacent to construction site where sedimentation may have been tracked.
<i>Constraints</i>	To supplement stabilized access roads and parking areas. If construction site is one acre or less, street cleaning may be used in lieu of stabilized exit. Sweeping should avoid generating dust to minimize airborne particles. Sweeping should include capture and proper disposal of swept debris.
<i>Equipment</i>	For small areas, manually clean the street with a shovel or broom. For larger areas use a vacuum sweeper. Washing or flushing of the street is not allowed.

F. Inspection and Maintenance

Street must be cleaned daily before the end of the workday. If excess sediments have tracked onto the streets, or if rain is expected, clean the street as often as necessary to keep the street clean at all times. Remove and dispose of sediments properly. Disposal of sediments into inlets is illegal and expressly prohibited.

G. Corresponding Technical Specification (Refer to Appendix C)

Item No. 4721 Street Cleaning

4.8 OTHER SOURCE CONTROLS ON CONSTRUCTION PROJECTS

4.8.1 General Source Controls

A. Definition

General source controls include management techniques for minimizing nonpoint source pollution related to erosion and nonerosion sources on construction sites.

B. Purpose

To reduce the availability of construction-related pollutants which can contaminate runoff water and, where runoff contamination cannot be avoided, to retain pollutants and polluted water on the site insofar as possible.

C. Conditions Where Practice Applies

This practice applies to all construction projects. The size and complexity of the construction site determine the level of planning and management necessary to control pollution adequately.

D. Planning Considerations

Construction activities, by their nature, create many sources of potential pollutants which can contaminate runoff and affect the quality of downstream receiving waters. Accelerated erosion and sedimentation caused by land-disturbing activities is one of the major pollution problems caused by construction. Sections 4.1 to 4.7 address specific best management practices (BMP) that address sediment problem areas on construction sites. This section will present general construction management practices that can also reduce the potential for erosion and sedimentation.

Nonerosion pollutants that may be associated with construction activities will contaminate runoff water when they are not properly managed. These include fertilizers, pesticides, gasoline, oils, grease, paints, cements, and solvents. Nontoxic solid wastes such as paper and cardboard can be potential pollutants when they are washed into streams and lakes in large quantities.

The best way to prevent nonpoint source pollution on construction sites is to use “good housekeeping” practices to keep the site in a neat and orderly condition. An overall plan should be outlined to include practices to retain runoff and to deal with toxic substances and materials.

E. Requirements

Specific elements for construction site housekeeping and good management are described below:

Erosion and Sedimentation Control Plan

Erosion and sedimentation controls are effective in controlling many other nonpoint source pollutants associated with construction activities. Development and implementation of a good erosion and sedimentation control plan is a key factor in controlling nonpoint source pollutants.

Topsoiling

When topsoiling, maintain erosion and sedimentation control systems, such as dikes, swales, grade stabilization structures, waterways, and sediment basins operational. Maintain grades which have been previously established on the areas to be topsoiled.

Protection of Trees

Protect trees designated to remain in construction areas. Heavy equipment, vehicular traffic, and stockpiles of construction materials, including topsoil, are not permitted within the dripline of any tree to be retained. Avoid grading, cutting or filling within tree drip lines. Tree trunks, exposed roots, and limbs of trees designated to be retained, which are damaged during construction operations, should be cared for by a forester or licensed tree expert. Specimen trees should be boxed or fenced.

Protection of trees may need to comply with local ordinances.

Dust Control

Control dust blowing and movement on construction sites and roads to prevent loss of soil surface, to reduce onsite and offsite damage, to prevent health hazards, and to improve traffic safety.

Control dust blowing by utilizing one or more of the following methods. Dust control methods shall be implemented immediately whenever dust can be observed blowing on the project site.

- a. Mulches bound with natural or chemical binders such as Curasol, Terratack, or equal.
- b. Temporary vegetative cover.
- c. Spray-on adhesives on mineral soils.
- d. Tillage to roughen surface and bring clods to the surface.
- e. Irrigation by water sprinkling.
- f. Barriers using solid board fences, snow fences burlap fences, crate walls, hay bales, or similar materials.

Equipment Maintenance and Repair

Maintenance and repair of construction machinery and equipment should be confined to areas specifically designated for that purpose. Such designated areas should be located and designed so that oils, gasoline, grease, solvents, and other potential pollutants cannot be washed directly into receiving streams or storm water conveyance systems. These areas should be provided with adequate waste disposal receptacles for liquid as well as solid waste. Maintenance areas should be inspected and cleaned daily.

On a construction site where designated equipment maintenance areas are not feasible, care should be taken during each individual repair or maintenance operation to prevent potential pollutants from becoming available to be washed into streams or conveyance systems. Temporary waste disposal receptacles should be provided.

Waste Collection and Disposal

A plan should be formulated for the collection and disposal of waste materials from a construction site. Such a plan should designate locations for trash and waste receptacles and establish a collection schedule. Methods for ultimate disposal of waste should be specified and carried out in accordance with applicable local, state, and federal health and safety regulations. Special provisions should be made for the collection and disposal of liquid wastes and toxic or hazardous materials.

Receptacles and other waste collection areas should be kept neat and orderly to the extent possible. Waste should not be allowed to overflow its container or accumulate

for excessively long periods of time. Trash collection points should be located where they will least likely be affected by concentrated storm water runoff.

Washing Areas

Vehicles such as cement or dump trucks and other construction equipment should not be washed at locations where the runoff will flow directly into a watercourse or storm water conveyance system. Areas should be designated for washing vehicles. These areas should be located where the wash water will spread out and evaporate or infiltrate directly into the ground, or where the runoff can be collected in a temporary holding or seepage basin. Wash areas should have gravel or rock bases to minimize mud generation.

Storage of Construction Materials, Chemicals, Etc.

Sites where chemicals, cements, solvents, paints, or other potential water pollutants are to be stored, should be isolated in areas where they will not cause runoff pollution.

Toxic and/or hazardous chemicals and materials, such as pesticides, paints, and acids should be stored in accordance with manufacturers' guidelines. Groundwater resources should be protected from leaching by placing a plastic mat, packed clay, tarpaper, or other impervious materials on any areas where toxic and/or hazardous liquids are to be opened and stored.

Spills of toxic and/or hazardous substances are to be cleaned and treated according to local, state and federal regulations.

Demolition Areas

Demolition projects usually generate large amounts of dust with significant concentrations of heavy metals and other toxic pollutants. Dust control techniques should be used to limit the transport of the airborne pollutants. However, water or slurry used to control dust should be retained on the site and not be allowed to run directly into watercourses or storm water conveyance systems.

Sanitary Facilities

All construction sites should be provided with adequate sanitary facilities for workers in accordance with applicable health regulations.

Pesticides

Pesticides used during construction should be stored and used in accordance with manufacturers' guidelines and with local, state and federal regulations. Overuse should be avoided and great care should be taken to prevent accidental spillage. Pesticide containers should never be washed in or near flowing streams or storm water conveyance systems. Certain facilities may be subjected to specific regulations. For example, Texas Public School Districts are required to have Integrated Pest Control Management

For more information on pesticides, contact the departments listed below:

Texas Structural Pest Control Board

William P. Hobby Building
333 Guadalupe, Suite I-530
Austin, Texas 78701
Phone: (512) 305-8250

Fax: (512) 305-8253
Website: <http://www.spcbtx.org>

Texas Cooperative Extension Service
The Texas A&M University System
112 Jack K. Williams
Administration Building
7101 TAMU
College Station, TX 77843-7101
Phone: (979) 845-7967
Website: <http://texasextension.tamu.edu>.

Department of Agriculture
P. O. Box 12847
Austin, TX 78711
Phone: (512) 463-7476
Fax: (512) 463-1104
Website: <http://www.agr.state.tx.us>

F. *Inspection and Maintenance*

Inspect general source controls as detailed above.

G. *Corresponding Technical Specifications (Refer to Appendix C)*

Item No. 4811 General Source Controls

4.8.2 Temporary Vehicle and Equipment Fueling Area

A. *Definition*

Temporary vehicle and equipment aboveground fueling storage tank, which will be on site for more than 48 hours, should be protected from leakage and spilling of fuel.

B. *Purpose*

To contain accidental spilling of fuel, allowing for the clean up of spill once it happens, and to prevent spilled fuel from running into unprotected area. There is no provision for containment of fuel spilled due to major catastrophic failure of the tank. In those cases, refer to the rules and regulations of local, state, and federal statutes, regulations and ordinances for protection and clean up requirements.

C. *Conditions Where Practice Applies*

Temporary fueling area is to be used where aboveground fuel storage tank is used at construction site.

D. *Planning Considerations*

1. Unless necessary, do not use storage tank on site. Locate the tank offsite in an approved storage area to minimize the risk of contaminating the site.
2. When storage tank is needed at the site, locate the tank in a temporary fueling area. The Contractor should prepare spill response and containment procedures to be implemented in the event of a materials spill. Spill containment equipment appropriate to the size of operation is to be located in close proximity to the fueling area. Such equipment may include, but not limited to, suitable waste containers for fuel, drip pans, booms, inlet covers, or absorbent.

E. Design Criteria and Requirements

Installation Do not locate fuel area in or near a channelized flow area or close to a storm sewer conveyance system. Sufficient space must be provided to allow installation of other erosion and sediment controls to protect those areas.

Provisions Protection of fuel areas is by means of:

1. Providing double containment for fuel tanks
2. Installation of curb and overspill pan to contain spills, overspills, and leaks.
3. Liners to prevent spilled fuel from percolating through the soil.

Aboveground Storage Tank

Tank Assembly: Must be listed with UL 1709 and UL2085.

Inner Steel Storage Tank: Follow UL 142, with minimum thickness of 1/8-inch all steel welded construction.

Tank Encasement: Either concrete or steel to provide a minimum of 110 percent containment of the inner tank capacity. Provide 5-gallon overspill containment tank for refueling.

Dispenser Pump: For submersible pump, UL listed emergency shut-off valve, with a shear section, is to be installed at each dispenser.

Representative Manufacturers: Convault, Fireguard, Ecovault, SuperVault, or as approved by local Fire Department.

Concrete 4,000 psi at 28 days

Aggregates Coarse aggregate shall consist of crushed stone, gravel, crushed blast furnace slag, or a combination of these materials. Aggregate shall be composed of clean, hard, durable materials, free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious materials.

Geotextile Fabric

Provide geotextile fabric in continuous rolls of longest practical length under coarse aggregate.

Removal Dispose fueling area after the fuel storage tank has been removed. Inspect the topsoils in the vicinity of the fueling area for evidence of fuel leaks. If pollutants have been released, the soil should be removed and properly disposed offsite.

F. Inspection and Maintenance

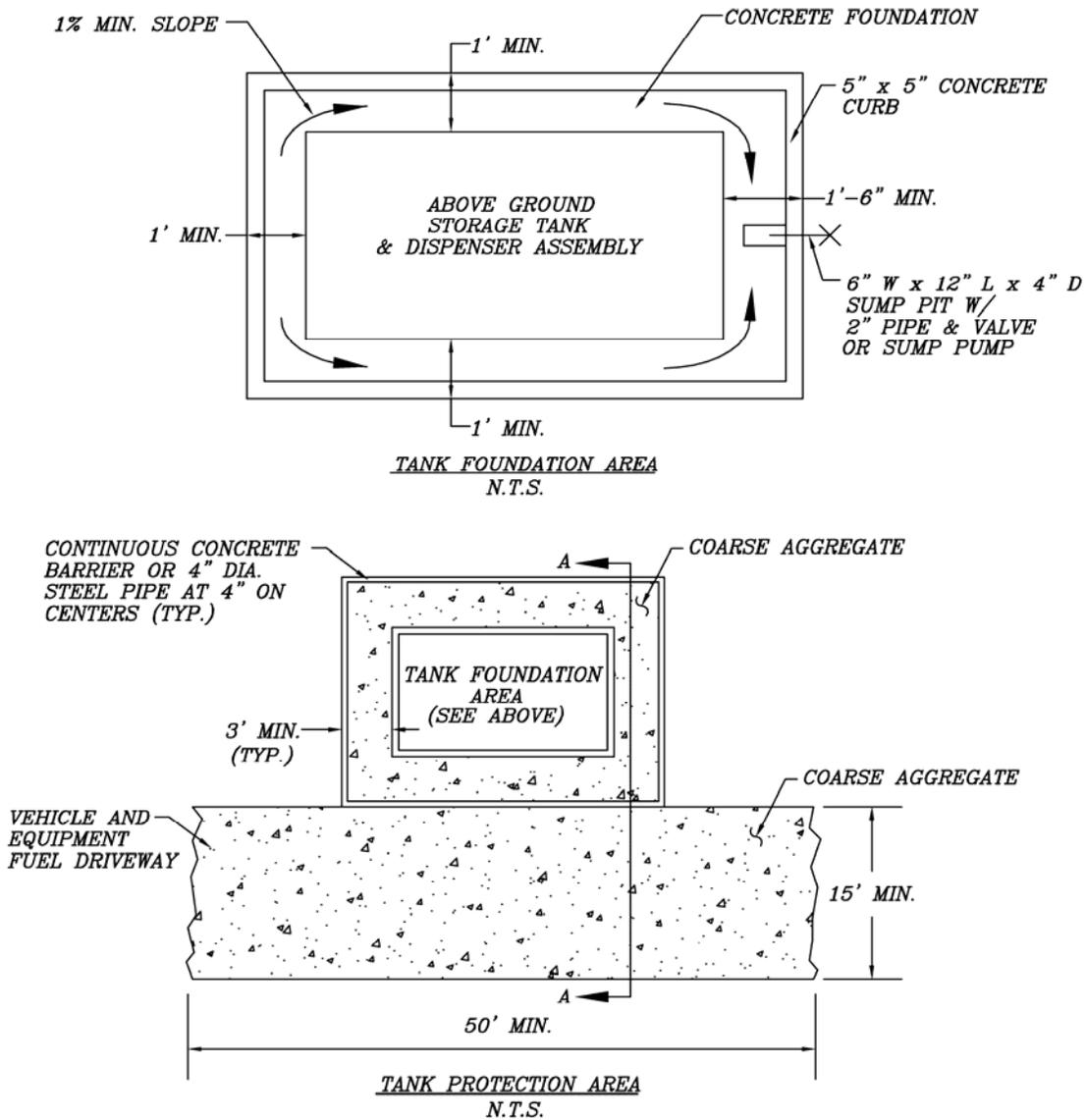
1. Inspect stabilized at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Provide periodic top dressing with additional coarse aggregate to maintain the required depth. Repair and clean out damaged control measures used to trap sediment.
2. Inspect fuel tank foundation's bermed area at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Visually examine storm water contained in the tank's bermed foundation area for oil sheen or other obvious

indicators of storm water pollution. Properly dispose of the storm water when pollution is present. Record visual examination of storm water discharge.

G. Corresponding Technical Specifications (Refer to Appendix C)

Item No. 4821 Temporary Vehicle and Equipment Fueling Area

TEMP. VEHICLE & EQUIPMENT FUELING AREA



General Notes:

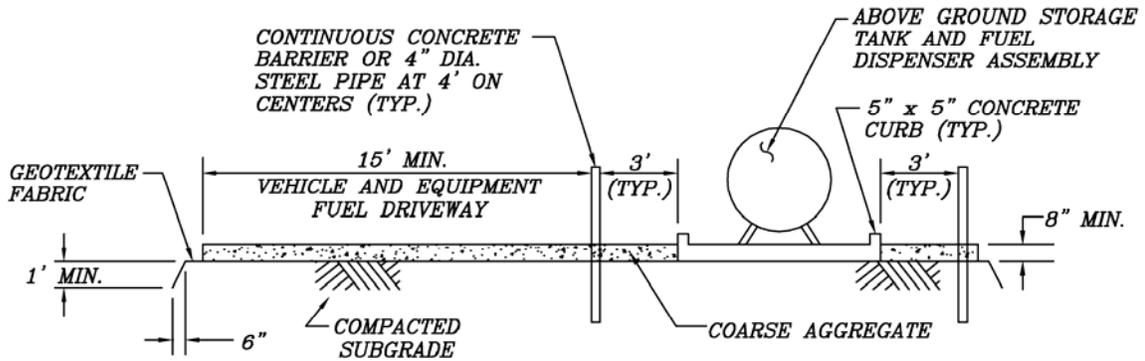
Not to Scale

1. The size of the tank foundation area depends on the size of above ground storage tank and dispenser assembly.
2. Provide a minimum of 1 foot clearance to the edge of the concrete curb.
3. Provide a minimum slope of 1% toward the sump pit.

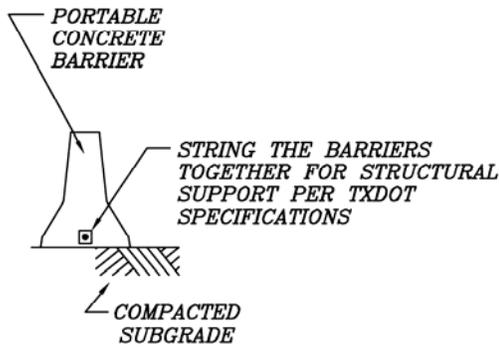
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FIGURE 4.8-1a
BMP 4821
*TEMPORARY VEHICLE & EQUIPMENT
FUELING AREA (DRAWING A)*

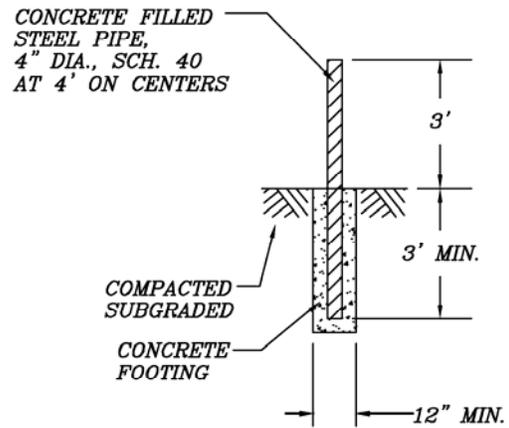
TEMP. VEHICLE & EQUIPMENT FUELING AREA



SECTION A-A
N.T.S.



CONCRETE BARRIER
N.T.S.



PIPE BOLLARD
N.T.S.

Not to Scale

TFA

FIGURE 4.8-1b
BMP 4821 (CONT.)
TEMPORARY VEHICLE & EQUIPMENT
FUELING AREA (DRAWING B)

ORDINANCE AND REGULATIONS

5.0 ORDINANCE AND REGULATIONS

This section provides information on the City of Houston ordinance and Harris County regulations, and contains the TCEQ TPDES storm water permit requirements. Construction projects must comply with applicable federal, state, and local laws, including the Endangered Species Act and historic preservation laws.

5.1 City of Houston Ordinance and Harris County Regulations

The City of Houston Storm Water Discharges Ordinance and the Regulations of Harris County, Texas for Storm Water Quality Management are available on the Storm Water Management Joint Task Force website: <http://www.cleanwaterclearchoice.org>. The City of Houston ordinance is also available at the City of Houston's Department of Public Works and Engineering's Plan Review Desk, 611 Walker, 2nd Floor, Houston, Texas, and at the City of Houston's Storm Sewer Review Desk, 3300 Main, 2nd Floor, Houston, Texas. The Harris County regulations are also available at the Harris County Public Infrastructure Department – Permit Office, 10,000 Northwest Freeway, Suite 102, Houston, Texas. Additional information on Harris County storm water permit requirements is available on the County's website: <http://www.eng.hctx.net/permits>.

5.2 Federal and State Storm Water Discharge Permit Regulations

Congress amended the Clean Water Act (CWA) in 1987 to require the Environmental Protection Agency (EPA) to establish phased NPDES requirements for storm water discharges. To implement these requirements, EPA published the initial permit application requirements for (a) 11 categories of storm water discharges associated with industrial activity, and (b) discharges from municipal separate storm sewer systems (MS4) located in municipalities with a population of 100,000 or more on November 16, 1990.

One of the 11 categories of industrial activity covered under this regulation is construction activity including, clearing, grading and excavation activities except: operations that result in the disturbance of less than 5 acres of total land area which are not part of a larger common plan of the development or sale. On June 4, 1992, the United States Court of Appeals for the Ninth Circuit remanded the exemption for construction sites of less than five (5) acres to the EPA for further rulemaking (Nos. 90-70671 and 91-70200). Storm water discharges into waters of the United States from such construction activity are unlawful, unless authorized by an NPDES permit. Storm water runoff can become polluted by picking up soil particles and other pollutants as it flows over construction sites. Requiring construction activity to have an NPDES storm water permit provides a way for EPA to monitor and manage these discharges, and reduce the amount of pollutants.

Under the CWA EPA authorized Texas to develop and implement the Texas Pollutant Discharge Elimination System (TPDES) Program, on September 14, 1998. Under the terms of this authorization Texas Commission on Environmental Quality (TCEQ) has assumed the role of storm water permitting authority for Industrial Activity, Construction Activity, and Municipal Separate Storm Sewer Systems (MS4s) in Texas.

5.3 TCEQ TPDES General Permit for Storm Water Discharges from Construction Sites, Permit No. TXR150000 (Construction General Permit)

The TCEQ storm water regulations present two (2) options for construction activity permit applications. The first option is to submit an individual permit application to TCEQ. The second option is to file a notice of intent (NOI) to seek coverage under a general permit in accordance with

the requirements of the Construction General Permit. One of the major requirements of the Construction General Permit is that operator(s) of the construction activity prepare and implement a Storm Water Pollution Prevention Plan (SWP3) to reduce the pollutants in storm water discharges from the construction site. Guidance to prepare the SWP3 is presented in other sections of this handbook.

This handbook is based on the requirements of the TPDES Construction General Permit. A copy of the Construction General Permit is included in this section.

5.4 The TPDES Construction General Permit

The TPDES Construction General Permit extended general permit coverage to small construction sites disturbing from one acre to less than 5 acres. Small construction sites are required to obtain permit coverage. Specific requirements for small construction sites are provided in the TPDES Construction General Permit.



TPDES General Permit
NO. TXR150000

This is a new general permit issued pursuant to Section 26.040 of the Texas Water Code and Section 402 of the Clean Water Act.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. BOX 13087
Austin, TX 78711-3087

GENERAL PERMIT TO DISCHARGE WASTE

under provisions of
Section 402 of the Clean Water Act
and Chapter 26 of the Texas Water Code

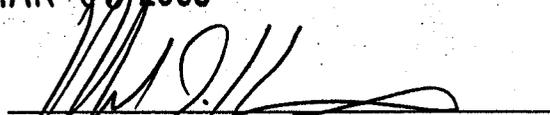
Construction sites located in the state of Texas

may discharge to surface water in the state

only according to effluent limitations, monitoring requirements and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this general permit does not grant to the permittee the right to use private or public property for conveyance of storm water and certain non-storm water discharges along the discharge route. This includes property belonging to but not limited to any individual, partnership, corporation or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit and the authorization contained herein shall expire at midnight five years after the date of issuance.

ISSUED AND EFFECTIVE DATE: MAR 05 2003



For the Commission

**TCEQ General Permit Number TXR150000 Relating To Discharges
From Construction Activities**

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Part VI. Standard Permit Conditions Page 29

Part VII. Fees Page 30

Appendix A. Periods of Low Potential by County Page 31

Attachment 1 Construction Site Notice for Part II.D.1 Waivers Page 32

Attachment 2 Construction Site Notice for Part II.D.2. Authorizations Page 33

Attachment 3 Discharge Monitoring Report for Concrete Batch Plants Page 34

Part I. Definitions

Best Management Practices - (BMPs) Schedules of activities, prohibitions of practices, maintenance procedures, structural controls, local ordinances, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spills or leaks, waste disposal, or drainage from raw material storage areas.

Commencement of Construction - The exposure of soils resulting from activities such as clearing, grading, and excavating.

Common Plan of Development - A construction activity that is completed in separate stages, separate phases, or in combination with other construction activities. A common plan of development is identified by the documentation for the construction project that identifies the scope of the project, and may include plats, blueprints, marketing plans, contracts, building permits, a public notice or hearing, zoning requests, or other similar documentation and activities.

Facility or Activity - Any TPDES “point source” or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the TPDES program.

Final Stabilization - A construction site status where either of the following conditions are met:

- (a) All soil disturbing activities at the site have been completed and a uniform (e.g, evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.
- (b) For individual lots in a residential construction site by either:
 - (1) the homebuilder completing final stabilization as specified in condition (a) above; or
 - (2) the homebuilder establishing temporary stabilization for an individual lot prior to the time of transfer of the ownership of the home to the buyer and after informing the homeowner of the need for, and benefits of, final stabilization.
- (c) For construction activities on land used for agricultural purposes (e.g. pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to a surface water and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization conditions of condition (a) above.

Large Construction Activity - Construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than five (5) acres of land. Large construction activity also includes the disturbance of less than five (5) acres of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than five (5) acres of land. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance. Large construction activity does not include the routine grading of existing dirt roads, asphalt overlays of existing roads, the routine clearing of existing right-of-ways, and similar maintenance activities.

Municipal Separate Storm Sewer System (MS4) - A separate storm sewer system owned or operated by a state, city, town, county, district, association, or other public body (created by or pursuant to state law) having jurisdiction over the disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law such as a sewer district, flood control or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization.

Notice of Intent (NOI) - A written submission to the executive director from an applicant requesting coverage under a general permit.

Notice of Termination (NOT) - A written submission to the executive director from a permittee authorized under a general permit requesting termination of coverage.

Operator - The person or persons associated with a large or small construction activity that meets either of the following two criteria:

- (a) the person or persons have operational control over construction plans and specifications to the extent necessary to meet the requirements and conditions of this general permit; or
- (b) the person or persons have day-to-day operational control of those activities at a construction site which are necessary to ensure compliance with a storm water pollution prevention plan for the site or other permit conditions (e.g. they are authorized to direct workers at a site to carry out activities required by the Storm Water Pollution Prevention Plan or comply with other permit conditions).

Permittee - An operator authorized under this general permit. The authorization may be gained through submission of a notice of intent, by waiver, or by meeting the requirements for automatic coverage to discharge storm water runoff and certain non-storm water discharges.

Point Source - Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are, or may be, discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Pollutant - (from the Texas Water Code, Chapter 26) Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, filter backwash, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into any surface water in the state. The term "pollutant" does not include tail water or runoff water from irrigation or rainwater runoff from cultivated or uncultivated rangeland, pastureland, and farmland.

Pollution - (from the Texas Water Code, Chapter 26) The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any surface water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Runoff Coefficient - The fraction of total rainfall that will appear at the conveyance as runoff.

Separate Storm Sewer System - A conveyance or system of conveyances (including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains), designed or used for collecting or conveying storm water; that is not a combined sewer, and that is not part of a publicly owned treatment works (POTW).

Small Construction Activity - Construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one (1) acre and less than five (5) acres of land. Small construction activity also includes the disturbance of less than one (1) acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one (1) and less than five (5) acres of land. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance. Small construction activity does not include the routine grading of existing dirt roads, asphalt overlays of existing roads, the routine clearing of existing right-of-ways, and similar maintenance activities.

Storm Water - Storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm Water Associated with Construction Activity - Storm water runoff from a construction activity where soil disturbing activities (including clearing, grading, excavating) result in the disturbance of one (1) or more acres of total land area, or are part of a larger common plan of development or sale that will result in disturbance of one (1) or more acres of total land area.

Structural Control (or Practice) - A pollution prevention practice that requires the construction of a device, or the use of a device, to capture or prevent pollution in storm water runoff. Structural controls and practices may include but are not limited to: silt fences, earthen dikes, drainage swales, sediment traps, check dams, subsurface drains, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins.

Surface Water in the State - Lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, wetlands, marshes, inlets, canals, the Gulf of Mexico inside the territorial limits

of the state (from the mean high water mark (MHW) out 10.36 miles into the Gulf), and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or nonnavigable, and including the beds and banks of all water-courses and bodies of surface water, that are wholly or partially inside or bordering the state or subject to the jurisdiction of the state; except that waters in treatment systems which are authorized by state or federal law, regulation, or permit, and which are created for the purpose of waste treatment are not considered to be water in the state.

Temporary Stabilization - A condition where exposed soils or disturbed areas are provided a protective cover, which may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place.

Waters of the United States - (from title 40, part 122, section 2 of the Code of Federal Regulations) Waters of the United States or waters of the U.S. means:

- (a) all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- (b) all interstate waters, including interstate wetlands;
- (c) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds that the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
 - (1) which are or could be used by interstate or foreign travelers for recreational or other purposes;
 - (2) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
 - (3) which are used or could be used for industrial purposes by industries in interstate commerce;
- (d) all impoundments of waters otherwise defined as waters of the United States under this definition;
- (e) tributaries of waters identified in paragraphs (a) through (d) of this definition;
- (f) the territorial sea; and
- (g) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR § 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

Part II. Permit Applicability and Coverage

Section A. Discharges Eligible for Authorization

1. Storm Water Associated with Construction Activity

Discharges of storm water runoff from small and large construction activities may be authorized under this general permit.

2. Discharges of Storm Water Associated with Construction Support Activities

Discharges of storm water runoff from construction support activities, including concrete batch plants, asphalt batch plants, equipment staging areas, material storage yards, material borrow areas, and excavated material disposal areas may be authorized under this general permit provided:

- (a) the activity is located within a 1-mile distance from the boundary of the permitted construction site and directly supports the construction activity;
- (b) the storm water pollution prevention plan is developed according to the provisions of this general permit and includes appropriate controls and measures to reduce erosion and discharge of pollutants in storm water runoff from the supporting industrial activity site; and
- (c) the industrial activity either does not operate beyond the completion date of the construction activity or obtains separate TPDES authorization for discharges.

3. Non-storm Water Discharges

The following non-storm water discharges from sites authorized under this general permit are also eligible for authorization under this general permit:

- (a) discharges from fire fighting activities;

- (b) fire hydrant flushings;
- (c) vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless spilled materials have been removed; and if local state, or federal regulations are applicable, the materials are removed according to those regulations), and where the purpose is to remove mud, dirt, an dust;
- (d) water used to control dust;
- (e) potable water sources including waterline flushings;
- (f) air conditioning condensate;
- (g) uncontaminated ground water or spring water, including foundation or footing drains where flows are not contaminated with industrial materials such as solvents.

4. Other Permitted Discharges

Any discharge authorized under a separate NPDES, TPDES, or TCEQ permit may be combined with discharges authorized by this permit.

Section B. Limitations on Permit Coverage

1. Post Construction Discharges.

Discharges that occur after construction activities have been completed, and after the construction site and any supporting activity site have undergone final stabilization, are not eligible for coverage under this general permit. Discharges originating from the sites are not authorized under this general permit following the submission of the notice of termination (NOT) for the construction activity.

2. Prohibition of Non-Storm Water Discharges

Except as provided in Part II. A.2., A3., and A4., all discharges authorized by this general permit must be composed entirely of storm water associated with construction activity.

3. Compliance With Water Quality Standards

Discharges to surface water in the state that would cause or contribute to a violation of water quality standards or that would fail to protect and maintain existing designated uses are not eligible for coverage under this general permit. The executive director may require an application for an individual permit or alternative

general permit (see Part II.G.3) to authorize discharges to surface water in the state from any activity that is determined to cause a violation of water quality standards or is found to cause, or contribute to, the loss of a designated use. The executive director may also require an application for an individual permit considering factors described in Part II. G.2.

4. Discharges to Water Quality-Impaired Receiving Waters.

New sources or new discharges of the constituents of concern to impaired waters are not authorized by this permit unless otherwise allowable under 30 TAC Chapter 305 and applicable state law. Impaired waters are those that do not meet applicable water quality standards and are listed on the EPA approved Clean Water Act Section 303(d) list. Constituents of concern are those for which the water body is listed as impaired.

Discharges of the constituents of concern to impaired water bodies for which there is a total maximum daily load (TMDL) implementation plan are not eligible for this permit unless they are consistent with the approved TMDL and the implementation plan. Permittees must incorporate the limitations, conditions, and requirements applicable to their discharges, including monitoring frequency and reporting required by TCEQ rules, into their storm water pollution prevention plan in order to be eligible for coverage under this general permit.

5. Discharges to the Edwards Aquifer Recharge Zone

Discharges cannot be authorized by this general permit where prohibited by 30 Texas Administrative Code (TAC) Chapter 213 (relating to Edwards Aquifer).

- (a) For new discharges located within the Edwards Aquifer Recharge Zone, or within that area upstream from the recharge zone and defined as the Contributing Zone, operators must meet all applicable requirements of, and operate according to, 30 TAC Chapter 213 (Edwards Aquifer Rule) in addition to the provisions and requirements of this general permit.
- (b) For existing discharges, the requirements of the agency-approved Water Pollution Abatement Plan under the Edwards Aquifer Rules are in addition to the requirements of this general permit. BMPs and maintenance schedules for structural storm water controls, for example, may be required as a provision of the rule. All applicable requirements of the Edwards Aquifer Rule for reductions of suspended solids in storm water runoff are in addition to the requirements in this general permit for this pollutant. For discharges from large construction activities located on the Edwards Aquifer contributing zone, applicants must also submit a copy of the NOI to the appropriate TCEQ regional office.”

Counties:

Comal, Bexar, Medina, Uvalde,
and Kinney

Williamson, Travis, and Hays

Contact:

TCEQ
Water Program Manager
San Antonio Regional Office
14250 Judson Rd.
San Antonio, Texas
(210) 490-3096

TCEQ
Water Program Manager
Austin Regional Office
1921 Cedar Bend Dr., Ste. 150
Austin, Texas
(512) 339-2929.

6. Discharges to Specific Watersheds and Water Quality Areas

Discharges otherwise eligible for coverage cannot be authorized by this general permit where prohibited by 30 TAC Chapter 311 (relating to Watershed Protection) for water quality areas and watersheds.

7. Protection of Streams and Watersheds by Other Governmental Entities

This general permit does not limit the authority or ability of federal, other state, or local governmental entities from placing additional or more stringent requirements on construction activities or discharges from construction activities. For example, this permit does not limit the authority of a home-rule municipality provided by Section 401.002 of the Texas Local Government Code.

8. Indian Country Lands

Storm water runoff from construction activities occurring on Indian Country lands are not under the authority of the TCEQ and are not eligible for coverage under this general permit. If discharges of storm water require authorization under federal National Pollutant Discharge Elimination System (NPDES) regulations, authority for these discharges must be obtained from the U.S. Environmental Protection Agency (EPA).

9. Oil and Gas Production

Storm water runoff from construction activities associated with the exploration, development, or production of oil or gas or geothermal resources, including transportation of crude oil or natural gas by pipeline, are not under the authority of the TCEQ and are not eligible for coverage under this general permit. If discharges

of storm water require authorization under federal NPDES regulations, authority for these discharges must be obtained from the EPA.

10. Storm Water Discharges from Agricultural Activities

Storm water discharges from agricultural activities that are not point source discharges of storm water are not subject to TPDES permit requirements. These activities may include clearing and cultivating ground for crops, construction of fences to contain livestock, construction of stock ponds, and other similar agricultural activities.

Section C. Deadlines for Obtaining Authorization to Discharge

1. Large Construction Activities

- (a) New Construction - Discharges from sites where the commencement of construction occurs on or after the issuance date of this general permit must be authorized, either under this general permit or a separate TPDES permit, prior to the commencement of those construction activities.
- (b) Ongoing Construction - Operators of large construction activities continuing to operate after the issuance date of this permit, and authorized under NPDES general permit TXR100000 (issued July 6, 1998, FR 36490), must submit an NOI to obtain authorization under this general permit within 90 days of the issuance date of this general permit. During this interim period, as a requirement of this TPDES permit, the operator must continue to meet the conditions and requirements of the federal NPDES permit. If the construction activity is completed prior to this 90-day deadline, and the site would otherwise qualify for termination of coverage under that federal NPDES permit, the operator must notify the executive director of the TCEQ in writing within 30 days of that condition.

2. Small Construction Activities

- (a) New Construction - Discharges from sites where the commencement of construction occurs on or after the issuance date of this general permit must be authorized, either under this general permit or a separate TPDES permit, prior to the commencement of those construction activities.
- (b) Ongoing Construction - Discharges from ongoing small construction activities that commenced prior to March 10, 2003, and that would not meet the conditions to qualify for termination of this permit as described in Part II.E. of this general permit, must be authorized, either under this general permit or a separate TPDES permit, prior to March 10, 2003.

Section D. Obtaining Authorization to Discharge

1. Small construction activities are determined to occur during periods of low potential for erosion, and operators of these sites may be automatically authorized under this general permit and not required to develop a storm water pollution prevention plan or submit a notice of intent (NOI), provided:
 - (a) the construction activity occurs in a county listed in Appendix A;
 - (b) the construction activity is initiated and completed, including either final or temporary stabilization of all disturbed areas, within the time frame identified in Appendix A for the location of the construction site;
 - (c) all temporary stabilization is adequately maintained to effectively reduce or prohibit erosion, final stabilization activities have been initiated and a condition, of final stabilization is completed no later than 30 days following the end date of the time frame identified in Appendix A for the location of the construction site;
 - (d) the permittee signs a completed construction site notice (Attachment 1 of this general permit), including the certification statement;
 - (e) a signed copy of the construction site notice is posted at the construction site in a location where it is readily available for viewing by the general public, local, state, and federal authorities prior to commencing construction activities, and maintained in that location until completion of the construction activity;
 - (f) a copy of the signed and certified construction site notice is provided to the operator of any municipal separate storm sewer system receiving the discharge at least two days prior to commencement of construction activities; and
 - (g) any supporting concrete batch plant or asphalt batch plant is separately authorized for discharges of storm water runoff or other non-storm water discharges under an individual TPDES permit, another TPDES general permit or under an individual TCEQ permit where storm water and non-storm water is disposed of by evaporation or irrigation (discharges are adjacent to water in the state).
2. Operators of small construction activities not described in Part II.D.1. above may be automatically authorized under this general permit, and operators of these sites are not required to submit an NOI provided they:
 - (a) develop a SWP3 according to the provisions of this general permit, that covers either the entire site or all portions of the site for which the applicant

is the operator, and implement that plan prior to commencing construction activities;

- (b) sign a completed construction site notice (Attachment 2 of this general permit);
 - (c) post a signed copy of the construction site notice at the construction site in a location where it is readily available for viewing by the general public, local, state, and federal authorities, prior to commencing construction activities, and maintain the notice in that location until completion of the construction activity; and
 - (d) provide a copy of the signed and certified construction site notice to the operator of any municipal separate storm sewer system receiving the discharge at least two days prior to commencement of construction activities.
3. Operators of all other construction activities that qualify for coverage under this general permit must:
- (a) develop a SWP3 according to the provisions of this general permit, that covers either the entire site or all portions of the site for which the applicant is the operator, and implement that plan prior to commencing construction activities;
 - (b) submit a Notice of Intent (NOI), using a form provided by the executive director, at least 2 days prior to commencing construction activities; or
 - (c) if the operator changes, or an additional operator is added after the initial NOI is submitted, the new operator must submit an NOI at least two (2) days before assuming operational control;
 - (d) post a copy of the NOI at the construction site in a location where it is readily available for viewing prior to commencing construction activities, and maintain the notice in that location until completion of the construction activity;
 - (e) provide a copy of the signed NOI to the operator of any municipal separate storm sewer system receiving the discharge, at least two (2) days prior to commencing construction activities; and
 - (f) implement the SWP3 prior to beginning construction activities.

4. Effective Date of Coverage

- (a) Operators of construction activities described in either Part II. D.1. or D.2. are authorized immediately following compliance with the conditions of Part II. D.1. or D.2. that are applicable to the construction activity.
- (b) Operators of all other construction activities eligible for coverage under this general permit, unless otherwise notified by the executive director, are provisionally authorized two (2) days from the date that a completed NOI is postmarked for delivery to the TCEQ. If electronic submission of the NOI is provided, and unless otherwise notified by the executive director, operators are provisionally authorized 24 hours following confirmation of receipt of the NOI by the TCEQ. Authorization is non-provisional when the executive director finds the NOI is administratively complete and an authorization number is issued for the activity.
- (c) Operators are not prohibited from submitting late NOIs or posting late notices to obtain authorization under this general permit. The TCEQ reserves the right to take appropriate enforcement actions for any unpermitted activities that may have occurred between the time construction commenced and authorization is obtained.

5. Notice of Change (NOC) Letter

If the operator becomes aware that it failed to submit any relevant facts, or submitted incorrect information in an NOI, the correct information must be provided to the executive director in a NOC letter within 14 days after discovery. If relevant information provided in the NOI changes, a NOC letter must be submitted within 14 days of the change. A copy of the NOC must be provided to the operator of any MS4 receiving the discharge.

6. Signatory Requirement for NOI Forms, Notice of Termination (NOT) Forms, NOC Letters, and Construction Site Notices

NOI forms, NOT forms, NOC letters, and Construction Site Notices must be signed according to 30 TAC § 305.44 (relating to Application for Permit).

7. Contents of the NOI

The NOI form shall require, at a minimum, the following information:

- (a) the name, address, and telephone number of the operator filing the NOI for permit coverage;
- (b) the name (or other identifier), address, county, and latitude/longitude of the construction project or site;

- (c) number of acres that will be disturbed (estimated to the largest whole number);
- (d) whether the project or site is located on Indian Country lands;
- (e) confirmation that a SWP3 has been developed and that the SWP3 will be compliant with any applicable local sediment and erosion control plans; and
- (f) name of the receiving water(s).

Section E. Application to Terminate Coverage

Each operator that has submitted an NOI for authorization under this general permit must apply to terminate that authorization following the conditions described in this section of the general permit. Authorization must be terminated by submitting a Notice of Termination (NOT) on a form supplied by the executive director. Authorization to discharge under this permit terminates at midnight on the day the NOT is postmarked for delivery to the TCEQ. If electronic submission of the NOT is provided, authorization to discharge under this permit terminates immediately following confirmation of receipt of the NOT by the TCEQ. Compliance with the conditions and requirements of this permit is required until an NOT is submitted.

1. Notice of Termination Required

The NOT must be submitted to TCEQ, and a copy of the NOT provided to the operator of any MS4 receiving the discharge, within thirty (30) days, after:

- (a) final stabilization has been achieved on all portions of the site that is the responsibility of the permittee; or
- (b) another permitted operator has assumed control over all areas of the site that have not been finally stabilized; and
- (c) all silt fences and other temporary erosion controls have either been removed, scheduled for removal as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage. Erosion controls that are designed to remain in place for an indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal.

2. Minimum Contents of the NOT

The NOT form shall require, at a minimum, the following information:

- (a) if authorization was granted following submission of a NOI, the permittees site-specific TPDES general permit number for the construction site;

- (b) an indication of whether the construction activity is completed or if the permittee is simply no longer an operator at the site;
- (c) the name, address and telephone number of the permittee submitting the NOT;
- (d) the name (or other identifier), address, county, and latitude/longitude of the construction project or site; and
- (e) a signed certification that either all storm water discharges requiring authorization under this general permit will no longer occur, or that the applicant to terminate coverage is no longer the operator of the facility or construction site, and that all temporary structural erosion controls have either been removed, will be removed on a schedule defined in the SWP3, or transferred to a new operator if the new operator has applied for permit coverage. Erosion controls that are designed to remain in place for an indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal.

Section F. Waivers from Coverage

The executive director may waive the otherwise applicable requirements of this general permit for storm water discharges from small construction activities under the terms and conditions described in this section.

1. Waiver Applicability and Coverage

Operators of small construction activities may apply for and receive a waiver from the requirements to obtain authorization under this general permit where:

- (a) the calculated rainfall erosivity R factor for the entire period of the construction project is less than five (5);
- (b) the operator submits a signed waiver certification form, supplied by the executive director, certifying that the construction activity will commence and be completed within a period when the value of the calculated rainfall erosivity R factor is less than five (5); and
- (c) the waiver certification form is submitted to the TCEQ at least two (2) days before construction activity begins.

2. Effective Date of Waiver

Operators of small construction activities are provisionally waived from the otherwise applicable requirements of this general permit two (2) days from the date that a completed waiver certification form is postmarked for delivery to TCEQ.

3. Activities Extending Beyond the Waiver Period

If a construction activity extends beyond the approved waiver period due to circumstances beyond the control of the operator, the operator must either:

- (a) recalculate the rainfall erosivity factor R factor using the original start date and a new projected ending date, and if the R factor is still under five (5), submit a new waiver certification form at least two (2) days before the end of the original waiver period; or
- (b) obtain authorization under this general permit according to the requirements delineated in either Part II.D.2. or Part II.D.3. at least two (2) days before the end of the approved waiver period.

Section G. Alternative TPDES Permit Coverage

1. Individual Permit Alternative

Any discharge eligible for coverage under this general permit may alternatively be authorized under an individual TPDES permit according to 30 TAC Chapter 305 (relating to Consolidated Permits). Applications for individual permit coverage should be submitted at least three hundred and thirty (330) days prior to commencement of construction activities to ensure timely issuance.

2. Individual Permit Required

The executive director may suspend an authorization or NOI in accordance with the procedures set forth in 30 TAC Chapter 205, including the requirement that the executive director provide written notice to the permittee. The executive director may require an operator of a construction site, otherwise eligible for authorization under this general permit, to apply for an individual TPDES permit because of:

- (a) the conditions of an approved TMDL or TMDL implementation plan;
- (b) the activity is determined to cause a violation of water quality standards or is found to cause, or contribute to, the loss of a designated use of surface water in the state: and
- (c) any other considerations defined in 30 TAC Chapter 205 would include the provision at 30 TAC § 205.4(c)(3)(D), which allows TCEQ to deny authorization under the general permit and require an individual permit if a discharger “has been determined by the executive director to have been out of compliance with any rule, order, or permit of the commission, including non-payment of fees assessed by the executive director.”

3. Any discharge eligible for authorization under this general permit may alternatively be authorized under a separate, applicable general permit according to 30 TAC Chapter 205 (relating to General Permits for Waste Discharges).

Section H. Permit Expiration

This general permit shall be issued for a term not to exceed five (5) years. Following public notice and comment, as provided by 30 TAC § 205.3 (relating to Public Notice, Public Meetings, and Public Comment), the commission may amend, revoke, cancel, or renew this general permit. If the TCEQ publishes a notice of its intent to renew or amend this general permit before the expiration date, the permit will remain in effect for existing, authorized, discharges until the commission takes final action on the permit. Upon issuance of a renewed or amended permit, permittees may be required to submit an NOI within 90 days following the effective date of the renewed or amended permit, unless that permit provides for an alternative method for obtaining authorization.

In the event that the general permit is not renewed, discharges that are authorized under the general permit must obtain either a TPDES individual permit or coverage under an alternative general permit.

Part III. Storm Water Pollution Prevention Plans (SWP3)

Storm water pollution prevention plans must be prepared for storm water discharges that will reach Waters of the United States, including discharges to MS4 systems and privately owned separate storm sewer systems that drain to Waters of the United States, to identify and address potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project. The SWP3 must describe and ensure the implementation of practices that will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and assure compliance with the terms and conditions of this permit.

Individual operators at a site may develop separate SWP3s that cover only their portion of the project provided reference is made to the other operators at the site. Where there is more than one SWP3 for a site, permittees must coordinate to ensure that BMPs and controls are consistent, and do not negate or impair the effectiveness of each other. Regardless of whether a single comprehensive SWP3 is developed, or separate SWP3s are developed for each operator, it is the responsibility of each operator to ensure that compliance with the terms and conditions of this general permit is met in the areas of the construction site where that operator has operational control over construction plans and specifications or day-to-day operational control.

Section A. Shared SWP3 Development

For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site is encouraged. Operators must independently submit an NOI and obtain authorization, but may work together to prepare and implement a single comprehensive SWP3 for the entire construction site.

1. The SWP3 must clearly list the name and, for large construction activities, the general permit authorization numbers, for each operator that participates in the shared SWP3. Until the TCEQ responds to receipt of the NOI with a general permit authorization number, the SWP3 must specify the date that the NOI was submitted to TCEQ by each operator. Each participant in the shared plan must also sign the SWP3.
2. The SWP3 must clearly indicate which operator is responsible for satisfying each shared requirement of the SWP3. If the responsibility for satisfying a requirement is not described in the plan, then each permittee is entirely responsible for meeting the requirement within the boundaries of the construction site where they perform construction activities. The SWP3 must clearly describe responsibilities for meeting each requirement in shared or common areas.

Section B. Responsibilities of Operators

1. Operators with Control Over Construction Plans and Specifications

All operators with operational control over construction plans and specifications to the extent necessary to meet the requirements and conditions of this general permit must:

- (a) ensure the project specifications allow or provide that adequate BMPs may be developed to meet the requirements of Part III of this general permit;
- (b) ensure that the SWP3 indicates the areas of the project where they have operational control over project specifications (including the ability to make modifications in specifications);
- (c) ensure all other operators affected by modifications in project specifications are notified in a timely manner such that those operators may modify best management practices as are necessary to remain compliant with the conditions of this general permit; and
- (d) ensure that the SWP3 for portions of the project where they are operators indicates the name and TPDES permit numbers for permittees with the day-to-day operational control over those activities necessary to ensure compliance with the SWP3 and other permit conditions. In the case that responsible parties have not been identified, the permittee with operational control over project specifications must be considered to be the responsible party until such time as the authority is transferred to another party and the plan is updated.

2. Operators with Day-to-Day Operational Control

Operators with day-to-day operational control of those activities at a project that are necessary to ensure compliance with a SWP3 and other permit conditions must:

- (a) ensure that the SWP3 for portions of the project where they are operators meets the requirements of this general permit;
- (b) ensure that the SWP3 identifies the parties responsible for implementation of best management practices described in the plan;
- (c) ensure that the SWP3 indicates areas of the project where they have operational control over day-to-day activities;
- (d) ensure that the SWP3 indicates, for areas where they have operational control over day-to-day activities, the name and TPDES permit number of the parties with operational control over project specifications (including the ability to make modifications in specifications).

Section C. Deadlines for SWP3 Preparation and Compliance

1. The SWP3 must be:

- (a) completed prior to obtaining authorization under this general permit;
- (b) implemented prior to commencing construction activities that result in soil disturbance;
- (c) updated as necessary to reflect the changing conditions of new operators, new areas of responsibility, and changes in best management practices; and
- (d) prepared so that it provides for compliance with the terms and conditions of this general permit.

Section D. Plan Review and Making Plans Available

- 1. The SWP3 must be retained on-site at the construction site or, if the site is inactive or does not have an on-site location to store the plan, a notice must be posted describing the location of the SWP3. The SWP3 must be made readily available at the time of an on-site inspection to: the executive director; a federal, state, or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; and the operator of a municipal separate storm sewer receiving discharges from the site.
- 2. Operators of a large construction activity obtaining authorization to discharge through submission of a NOI must post a notice near the main entrance of the

construction site. If the construction project is a linear construction project (e.g. pipeline, highway, etc.), the notice must be placed in a publicly accessible location near where construction is actively underway. Notice for these linear sites may be relocated, as necessary, along the length of the project. The notice must be readily available for viewing by the general public, local, state, and federal authorities, and contain the following information:

- (a) the TPDES general permit number for the project (or a copy of the NOI that was submitted to the TCEQ if a permit number has not yet been assigned);
 - (b) the name and telephone number of a representative for the operator;
 - (c) a brief description of the project; and
 - (d) the location of the SWP3.
3. This permit does not provide the general public with any right to trespass on a construction site for any reason, including inspection of a site; nor does this permit require that permittees allow members of the general public access to a construction site.

Section E. Keeping Plans Current

The permittee must revise or update the storm water pollution prevention plan whenever:

- 1. there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants and that has not been previously addressed in the SWP3; or
- 2. results of inspections or investigations by site operators, operators of a municipal separate storm sewer system receiving the discharge, authorized TCEQ personnel, or a federal, state or local agency approving sediment and erosion plans indicate the SWP3 is proving ineffective in eliminating or significantly minimizing pollutants in discharges authorized under this general permit.

Section F. Contents of SWP3

The SWP3 must include, at a minimum, the information described in this section.

- 1. A site description, or project description must be developed to include:
 - (a) a description of the nature of the construction activity, potential pollutants and sources;
 - (b) a description of the intended schedule or sequence of major activities that will disturb soils for major portions of the site;

- (c) the total number of acres of the entire property and the total number of acres where construction activities will occur, including off-site material storage areas, overburden and stockpiles of dirt, and borrow areas;
 - (d) data describing the soil or the quality of any discharge from the site;
 - (e) a map showing the general location of the site (e.g. a portion of a city or county map);
 - (f) a detailed site map (or maps) indicating the following:
 - (i) drainage patterns and approximate slopes anticipated after major grading activities;
 - (ii) areas where soil disturbance will occur;
 - (iii) locations of all major structural controls either planned or in place;
 - (iv) locations where stabilization practices are expected to be used;
 - (v) locations of off-site material, waste, borrow, fill, or equipment storage areas;
 - (vi) surface waters (including wetlands) either adjacent or in close proximity; and
 - (vii) locations where storm water discharges from the site directly to a surface water body.
 - (g) the location and description of asphalt plants and concrete plants providing support to the construction site and authorized under this general permit;
 - (h) the name of receiving waters at or near the site that will be disturbed or that will receive discharges from disturbed areas of the project; and
 - (i) a copy of this TPDES general permit.
2. The SWP3 must describe the best management practices that will be used to minimize pollution in runoff. The description must identify the general timing or sequence for implementation. At a minimum, the description must include the following components:
- (a) Erosion and Sediment Controls
 - (i) Erosion and sediment controls must be designed to retain sediment on-site to the extent practicable with consideration for local

topography, soil type, and rainfall. Controls must also be designed and utilized to reduce the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water from the site.

- (ii) Control measures must be properly selected, installed, and maintained according to the manufacturer's or designer's specifications. If periodic inspections or other information indicates a control has been used incorrectly, or that the control is performing inadequately, the operator must replace or modify the control as soon as practicable after discovery that the control has been used incorrectly, is performing inadequately, or is damaged.
- (iii) Sediment must be removed from sediment traps and sedimentation ponds no later than the time that design capacity has been reduced by 50%.
- (iv) If sediment escapes the site, accumulations must be removed at a frequency to minimize further negative effects, and whenever feasible, prior to the next rain event.
- (v) Controls must be developed to limit, to the extent practicable, offsite transport of litter, construction debris, and construction materials.

(b) Stabilization Practices

The SWP3 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 it is possible.

- (i) Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing trees and vegetation, and other similar measures.
- (ii) The following records must be maintained and either attached to or referenced in the SWP3, and made readily available upon request to the parties in Part III.D.1 of this general permit:
 - (a) the dates when major grading activities occur;
 - (b) the dates when construction activities temporarily or permanently cease on a portion of the site; and

- (c) the dates when stabilization measures are initiated.
- (iii) Stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, and except as provided in (a) through (c) below, must be initiated no more than fourteen (14) days after the construction activity in that portion of the site has temporarily or permanently ceased.
 - (a) Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.
 - (b) Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within twenty-one (21) days, temporary stabilization measures do not have to be initiated on that portion of site.
 - (c) In arid areas (areas with an average rainfall of 0 to 10 inches), semiarid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonably arid conditions, stabilization measures must be initiated as soon as practicable.

3. Structural Control Practices

The SWP3 must include a description of any structural control practices used to divert flows away from exposed soils, to limit the contact of runoff with disturbed areas, or to lessen the off-site transport of eroded soils.

- (a) Sediment basins are required, where feasible 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-year, 24-hour storm from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where rainfall data is not available or a calculation cannot be performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained is required where attainable until final stabilization of the site. When calculating the volume of runoff from a 2-year, 24-hour storm event, it is not required to include the flows from offsite areas and flow from onsite areas that are either undisturbed or have already undergone final stabilization, if

these flows are diverted around both the disturbed areas of the site and the sediment basin. In determining whether installing a sediment basin is feasible, the permittee may consider factors such as site soils, slope, available area on site, public safety, precipitation patterns, site geometry, site vegetation, infiltration capacity, geotechnical factors, depth to groundwater and other similar considerations. Where sediment basins are not feasible, equivalent control measures, which may include a series of smaller sediment basins, must 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.

- (b) Sediment traps and sediment basins may also be used to control solids in storm water runoff for drainage locations serving less than ten (10) acres. 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. Alternatively, a sediment basin that provides storage for a calculated volume of runoff from a 2-year, 24-hour storm from each disturbed acre drained, or equivalent control measures, may be provided or where rainfall data is not available or a calculation cannot be performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained may be provided.

4. Permanent Storm Water Controls

A description of any 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 must be included in the SWP3. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site or prior to submission of an NOT.

5. Other Controls

- (a) Off-site vehicle tracking of sediments and the generation of dust must be minimized.
- (b) The SWP3 must include a description of construction and waste materials expected to be stored on-site and a description of controls to reduce pollutants from these materials.
- (c) The SWP3 must 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.

- (d) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

6. Approved State and Local Plans

- (a) Permittees must ensure the SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or site permits approved by federal, state, or local officials.
- (b) SWP3s must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment erosion site plans or site permits, or storm water management site plans or site permits approved by state or local official for which the permittee receives written notice.

7. Maintenance

All erosion and sediment control measures and other protective measures identified in the SWP3 must be maintained in effective operating condition. If through inspections the permittee determines that BMPs are not operating effectively, maintenance must 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. Erosion and sediment controls that have been intentionally disabled, run-over, removed, or otherwise rendered ineffective must be replaced or corrected immediately upon discovery.

8. Inspections of Controls

In the event of flooding or other uncontrollable situations which prohibit access to the inspection sites, inspections must be conducted as soon as access is practicable

- (a) Personnel provided by the permittee and familiar with the SWP3 must inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWP3 must be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking. Inspections must be conducted at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm event of 0.5 inches or greater.

Where sites have been finally or temporarily stabilized, where runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or frozen ground exists), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches), inspections must be conducted at least once every month.

As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm event of 0.5 inches or greater, the SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

- (b) Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may provide inspection personnel with limited access to the areas described in Part III.F.8.(a) above. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls must be inspected at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm event of 0.5 inches, but representative inspections may be performed. For representative inspections, personnel must inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described in Part III.F.8.(a) above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm event of 0.5 inches or greater, the SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

- (c) The SWP3 must be modified based on the results of inspections, as necessary, to better control pollutants in runoff. Revisions to the SWP3 must be completed within seven (7) calendar days following the inspection. If existing BMPs are modified or if additional BMPs are necessary, an implementation schedule must be described in the SWP3 and wherever

possible those changes implemented before the next storm event. If implementation before the next anticipated storm event is impracticable, these changes must be implemented as soon as practicable.

- (d) A report summarizing the scope of the inspection, names and qualifications of personnel making the inspection, the dates of the inspection, and major observations relating to the implementation of the SWP3 must be made and retained as part of the SWP3. Major observations should include: The locations of discharges of sediment or other pollutants from the site; locations of BMPs that need to be maintained; locations of BMPs that failed to operate as designed or proved inadequate for a particular location; and locations where additional BMPs are needed.

Actions taken as a result of inspections must be described within, and retained as a part of, the SWP3. Reports must identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the facility or site is in compliance with the SWP3 and this permit. The report must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports)

- 9. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for all eligible non-storm water components of the discharge.

Part IV. Numeric Effluent Limitations

Section A. Limitations

All discharges of storm water runoff from concrete batch plants that qualify for coverage, and that are authorized to discharge storm water under the provisions of this general permit must be monitored at the following monitoring frequency and comply with the following numeric effluent limitations:

<u>Parameter</u>	<u>Limitations</u> <u>Daily Maximum</u>	<u>Monitoring</u> <u>Frequency</u>
Total Suspended Solids	65 mg/l	1/Year*
Oil and Grease	15 mg/l	1/Year*
pH	between 6 and 9 standard units	1/Year*

* If discharge occurs.

Section B. Reporting Requirements

Results of monitoring for determining compliance with numeric effluent limitations must be recorded on a discharge monitoring report (DMR). The DMR must either be an original EPA No. 3320-1 form (Attachment 3 of this general permit), a duplicate of the form, or as otherwise provided by the executive director. Monitoring must be conducted prior to December 31st for each annual

monitoring period. A copy of the DMR must either be retained at the facility or shall be made readily available for review by authorized TCEQ personnel upon request, by March 31st following the end of each annual monitoring period. If the results indicate the violation of one or more of these numeric limitations, the permittee must also submit the DMR to the TCEQ's Information Resources Center (MC 212) by March 31st of each annual monitoring period.

Part V. Retention of Records

The permittee must retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D. For activities that are not required to submit an NOT, records shall be retained for a minimum period of three (3) years from the date that either: final stabilization has been achieved on all portions of the site that is the responsibility of the permittee; or another permitted operator has assumed control according to over all areas of the site that have not been finally stabilized. Records include:

1. A copy of the SWP3 plan.
2. All reports and actions required by this permit, including a copy of the construction site notice.
3. All data used to complete the NOI, if an NOI is required for coverage under this general permit.

Part VI. Standard Permit Conditions

1. The permittee has a duty to comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.
2. Authorization under this general permit may be suspended or revoked for cause. Filing a notice of planned changes or anticipated non-compliance by the permittee does not stay any permit condition. The permittee must furnish to the executive director, upon request and within a reasonable time, any information necessary for the executive director to determine whether cause exists for revoking, suspending, or terminating authorization under this permit. Additionally, the permittee must provide to the executive director, upon request, copies of all records that the permittee is required to maintain as a condition of this general permit.
3. It is not a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity to maintain compliance with the permit conditions.
4. Inspection and entry shall be allowed under Texas Water Code Chapters 26-28, Health and Safety Code §§ 361.032-361.033 and 361.037, and 40 Code of Federal Regulations (CFR) §122.41(i). The statement in Texas Water Code § 26.014 that commission entry of a facility shall occur according to an establishment's rules and regulations concerning safety, internal security, and fire protection is not grounds for denial or restriction of entry to any part of the

facility or site, but merely describes the commission's duty to observe appropriate rules and regulations during an inspection.

5. The discharger is subject to administrative, civil, and criminal penalties, as applicable, under Texas Water Code §§ 26.136, 26.212, and 26.213 for violations including but not limited to the following:
 - a. negligently or knowingly violating CWA, §§ 301, 302, 306, 307, 308, 318, or 405, or any condition or limitation implementing any sections in a permit issued under CWA, § 402, or any requirement imposed in a pretreatment program approved under CWA, §§ 402(a)(3) or 402(b)(8);
 - b. knowingly making any false statement, representation, or certification in any record or other document submitted or required to be maintained under a permit, including monitoring reports or reports of compliance or noncompliance.
6. All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).
7. Authorization under this general permit does not convey property or water rights of any sort and does not grant any exclusive privilege.

Part VII. Fees

Section A. Application Fees

An application fee of \$100 must be submitted with each NOI for coverage of a large construction activity. A fee is not required for submission of an NOT or NOC letter.

Section B. Water Quality Fees

Large construction activities authorized under this general permit must pay an annual Water Quality Fee of \$100 under Texas Water Code 26.0291 and according to TAC Chapter 205 (relating to General Permits for Waste Discharges).

Appendix A.
Periods of Low Erosion Potential by County

<u>Start Date - End Date</u>	<u>Start Date - End Date</u>	<u>Start Date - End Date</u>
Dec. 15 - Feb. 14	Nov. 15 - Apr. 30	Nov. 15 - Jan. 14 or Feb. 1 - Mar. 30
Archer	Andrews	Crockett
Baylor	Armstrong	Dickens
Brown	Borden	Kent
Callahan	Brewster	Motley
Childress	Briscoe	Val Verde
Coke	Carson	
Coleman	Castro	<u>Start Date - End Date</u>
Concho	Crane	Nov. 1 - Apr. 14 or Nov. 15 - Apr. 30
Cottle	Crosby	Dallam
Dimmit	Dawson	Hockley
Eastland	Deaf Smith	Lamb
Edwards	Ector	Parmer
Fisher	Floyd	Ward
Foard	Gaines	
Hardeman	Garza	<u>Start Date - End Date</u>
Haskell	Glasscock	Nov. 1 - Apr. 30 or Nov. 15 - May. 14
Irion	Hale	Bailey
Jones	Hansford	Cochran
Kerr	Hartley	Jeff Davis
Kimble	Howard	Loving
King	Hutchinson	Presidio
Kinney	Lubbock	Reeves
Knox	Lynn	Winkler
Mason	Martin	Yoakum
Maverick	Midland	
McCulloch	Mitchell	<u>Start Date - End Date</u>
Menard	Moore	Nov. 1 - May. 14
Nolan	Oldham	Culberson
Real	Pecos	Hudspeth
Runnels	Potter	
Schleicher	Randall	<u>Start Date - End Date</u>
Shackelford	Reagan	Jan. 1 - Jul. 14 or May. 15 - Jul. 31 or
Stephens	Scurry	Jun. 1 - Aug. 14 or Jun. 15 - Sept. 14 or
Stonewall	Sherman	Jul. 1 - Oct. 14 or Jul. 15 - Oct. 31 or
Sutton	Sterling	Aug. 1 - Apr. 30 or Aug. 15 - May. 14 or
Taylor	Swisher	Sept. 1 - May. 30 or Oct. 1 - Jun. 14 or
Throckmorton	Terrell	Nov. 1 - Jun. 30 or Nov. 15 - Jul. 14
Tom Green	Terry	El Paso
Uvalde	Upton	
Wichita		<u>Start Date - End Date</u>
Wilbarger	<u>Start Date - End Date</u>	Jan. 1 - Mar. 30 or Dec. 1 - Feb. 28
Young	Feb. 1 - Mar. 30	Collingsworth Wheeler
Zavala	Hall	Donley
		Gray
		Hemphill
		Lipscomb
		Ochiltree
		Roberts



CONSTRUCTION SITE NOTICE

FOR THE
 Texas Commission on Environmental Quality (TCEQ)
 Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.1.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: (Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	

For Construction Sites Authorized Under Part II.D.1. the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization by waiver under Part II.D.1. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. Construction activities at this site shall occur within a time period listed in Appendix A of the TPDES general permit for this county, that period beginning on _____ and ending on _____. I understand that if construction activities continue past this period, all storm water runoff must be authorized under a separate provision of this general permit. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

 Signature and Title

 Date



CONSTRUCTION SITE NOTICE

FOR THE
 Texas Commission on Environmental Quality (TCEQ)
 Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: ((Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized))	
Location of Storm Water Pollution Prevention Plan :	

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

Signature and Title

Date

CONCRETE BATCH FACILITIES

STW/ TXR15_____ / CO

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

NOTE: Enter your permit number in the underlined space in the upper right hand corner of this page. Example: STW/TXR15 00123/ CO

NAME

DISCHARGE MONITORING REPORT (DMR)

ADDRESS

(2-16)	(17-19)
PERMIT NUMBER	DISCHARGE NUMBER

Mail to: TCEQ (MC 212)
P.O. Box 13087
Austin, TX 78711-3087

FACILITY LOCATION

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
	01	01		12	31
(20-21)	(22-23)	(24-25)	(26-27)	(28-29)	(30-31)

PARAMETER (32-37)	SAMPLE MEASUREMENT / REQUIREMENT	(3 Card Only) QUANTITY OR LOADING (46-53)			(4 Card Only) QUALITY OR CONCENTRATION (38-45)			UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM				
Total Suspended Solids	SAMPLE MEASUREMENT	*****	*****	*****	*****	*****					
	SAMPLE REQUIREMENT	*****	*****	*****	*****	*****	65 Daily Max	mg/l		1/Year	Grab
Oil & Grease	SAMPLE MEASUREMENT	*****	*****	*****	*****	*****					
	SAMPLE REQUIREMENT	*****	*****	*****	*****	*****	15 Daily Max	mg/l		1/Year	Grab
pH	SAMPLE MEASUREMENT	*****	*****	*****	*****	*****					
	SAMPLE REQUIREMENT	*****	*****	*****	*****	*****	6.0 - 9.0 Range	S.U.		1/Year	Grab
	SAMPLE MEASUREMENT										
	SAMPLE REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	<small>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 GATHER AND EVALUATE 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.</small>	TELEPHONE	DATE				
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)



CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program
TPDES GENERAL PERMIT TXR150000

This notice applies to construction sites operating under Part II.D.3. of the TPDES General Permit Number TXR150000 for discharges of storm water runoff from construction sites equal to or greater than five acres, including the larger common plan of development. This is an optional notice which contains information required in Part III.D.2. of the general permit. This information should be posted along with a signed copy of the Notice of Intent. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

TPDES Permit Number:	
Contact Name and Phone Number:	
Project Description: <i>Physical address or description of the site's location, and Estimated start date and projected end date, or date that disturbed soils will be stabilized.</i>	
Location of Storm Water Pollution Prevention Plan (SWP3):	

APPENDIX A

**METHODS FOR RUNOFF AND
SEDIMENT LOSS CALCULATIONS**

INTRODUCTION

Estimating the peak rate of runoff, volume of runoff, and soil loss is not required as part of the TCEQ TPDES general permit Storm Water Pollution Prevention Plan (SWP3) for construction activities. However this information may be needed for the design of erosion and sedimentation control facilities and is provided herein for general information purposes. Estimation of the runoff coefficient of the site before construction begins and after construction activities are completed, is a required element of the SWP3 for construction activities.

Appendix A presents information and examples related to runoff and runoff coefficient estimations, volume of runoff and soil loss computations. This information is presented in the following order:

- Part 1 - Estimating runoff
- Part 2 - Estimating runoff coefficient
- Part 3 - Estimating sedimentation loss

This Appendix is intended to provide general guidance in managing storm water discharges from construction sites. Technical and guidance data included have come from a number of sources (See Appendix E.) Careful consideration must be given to selecting the most appropriate control measures based on site-specific features. Additional information from professionals, agencies, organizations, and institutions with expertise in a particular area may be required in selecting, designing, and installing the BMPs.

PART 1 - ESTIMATING RUNOFF

The method of estimating runoff in this handbook is adopted from the procedures established by the Natural Resource Conservation Service (NRCS) (formerly the U.S. Soil Conservation Service (SCS)) and published in Technical Release No. 55, *Urban Hydrology for Small Watersheds*. Methods and recommended values used in the drainage criteria manuals of Harris County Flood Control District, Montgomery County, and Fort Bend County have been referred to or adopted in this handbook. However, the user should use the most current approved design criteria for the design of the erosion and sediment control of the local jurisdiction for the project area. The procedures described in this handbook are intended for use in designing erosion and sediment control facilities and are not intended for use as a design mechanism for drainage and flood control facilities.

Runoff volume or “Rainfall excess” is the directional runoff from a storm event. The volume of runoff is highly dependent on rainfall volume and intensity but is also affected by basin or drainage area characteristics. In addition to the intensity of the rainfall, runoff from the drainage area is a function of several physical characteristics of the drainage area including slope, shape, soil type, and ground cover.

Soils in Harris County and the greater Houston area are predominantly characterized as poorly draining soils on flat slopes. Although exceptions to these characteristics may exist, the need to establish a standard method for calculating runoff justifies some generalization of the parameters to be used. The NRCS has mapped Texas soils by county. The user of this handbook is encouraged to refer to the appropriate NRCS Soil Survey book for further details and soil variations in the project site.

In general, drainage areas with flatter slopes of sandy soils with well-established ground cover have a lower peak rate of runoff and lower total volume of runoff than drainage areas with steeper slopes of clayey soils and poorly established ground cover or impervious areas. This is because more rainfall infiltrates through the sandy soil and the volume of runoff available is reduced and the runoff moves at a slower rate on flatter slopes than on steeper slopes.

Basin shape also affects the peak rate of runoff. For example, a tear-drop shaped basin will result in a higher peak rate of runoff than a rectangular basin of the same size because the runoff reaches the most down stream point of the drainage area faster, resulting in a shorter time of concentration.

There are several acceptable methods to calculate peak rainfall runoff. The Rational Method is generally used for basins unaffected by complex hydrologic situations with drainage areas less than 200 acres. The NRCS has also developed procedures for estimating peak runoff for a small watershed. These two methods are presented in this handbook. The surrounding counties in the greater Houston area also have developed drainage manuals specific to their county. For further details and more information in determining peak runoff and recommended methods, the user of this handbook is encouraged to refer to those drainage manuals.

The design of erosion and sediment control facilities should consider both the anticipated peak rate of runoff and the total volume of runoff. Conveyance systems (dikes, swales, etc.) should emphasize the peak rate of runoff in design. Storage facilities (sediment traps and basins) should emphasize the total volume of runoff.

Definitions

Runoff Curve Number (CN) - The volume and rate of runoff depends on both meteorological and watershed characteristics, and the estimation of runoff requires an index to represent these factors. The SCS has developed an index, which was called the runoff curve number (CN), to represent the combined hydrologic effect of soil, land use, land treatment, and antecedent soil moisture. The CN is a representation of the likelihood that rainfall will become runoff. The higher the CN value, the more runoff and less infiltration that will occur. For design purposes, the following table is recommended:

Land Use	CN
Cultivated land	85
Pasture or Range land	80
Meadows	75
Woods and Forest	75
Open Spaces (lawns, parks, etc.)	80
Disturbed construction sites	65
Impervious areas (roofs, parking, roads, etc.)	95

A drainage area may be comprised of lands with different CNs. The composite CN for a watershed is computed by summing the product of the individual land area times its respective CN divided by the area of the drainage area.

$$CN = \frac{A_1 CN_1 + A_2 CN_2 \dots + A_x CN_x}{\sum \text{of } A}$$

Example:

Drainage area	Size, acres	CN
Parking lot	2	95
Bare ground	4	65
Lawn	4	80

$$CN = \frac{(2 \text{ ac.} \times 95) + (4 \text{ ac.} \times 65) + (4 \text{ ac.} \times 80)}{(2 \text{ ac.} + 4 \text{ ac.} + 4 \text{ ac.})} \Rightarrow CN = \frac{770 \text{ ac.}}{10 \text{ ac.}} \Rightarrow CN = 77$$

Rainfall Frequency - The applicable design rainfall frequency is considered to be a function of the duration that the construction site will be disturbed. Temporary erosion and sedimentation control BMPs are typically sized using a 2-year frequency.

Duration of Construction	Rainfall Frequency
0 - 3 months	2 year
3 - 6 months	3 year
More than 6 months	5 year

Harris County Flood Control District (HCFCD) has developed rainfall frequency curves for Houston-Galveston area based on data from the Weather Bureau Technical Paper No. 40, TP40, Rainfall Frequency Atlas of the United States. The following table is adapted from the 24 hours duration HCFCD frequency curves.

Rainfall Frequency	24-hour Rainfall, inches
2 year	5.5
3 year	6.5
5 year	7.1

Computation of Runoff Volume - Runoff volume or “Rainfall excess” is the direct runoff from a storm event. The volume of runoff is highly dependent on rainfall volume and rate but is also affected by basin or drainage area characteristics. Antecedent soil moisture, depression storage, interception, infiltration, and evaporation are some of the basin characteristics that affect runoff volume.

In the NCRS method, runoff volume (in inches) is computed by the following formulas:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad S = \frac{1000}{CN} - 10$$

Where:

- S is a characteristic of rainfall loss
- P is the rainfall in inches
- Q is the runoff in inches over the watershed
- CN is the runoff curve number

Peak Rate of Runoff - This is the highest rate at which runoff is expected to occur. It is usually computed in terms of cubic feet of runoff per second (cfs). Peak rate of runoff can be computed using the curve for peak discharge on the following page and the inches of runoff computed as described above.

$$q = Q_p * Q$$

Where:

- q is the peak rate of runoff (cfs)
- Q_p is the peak discharge (cfs per inch of runoff)
- Q is the runoff in inches over the watershed

Example: Assume a 10-acre watershed with an CN = 77 for design of temporary erosion and sedimentation control BMPs. Then the design runoff volume would be computed as:

$$\begin{aligned} S &= (1000/77) - 10 \\ S &= 2.99 \\ P &= 5.5 \text{ inches (2 year event)} \\ Q &= (5.5 - 0.2 * 2.99)^2 / (5.5 + 0.8 * 2.99) \\ Q &= 3.04 \text{ inches} \end{aligned}$$

From the figure on the following page, for a 10-acre drainage area and CN of 77, the peak rate of discharge, Q_p , is 7.7 cfs/inch of runoff. The peak rate, q, is then

$$\begin{aligned} q &= 7.7 \text{ cfs/inch} * 3.04 \text{ inches} \\ q &= 23.41 \text{ cfs} \end{aligned}$$

The design peak rate of runoff is 23.41 cfs.

THE RATIONAL METHOD

The Rational Method is based on a direct relationship between rainfall intensity and runoff, and is expressed by the following equation:

$$Q = ciA$$

Where:

- Q= the peak rate of runoff in cubic feet per second, cfs
- c= runoff coefficient, dimensionless (Table A.1)
- i= the average rainfall intensity, inches per hour
- A= drainage area of the basin contributing runoff, acres

The reader is referred to the City of Houston Design Manual, *Chapter 9 - Storm Water Design Requirements (October 1999)* and other sources (e.g., Maidment et al., *Applied Hydrology*) for additional guidance on use of the Rational Method.

Determination of Peak Rate of Runoff

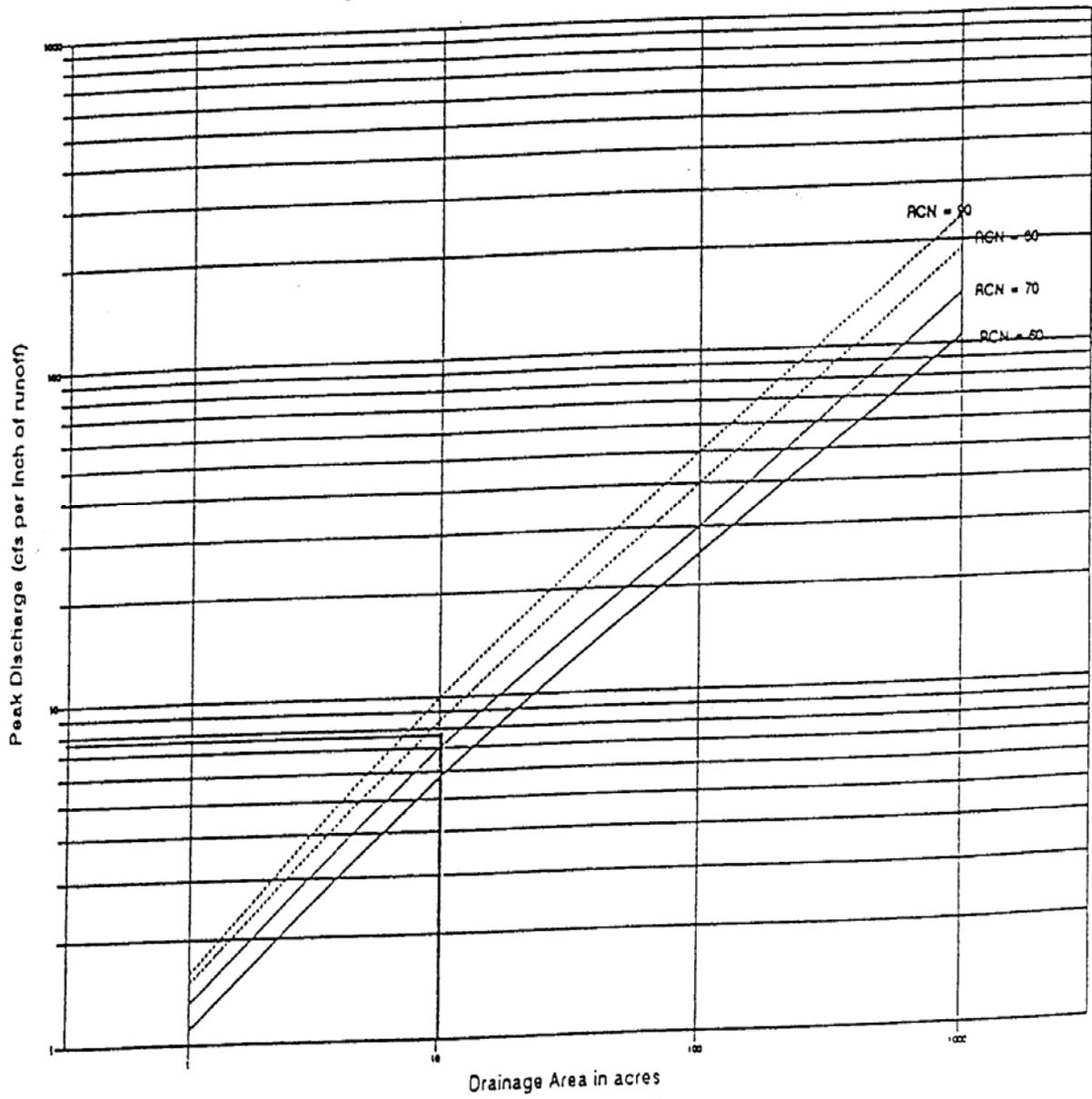


FIGURE A.1

PART 2 - CALCULATING THE RUNOFF COEFFICIENT

The following method of calculating the runoff coefficient is directly adopted from the procedures described in the preliminary draft of “*Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices*,” EPA, 1992.

The runoff coefficient (“C” value) is the partial amount of the total rainfall which will become runoff. The less rainfall that is absorbed (infiltrates) into the ground, evaporates, or is otherwise absorbed on site, the higher the “C” value. For example, the “C” value of a lawn area is 0.2, which means that only 20% of the rainfall landing on that area will runoff, the rest will be absorbed or evaporate. A paved parking area would have a “C” value of 0.9, which means that 90% of the rainfall landing on that area will become runoff. The “C” value to be calculated is the one that represents the final condition of the site after construction is complete. It is suggested that a runoff coefficient be calculated for each drainage basin on the site. The following is an example of how to calculate the “C” value.

Note: Since C is a representative constant for all rainfall events, it tends to underestimate runoff for small events.

EXAMPLE

The runoff coefficient of “C” value for a variety of land uses may be found in Table A.1. These “C” values provide an estimate of anticipated runoff for particular land uses. Most sites have more than one type of land use and therefore more than one “C” value will apply. To have a “C” value that represents the proposed construction site, a “weighted C value” should be calculated.

Calculating a “Weighted C”

When a drainage area contains more than one type of surface materials with more than one runoff coefficient a “weighted C” should be calculated. This “weighted C” will take into account the amount of runoff from all the various parts of the site. A formula used to determine “weighted C” is as follows:

$$c = \frac{A_1 c_1 + A_2 c_2 \dots + A_x c_x}{\sum \text{of } A}$$

Where A = acres and c = coefficient. Therefore, if a drainage area has 15 acres (ac.) with 5 paved acres (c = 0.9), 5 grassed acres (c = 0.2), and 5 acres in natural vegetation (C = 0.1), a “weighted C” would be calculated as follows:

$$c = \frac{(5 \text{ ac.} \times 0.9) + (5 \text{ ac.} \times 0.2) + (5 \text{ ac.} \times 0.1)}{5 \text{ ac.} + 5 \text{ ac.} + 5 \text{ ac.}}$$

$$c = \frac{(4.5 \text{ ac.}) + (1.0 \text{ ac.}) + (0.5 \text{ ac.})}{15 \text{ ac.}} \quad \Rightarrow c = \frac{6.0 \text{ ac.}}{15 \text{ ac.}} \quad \Rightarrow c = 0.4$$

TABLE A.1 TYPICAL “C” VALUES

Land Use Type	Runoff Coefficient (C)
Residential Lots more than 1/2 Acre Lots 1/4 - 1/2 Acre Lots less than 1/4 Acre	0.35 0.45 0.55
Multi-Family Areas Less than 20 Service Units/Acre 20 Service Units/Acre or Greater	0.65 0.80
Business Districts	0.80
Industrial Districts Light Areas Heavy Areas	0.65 0.75
Railroad Yard Areas	0.30
Parks/Open Areas	0.18

Source: *City Of Houston Department Of Public Works And Engineering Design Manual For Wastewater Collection Systems, Water Lines, Storm Drainage, And Street Paving*, October 1999, Houston, Texas

PART 3 - ESTIMATING SEDIMENT LOSS DUE TO WATER EROSION

The principal factors influencing sheet erosion are rainfall energy and intensity, soil erodibility, slope gradient, slope length, land management practices in use, and surface cover involved such as grass, woodland, crops, mulch, and pavement or absence of protective cover.

The method of estimating rainfall-erosion soil losses described herein applies to construction sites and similarly disturbed and unprotected areas. It does not account for large quantities of soil material that may be lost by gully and streambank erosion.

The Universal Soil Loss Equation (USLE)

The former Soil Conservation Service, now Natural Resources Conservation Service, developed the Universal Soil Loss Equation (USLE). The USLE can be used for predicting soil loss from sheet and rill erosion by water. This equation is used for predicting soil loss on construction site and the alternative land treatment for erosion control on construction sites. Careful consideration should be given to the time span a construction site may remain unprotected. The equation has the following form:

$$A = R(\text{or EI})KLSCP$$

A = The computed soil loss (sheet and rill erosion) in tons per acre per year.

R = The rainfall factor. It is the number of erosion-index units in a normal year's rain and is a measure of the average annual erosive force of rainfall. Refer to Figure A.2 for average annual values of the factor R.

The rainfall erosion index, EI, is a measure of the total raindrop energy of a storm and its relation to the maximum 30-minute intensity. Soil losses are linearly proportional to the number of EI units. The EI value for a portion of the year can be determined by using the erosion-index distribution curve in Figures 3-6 for the Houston-Harris County area. Multiply the equation by the percent of annual EI that falls within the designated part of the year.

K = The soil-erodibility factor. It is the erosion rate per unit of erosion index for a specific soil in cultivated continuous fallow on a 9-percent slope 72.6 feet long. See Table A.2 for values of K for various horizons of Texas soils.

L = The slope-length factor. It is the ratio of the soil loss from the field slope length to that from a 72.6 ft. length on the same soil type and gradient.

S = The slope-gradient factor. It is the ratio of soil loss from the field gradient to that from a 9-percent slope.

The LS, slope-length and slope-gradient factors are closely interrelated and have been computed into one combined value. These values are shown on Table A.2.

C = The cropping management factor. It is the ratio of soil loss from a field with specified cropping and management to that from the fallow condition on which the factor K is evaluated.

The C factor is also called the cover index and can be used to represent the effect of land cover or treatment that may be used to protect construction sites. See Table A.4 for C values for treatment that may be used to protect construction sites.

P = The erosion-control practice factor. It is the ratio of soil loss with contouring, stripcropping, or contour irrigated furrows to that with straight-row farming, up-and-down slope.

A value of one is usually assigned for C and P factors on bare construction sites and similarly unprotected areas because of the absence of surface cover and other supporting practice.

Examples of How the Universal Soil Loss Equation May Be Used

Given:

The Houston vicinity is the locale of an unvegetated construction site. The disturbed area is 50 acres in size. The average slope is 1 percent. The average slope length is 400 feet. The soil is Addicks loam, and 2 feet of the surface has been removed.

Example 1

Compute the estimated average annual soil loss (sheet and rill) in tons and cubic yards from the unprotected surface of the site.

- (a) Determine the R value

From Figure A.2, the average annual R value for the Houston vicinity is 400, per SCS communication.

- (b) Determine the K factor

From Table A.2, the K factor for Addicks loam, 11-49 inches depth (as 2 feet of the surface has been removed) is, 0.37.

- (c) Determine the LS value

From Table A.2, the LS value is 0.20 for a 1 percent slope and 400 feet slope length.

- (d) Determine the C and P factors

From Table A.4, the C factor is 1.00 because there is no protective cover and the surface is freshly disturbed. The erosion control Factor P is 1.00 because there are no erosion control practices installed.

- (e) Compute the estimated average annual soil loss (sheet and rill) in tons and cubic yards.

$$A = RKLSCP$$

$$R = 400 \quad LS = 0.20 \quad P = 1.00$$

$$K = 0.37 \quad C = 1.00$$

$$A = 400 \times 0.37 \times 0.20 \times 1.00 \times 1.00 = 29.6 \text{ or } 30 \text{ tons per acre annually.}$$

$$A (50 \text{ acres}) = 30 \text{ tons per acre per year} \times 50 \text{ acres} = 1,500 \text{ tons annually.}$$

$$A (50 \text{ acres}) = 1,500 \text{ tons annually} \times 0.82 \text{ (Table A.5)} = 1,230 \text{ cubic yards annually.}$$

Note - factor for converting soil losses (air-dry) from tons to cubic yards is determined to be 0.82 since the soil survey interpretation sheet for the Addicks series shows the texture at 11 to 49 inches depth to be a loamy soil. Soil survey interpretation sheets are available at Soil Conservation Service field offices.

Example 2

Compute the average soil loss for the five-month period extending from May 1 through September 30.

- (a) Determine percent EI for period May 1 through September 30. (Refer to key map,

Figure A.3, and erosion-index distribution Curve 8 Figure A.4).

Percent EI - October 1 = 79

Percent EI - May 1 = 20

Difference = 59 percent

- (b) Compute the estimated average soil loss for the five-month period, May through September.

1,500 tons annually (Problem 1) \times 0.59 = 885 tons soil loss, May through September

or

1,230 cubic yards annually (Problem 1) \times 0.59 = 726 cubic yards soil loss, May through September.

Example 3

Compute the estimated average annual soil loss after establishment of an annual ryegrass (90 percent stand).

- (a) Determine the C factor.

From Table A.4, the C factor for annual ryegrass is 0.10.

- (b) Compute the estimated average annual soil loss.

1,500 tons annually (Problem 1) \times 0.10 = 150 tons annually

or

1,230 cubic yards annually (Problem 1) \times 0.10 = 123 cubic yards annually.

Considerations in Applying the Universal Soil Loss Equation

The USLE can be used as a planning guide and is the most feasible method available for calculating sheet and rill erosion from specific areas in most of Texas. However, soil losses computed by the equation must be accepted as estimates rather than as absolutes. Derivations of site values of the equation's six factors are based on relationships derived from erosion research of the past 40 years. These relationships can, in specific situations, be significantly influenced by interactions with other variables.

The soil loss equation and supporting data tables were designed to predict longtime average losses for specific conditions. Specific-year losses may be substantially greater or smaller than the annual averages because of differences in the number, size, and timing of erosive rainstorms and in other weather parameters. The frequency distribution of the rainfall factor, R, differs by location, but the following generalities provide some indication of the magnitude of yearly variations in R value: less than average about 60 percent of the time; greater than average about 40 percent of the time; 10 percent probability of being 50 percent greater than average; 5 percent probability of being 75 percent greater than average. A single extreme runoff event shortly after clearing of a site or field could erode, as much soil as the average annual soil loss, but the probability of this occurrence is small.

It is important to distinguish soil loss from sediment yield. The soil loss equation was designed to predict soil loss from sheet and rill erosion but does not directly predict downstream yield. Soil loss predicted by the equation is that soil moved off the particular slope represented by the selected topographic factor. A field's sediment yield is the sum of the soil losses on the slope segments minus deposition in depressions within the field, at the toe of slopes, along field boundaries, and in terrace channels. The equation does not account for this deposition nor does it account for soil losses from other sediment sources such as stream and gully erosion which may be significant within a field boundary or watershed.

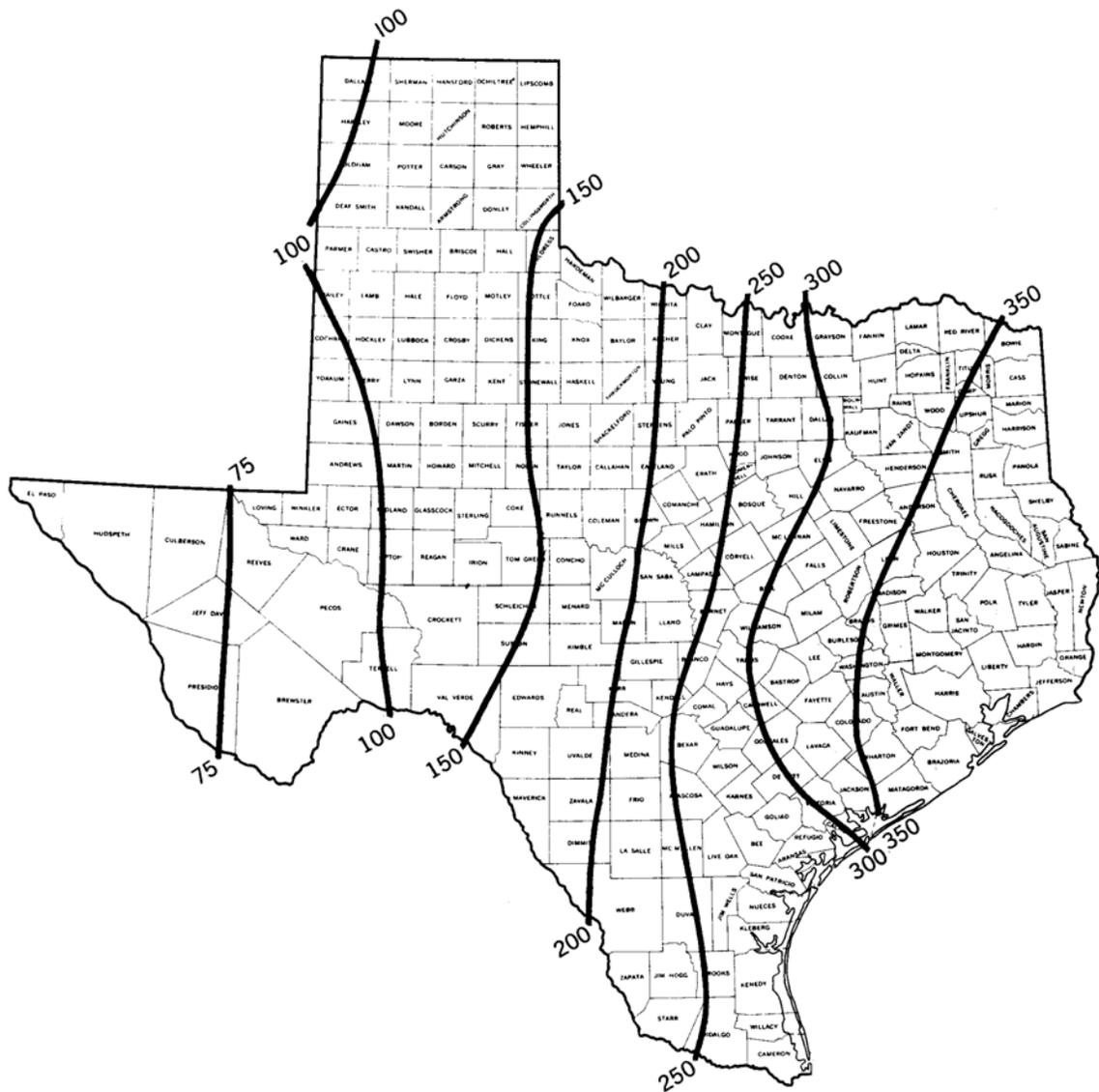


FIGURE A.2
 AVERAGE ANNUAL VALUES OF THE FACTOR R

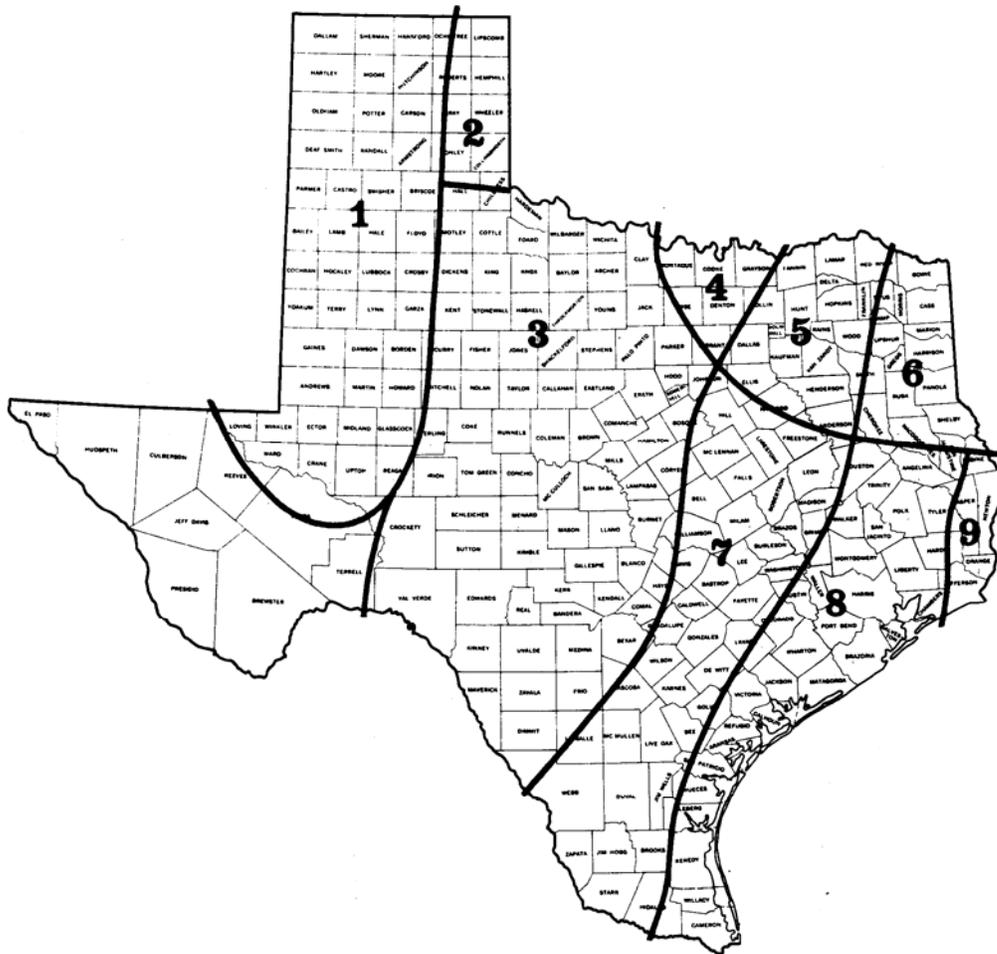


FIGURE A.3
 KEY MAP FOR SELECTION OF APPLICABLE
 EROSION-INDEX DISTRIBUTION CURVE

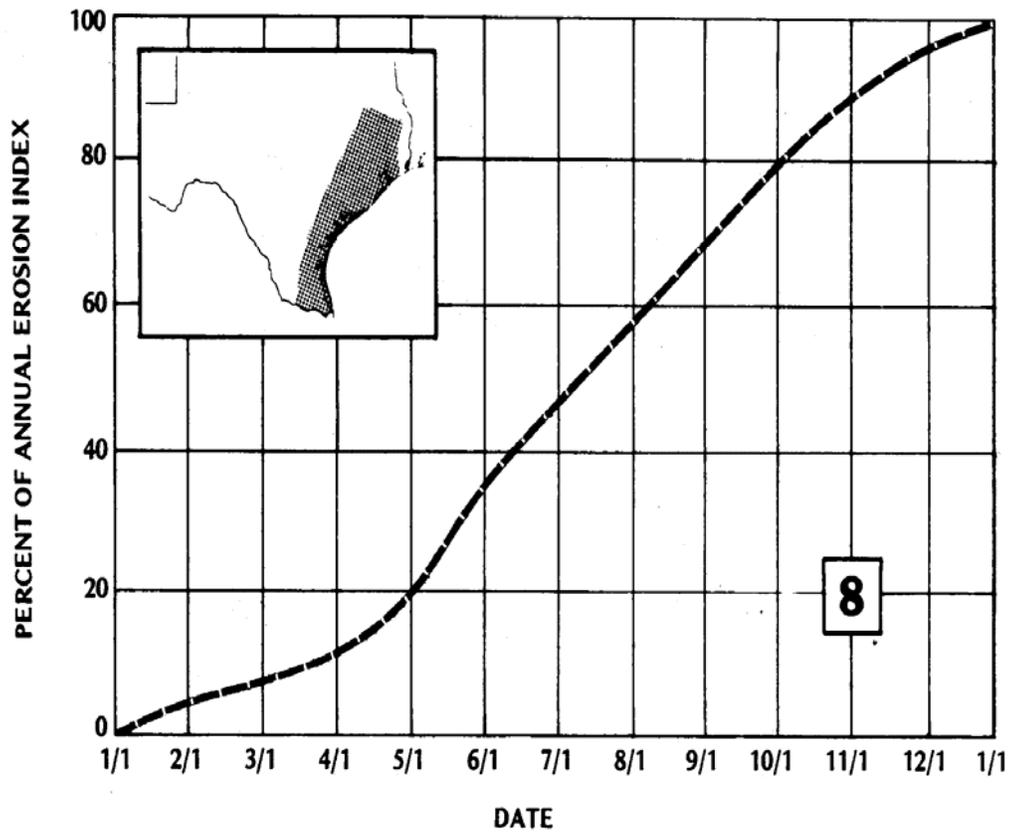


FIGURE A.4
 EROSION-INDEX DISTRIBUTION CURVE 8: PART OF TEXAS

TABLE A.2

K FACTORS AND T^{1/} FACTORS OF SOILS IN TEXAS

SERIES	HOR. D. TEXTURES	K T ^{1/}	SERIES	HOR. D. TEXTURES	K T
Abilene	00-8	.32 5	Attoyac	00-17	.24 5
Abilene	08-28	.32	Attoyac	17-75	.32
Abilene	28-65	.28	Aufco	00-75	.32 5
Acadia	00-9	.43 4	Austin	00-15	.32 2
Acadia	09-19	.32	Austin	15-30	.32
Acadia	19-50	.32	Austwell	00-80	.32 5
Acadia	50-70	.32	Axtell	00-8	.43 5
Acme	00-15	.32 1	Axtell	08-39	.37
Acove	00-15 LFS	.20	Axtell	39-75	.37
Acove	00-15	.20	Balmorhea	00-60	.15 5
Acove	00-15	.32 2	Banquete	00-60	.32 5
Acove	15-19	.20	Barbarosa	00-24	.32 5
Acove	19-38	.20	Barbarosa	24-48	.32
Acuff	00-12	.28 5	Barbarosa	48-72	.32
Acuff	12-80	.32	Barrada	00-52	.43 5
Adamsville	00-72	.10 5	Bastrop	16-85	.32
Addicks	00-11	.32 5	Bauman	00-4	.17 3
Addicks	11-49	.37	Bayucos	06-60	.43
Addicks	49-78	.37	Bazette	00-6	.32
Addielou	00-28	.32 5	Bazette	06-34	.37
Addielou	28-60	.32	Bazette	34-60	.37
Addielou	60-80	.28	Beaumont	00-60	.32 5
Agustin	00-60	.17 3	Beauregard	00-7	.43 4
Alaga	00-6	.17 5	Beauregard	07-38	.37
Alaga	06-99	.17	Beauregard	38-65	.37
Albany	00-48	.17 5	Beauregard	65-90	.37
Albany	48-56	.20	Behring	08-49	.32
Albany	56-88	.24	Benito	00-54	.32 5
Aldine	00-10	.43 5	Benito	54-80	.43
Aldine	10-19	.43	Berda	00-10 FSL	.24
Aldine	19-60	.32	Berda	00-10	.28 5
Aledo	00-4	.32 1	Berda	10-60	.28
Aledo	04-16	.10	Bergstrom	00-26	.37 5
Alto	00-8	.32 5	Bergstrom	26-80	.43
Alto	08-68	.32	Bernaldo	00-14	.43 5
Alto	68-80	.32	Bernaldo	14-47	.32
Altoga	00-25	.32 5	Bernaldo	47-65	.32
Altoga	25-60	.32	Bernard	00-6	.32 5
Altoga	60-60	.32	Bernard	06-60	.32
Altus	00-15 LFS	.20 5	Bernard	60-78	.32
Altus	00-15 FSL	.24 5	Berthoud	00-8 FSL	.24
Altus	15-21	.24	Berthoud	00-8 L,CL	.37
Altus	21-70	.32	Berthoud	08-56	.37
Alum	00-28	.20 5	Bexar	00-17	.32 2
Alum	28-48	.32	Bexar	17-28	.15
Alum	48-65	.32	Bibb	00-37	.20
Amarillo	00-11	.24 5	Bibb	37-60	.37
Amarillo	00-11 LFS	.20	Bienville	00-20	.20 5
Amarillo	11-80	.32	Bienville	20-72	.20
Amphion	00-10	.32 5	Bippus	00-28	.28 5
Amphion	10-39	.32	Bippus	00-28 FSL	.24
Amphion	39-80	.28	Bippus	28-60	.28
Amy	00-18	.43 5	Bissonnet	00-28	.43 5
Amy	18-68	.43	Bissonnet	28-32	.43
Anacoco	00-11	.37 3	Bissonnet	32-70	.43
Anacoco	11-46	.32	Blakerley	00-18	.24 1
Anacoco	46-96	.32	Blanket	00-14	.32 5
Anahuac	00-28	.37 5	Blanket	14-40	.37
Anahuac	28-68	.32	Blanket	40-72	.43
Anahuac	68-72	.37	Blanton	00-58	.17 5
Anapra	00-26	.43 5	Blanton	58-62	.24
Anapra	26-60	.17	Blanton	62-85	.32
Angelina	00-4	.28 5	Blevins	00-16	.37 4
Angelina	04-32	.28	Blevins	16-45	.37
Angelina	32-60	.28	Blevins	45-54	.37
Angelo	00-12	.32 4	Blevins	54-72	.37
Angelo	12-28	.32	Bluegrove	00-8	.28 2
Angelo	28-80	.32	Bluegrove	00-8 FSL	.24
Angle	00-10	.32 3	Bluegrove	08-34	.32
Angle	10-65	.32	Bolar	00-16	.32 2
Anhalt	00-28	.32 2	Bolar	16-36	.17
Annona	00-10	.43 5	Bonham	00-10	.37 5
Annona	10-40	.32	Bonham	10-17	.32
Annona	40-80	.28	Bonham	17-60	.32
Anocon	00-16	.32 5	Bonti	00-8	.37 2
Anocon	16-39	.32	Bonti	08-30	.32
Anocon	39-65	.32	Boracho	00-10	.17 1
Aransas	00-66	.32 5	Bosque	00-20	.28 5
Ardilla	00-15	.24 5	Bosque	20-50	.28
Ardilla	15-38	.28	Bosque	50-60	.28
Ardilla	38-60	.28	Boswell	00-5 SIL	.43 5
Arenosa	00-80	.15 5	Boswell	00-5 FSI	.37 5
Aris	00-21	.37 5	Boswell	05-70	.32
Aris	21-78	.32	Bowie	00-12	.24 4
Arno	00-60	.32 5	Bowie	12-42	.32
Arol	00-6	.43 3	Bowie	42-78	.28
Arol	06-30	.32	Boy	00-47	.17 5
Arvana	00-8	.24 2	Boy	47-70	.24
Arvana	08-28	.32	Branyon	00-80	.32 5
Asa	00-30	.28 5	Brazos	00-80	.17 5
Asa	30-40	.43	Brennan	00-12	.24 5
Asa	40-80	.43	Brennan	12-40	.32
Aspermont	00-8	.32 4	Brennan	40-80	.28
Aspermont	08-60	.32			
Atasco	00-16	.37 5			
Atasco	16-19	.37			
Atasco	19-60	.32			
Atco	00-72	.32 5			

^{1/} Maximum rate of soil loss (tons/acre/year) that will permit a high level of crop productivity to be sustained economically and indefinitely.

TABLE A.2 (continued)

SERIES	HOR. D. TEXTURES	K T	SERIES	HOR. D. TEXTURES	K T
Brewer	00-12	.43 5	Clareville	11-18	.32
Brewer	12-50	.37	Clareville	18-38	.32
Brewer	50-90	.43	Clareville	38-64	.32
Brewster	00-8	.10 1	Clemville	00-30	.43 5
Bronte	00-5	.32 4	Clemville	30-62	.37
Bronte	05-54	.32	Click	00-13	.15 4
Bronte	54-80	.32	Click	13-26	.10
Broome	00-80	.43 5	Click	26-54	.10
Brownfield	00-26	.17 5	Clodine	00-10	.32 5
Brownfield	26-80	.24	Clodine	10-80	.32
Brundage	00-3	.43 5	Cobb	00-8 LFS	.20
Brundage	03-38	.43	Cobb	00-8	.24 2
Brundage	38-78		Cobb	08-30	.32
Bruno	00-8	.17 5	Colibro	00-16	.28 5
Bruno	08-42	.17	Colibro	16-48	.28
Bruno	42-80	.17	Colibro	48-60	.28
Bryarly	00-3	.43 5	Colorado	00-50	.32 5
Bryarly	03-46	.32	Comitas	00-26	.17 5
Bryarly	46-80	.32	Comitas	26-60	.24
Brystal	00-7	.24 5	Cona	00-8	.32 3
Brystal	07-80	.32	Cona	08-45	.37
Bub	00-5	.32 2	Conalb	00-64	.28 5
Bub	05-15	.32	Conger	00-17	.32 1
Buchel	00-80	.32 5	Conlen	00-10	.32 5
Bunyan	00-10	.43 5	Conlen	10-60	.32
Bunyan	10-46	.43	Conroe	00-25	.24 5
Bunyan	46-52	.43	Conroe	25-38	.20
Burleson	00-70	.32 5	Conroe	38-80	.17
Burson	00-6	.43 1	Contee	00-8	.32 5
Caddo	00-30	.43 3	Contee	08-62	.32
Caddo	30-87	.37	Contee	62-80	.32
Cahaba	00-9	.24 4	Copita	00-11	.24 3
Cahaba	09-53	.28	Copita	11-49	.24
Cahaba	53-80	.24	Corlena	00-70	.17 5
Caid	00-12	.24 5	Corrigan	00-8	.43 3
Caid	12-35	.24	Corrigan	08-36	.32
Caid	35-76	.24	Cosh	00-6	.24 1
Calhoun	00-17	.49 3	Cosh	06-16	.32
Calhoun	17-30	.43	Cottonwood	00-8	.32 1
Calhoun	30-72	.43	Coy	00-12	.32 5
Callahan	00-7	.32 4	Coy	12-65	.32
Callahan	07-36	.32	Crawford	00-28	.32 2
Camargo	00-63	.43 5	Crevasse	00-60	.15 5
Cameron	00-23	.32 5	Crockett	00-8	.43 5
Cameron	23-63	.43	Crockett	08-57	.32
Canutio	00-60	.10 5	Crockett	57-80	.32
Capps	00-22	.32 4	Crowley	00-16	.43 4
Capps	22-60	.32	Crowley	16-29	.32
Caradan	00-4	.32 2	Crowley	29-60	.32
Caradan	04-25	.32	Cuero	00-8	.24 4
Caradan	25-62	.24	Cuero	08-40	.24
Carey	00-14	.43 5	Cuero	40-63	.28
Carey	14-48	.43	Cuevitas	00-9	.20 1
Carey	48-80	.43	Cuthand	00-25	.37 2
Cart	00-23	.37 5	Cyril	00-60	.37
Cart	23-42	.37	Cyril	00-60	.37 5
Cart	42-70	.32	Dacosta	00-10	.32 5
Caspiana	00-11 SICL	.32 5	Dacosta	10-80	.32
Caspiana	00-11 SIL	.37 5	Dalby	00-60	.32 5
Caspiana	11-27	.32	Dalco	00-35	.32 3
Caspiana	27-60	.32	Dalhart	00-9 FSL	.24 5
Castell	00-13	.20 2	Dalhart	00-9 LFS	.20 5
Castell	13-24	.32	Dalhart	09-38	.32
Castroville	00-28	.28 4	Dalhart	38-72	.32
Castroville	28-52	.28	Dallam	00-8	.24 5
Castroville	52-80	.28	Dallam	00-8 LFS	.20
Catalpa	00-60	.28 5	Dallam	08-80	.32
Catarina	00-48	.32 4	Dalupe	00-60	.28 5
Catarina	48-60	.32	Dandridge	00-16	.17 1
Catilla	00-46	.17 5	Dant	00-11	.32 5
Catilla	46-75	.24	Dant	11-41	.32
Chaney	00-14	.20 5	Dant	41-72	.32
Chaney	00-14 FSL	.32	Darco	00-49	.17 5
Chaney	14-34	.28	Darco	49-80	.24
Chaney	34-72	.28	Darl	00-16	.32 1
Chargo	00-41	.37 5	Darnell	00-5 FSL	.20 2
Chargo	41-63	.37	Darnell	00-5 STX-FSL	.15 2
Chastain	00-10	.32 5	Darnell	05-15	.32
Chastain	10-72	.37	Darrouzett	00-6	.32 5
Chenneby	00-55	.32	Darrouzett	06-75	.37
Chenneby	55-72	.24	Darst	00-8	.10 2
Chickasha	00-12	.37 4	Darst	08-37	.10
Chickasha	12-24	.37	Deandale	00-12	.43 5
Chickasha	24-58	.37	Deandale	12-80	.37
Chigley	00-6	.32 4	Deleon	00-64	.32 5
Chigley	06-40	.28	Delfina	00-15	.24 5
Chigley	40-68	.28	Delfina	15-47	.32
Chipley	00-77	.17 5	Delfina	47-80	.32
Chispa	00-4	.20 4	Delmita	00-14	.24 2
Chispa	04-44	.28	Delmita	00-14 LFS	.20
Chispa	44-80	.28	Delmita	14-30	.28
Cho	00-10	.28 1	Delnorte	00-8	.10 1
Cho	14-60	.28	Delwin	00-16	.17 5
Cisco	00-10 LFS	.20	Delwin	16-80	.24
Cisco	00-10	.37 5	Demona	00-24	.17 5
Cisco	10-50	.32	Demona	24-48	.24
Cisco	50-70	.32	Demona	48-56	.24
Clairemont	00-60	.43 5	Demona	56-64	.24
Clareville	00-11	.32 5	Denhawken	00-14	.32 5

TABLE A.2 (continued)

SPECIES	HOR. D. TEXTURES	K T	SPECIES	HOR. D. TEXTURES	K T
Denhewen	14-68	.32	Eufaula	00-80	.17 5
Dennis	00-13	.43 5	Eustia	00-98	.17 5
Dennis	13-17	.37	Exray	00-8	.43 1
Dennis	17-78	.37	Exray	08-16	.32
Denton	00-26	.32 2	Falba	00-7	.43 2
Denton	26-34	.32	Falba	07-33	.32
Deport	00-57	.32 4	Falfurrias	00-80	.15 5
Desan	00-48	.17 5	Faskin	00-8	.24 5
Desan	48-66	.24	Faskin	00-8 LFS	.20
Desan	68-80	.37	Faskin	08-80	.32
Desha	00-7 SIL,SICL	.43 5	Ferris	00-66	.32 4
Desha	00-7 SIC,C	.32 5	Fett	00-14	.10 5
Desha	07-44	.28	Fett	14-30	.10
Desha	44-72	.37	Fett	30-80	.24
Dev	00-50	.10 5	Flomot	00-6 L	.28
Devine	00-38	.10 5	Flomot	00-6	.28 5
Devine	38-80	.10	Flomot	06-80	.28
Devol	00-14 LFS	.17 5	Floresville	00-10	.32 5
Devol	00-14 FSL	.20	Floresville	10-30	.28
Devol	14-40	.20	Floresville	30-65	.28
Devol	40-64	.20	Foard	00-09 SICL	.43 5
Dianola	00-62	.15 5	Foard	00-9 SIL	.49 5
Dietrich	00-12	.20 5	Foard	09-66	.55
Dietrich	12-45	.32	Foley	00-8	.43 3
Dietrich	45-72	.32	Foley	08-16	.43
Dilley	00-8	.20 1	Foley	16-42	.43
Dilley	08-16	.20	Foley	42-60	.49
Dilton	00-16	.17 1	Fordtran	00-28	.24 5
Dina	00-11	.15 2	Fordtran	28-48	.32
Dina	11-31	.10	Fordtran	48-72	.32
Divot	00-16	.32 5	Francitas	00-80	.32 5
Divot	16-65	.32	Frankirk	00-16	.32 5
Divot	65-80	.32	Frankirk	16-48	.37
Dodson	00-8	.32 5	Frankirk	48-80	.37
Dodson	08-80	.32	Freestone	00-12	.32 5
Doss	00-19	.24 1	Freestone	12-46	.32
Dougherty	00-26	.20 5	Freestone	46-80	.32
Dougherty	26-42	.32	Friends	00-9	.32 5
Dougherty	42-54	.32	Friends	09-75	.28
Dougherty	54-70	.24	Frio	00-62	.32 5
Douro	00-9	.24 2	Friona	00-8	.28 2
Douro	09-30	.32	Friona	08-31	.32
Drake	00-60	.28 5	Frost	00-11	.43 3
Duffau	00-10 LFS	.32	Frost	11-68	.37
Duffau	00-10	.43 5	Fulshear	00-5	.32 5
Duffau	10-80	.32	Fulshear	05-50	.28
Dugout	00-18	.15 1	Fulshear	50-80	.28
Dumas	00-7	.28 5	Fuquay	00-34	.20 5
Dumas	07-80	.32	Fuquay	34-80	.20
Durant	00-8	.49 5	Gabaloon	00-60	.37 5
Durant	08-11	.43	Gaddy	00-8 LFS	.17 5
Durant	11-64	.37	Gaddy	00-8 FSL,SIL	.32 5
Duval	00-12	.24 4	Gaddy	00-8 LFS	.17 5
Duval	00-12 LFS	.20	Gaddy	08-60	.17
Duval	12-58	.32	Gageby	00-36	.28 5
Earle	00-6 C,SIC	.32 5	Gageby	36-50	.28
Earle	00-6 SICL	.37 5	Gageby	50-65	.17
Earle	06-29	.37	Gainesville	00-90	.17 5
Earle	29-60	.43	Galey	00-14 FSL	.24 5
Eckert	00-12	.10 1	Galey	00-14 LFS	.20 5
Eckrant	00-12	.10 1	Galey	14-72	.32
Ector	00-8	.10 1	Galveston	00-70	.15 5
Eddy	00-6	.24 1	Garceno	00-9	.37 5
Edna	00-9	.43 5	Garceno	09-60	.32
Edna	09-65	.37	Garcitas	00-24	.10 5
Edroy	00-18	.32 5	Garcitas	24-58	.15
Edroy	18-42	.32	Garcitas	58-78	.28
Edroy	42-53	.37	Garner	00-4	.32 5
Edroy	53-72	.43	Garner	04-65	.32
Elandco	00-14	.37 5	Gessner	00-16	.43 5
Elandco	14-40	.37	Gessner	16-53	.43
Elandco	40-62	.43	Gessner	53-80	.32
Elindio	00-15	.32 4	Gladleville	00-10	.24 1
Elindio	15-39	.32	Gladewater	00-65	.32 5
Elindio	39-72	.32	Glenrio	00-14	.32 1
Ellen	00-28	.10 5	Goliad	00-8	.17 2
Ellen	28-80	.17	Goliad	08-28	.24
Ellis	00-30	.32 3	Gomez	00-15 LFS	.17
Ellis	30-66	.32	Gomez	00-15	.24 5
Elmendorf	00-16	.32 5	Gomez	15-72	.24
Elmendorf	16-38	.32	Cowen	00-30	.28 5
Elmendorf	38-80	.32	Cowen	30-60	.28
Elmina	00-24	.28 3	Gracemont	00-10 FSL,L,CL	.28 5
Elmina	24-44	.32	Gracemont	00-10 LFS	.17 5
Elrose	00-10 LFS	.20	Gracemont	10-40	.32
Elrose	00-10 FSL	.24 5	Gracemont	40-64	.28
Elrose	10-68	.32	Gracemont, Saline	00-64	.55 5
Elrose	68-80	.24	Gracemore	00-10 FS,LFS	.17 5
Elysian	00-29	.37 5	Gracemore	00-10 FSL,VFSL,L	.32 5
Elysian	29-72	.37	Gracemore	10-72	.17
Engle	00-5	.28 2	Grandfield	00-10 LFS	.20 5
Engle	05-30	.28	Grandfield	00-10 FSL	.24 5
Enterprise	00-60	.43 5	Grandfield	10-70	.32
Erno	00-13	.37 5	Grolla	00-62	.32 5
Erno	13-41	.37	Gruver	00-8	.32 5
Erno	41-70	.32	Gruver	08-80	.32
Espy	00-16	.10 1	Guadalupe	00-38	.28 4
Estacado	00-16	.28 5	Guadalupe	38-60	.17
Estacado	16-80	.32	Gunter	00-46	.17 5

TABLE A.2 (continued)

SPECIES	HOR. D. TEXTURES	K T	SPECIES	HOR. D. TEXTURES	K T
Gunter	46-75	.24	Kerrick	00-10	.32 2
Guyton	00-23	.49 3	Kerrick	10-31	.32
Guyton	23-46	.37	Kerahaw	00-80	.15 5
Guyton	46-80	.37	Kincheloe	00-24	.32 3
Hamby	00-10	.32 5	Kinco	00-8	.24 5
Hamby	00-10 LFS	.20	Kinco	00-8 LFS	.17
Hamby	10-66	.28	Kinco	08-60	.28
Hamby	66-80	.28	Kiomatia	00-60	.17 5
Hanis	00-9	.17 5	Kipling	00-3 SICL	.32 4
Hanis	09-37	.20	Kipling	00-3 SIL	.43 4
Hanis	37-72	.17	Kipling	03-62	.32
Hannahatchee	00-20	.28 5	Kirvin	00-11	.37 4
Hannahatchee	20-35	.28	Kirvin	11-41	.32
Hannahatchee	35-60	.28	Kirvin	41-64	.32
Hardeman	00-60	.28 5	Kisatchie	00-6	.43 2
Hargill	00-18	.24 5	Kisatchie	06-17	.32
Hargill	18-72	.32	Kisatchie	17-24	.32
Harjo	00-10 L	.49 5	Klump	00-14	.24 5
Harjo	00-10 C,CL	.43 5	Klump	14-52	.32
Harjo	10-40	.43	Klump	52-62	.32
Harjo	40-50	.49	Knippa	00-35	.32 5
Harlingen	00-71	.32 5	Knippa	35-60	.32
Harper	00-17	.32 1	Knoco	00-8	.32 1
Harris	00-12	.20 5	Kokernot	00-3	.10 1
Harris	12-60	.32	Kokernot	03-18	.10
Hassee	00-14	.43 5	Konawa	00-14 FSL	.24 5
Hassee	14-32	.32	Konawa	00-14 LFS,FS	.20 5
Hassee	32-72	.32	Konawa	14-38	.32
Hatliff	00-10 LFS	.24	Konawa	38-70	.24
Heatly	00-28	.17 5	Konsail	00-12	.24 5
Heatly	28-80	.24	Konsail	00-12 LFS	.20
Heaton	00-30	.17 5	Konsail	12-71	.32
Hebronville	00-15	.20 5	Kosse	00-17	.28 5
Hebronville	15-60	.24	Kosse	17-72	.28
Hebronville	60-70	.24	Krade	00-80	.24 5
Heiden	00-70	.32 5	Krum	00-6	.32 5
Hensley	00-4	.32 1	Krum	06-44	.32
Hensley	04-16	.32	Krum	44-72	.32
Hext	00-12	.24 1	Kullit	00-16	.37 5
Hext	12-19	.24	Kullit	16-54	.37
Hidalgo	00-17	.24 5	Kullit	54-72	.28
Hidalgo	28-80	.32	Lacoste	00-9	.24 1
Hilgrave	00-7	.10 5	Lacoste	09-17	.28
Hilgrave	07-26	.10	Lagloria	00-45	.49 5
Hilgrave	26-60	.10	Lagloria	45-78	.49
Hindes	00-8	.10 3	Lake Charles	00-80	.32 5
Hindes	08-31	.10	Lakeland	00-90	.17 5
Hindes	31-60	.24	Lamar	00-62	.32 4
Hoban	00-12	.37 5	Laredo	00-18	.37 5
Hoban	12-60	.37	Laredo	18-72	.43
Hockley	00-23	.24 5	Larue	00-26	.17 5
Hockley	23-50	.32	Latina	00-4	.32 5
Hockley	50-80	.28	Latina	04-63	.32
Hodgins	00-8	.32 4	Latona	00-8	.24 1
Hodgins	08-60	.32	Leaf	00-9	.32 4
Hollister	00-12	.32 5	Leaf	09-72	.32
Hollister	12-70	.32	Leeffield	00-23	.10
Hopco	00-80	.37 5	Leeffield	23-57	.15
Hornsby	00-18	.10 5	Leeffield	57-75	.10
Hornsby	18-37	.10	Leemont	00-80	.32 5
Hornsby	37-70	.10	Leeray	00-64	.32 5
Hornsby	70-80	.10	Leming	00-22	.20 5
Houlka	00-60	.28 5	Leming	22-48	.32
Houston	00-10	.27 4	Leming	48-60	.32
Houston	10-42	.32	Leson	00-60	.32 4
Houston	42-72	.32	Levisville	00-16	.32 4
Houston Black	00-80	.32 5	Levisville	16-34	.37
Hueco	00-5	.20 2	Lewisville	34-62	.37
Hueco	05-30	.24	Ligon	00-6	.28 1
Hurds	00-10	.10 5	Ligon	06-15	.32
Hurds	10-40	.10	Likes	00-60	.15 5
Hurds	40-60	.10	Limpia	00-12	.10 5
Hye	00-18	.24 3	Limpia	12-60	.10
Hye	18-36	.32	Lincoln	00-10 FSL,L,CL	.32 5
Ijam	00-62	.32 5	Lincoln	00-10 FS,LFS	.17 5
Ingram	00-42	.20 2	Lincoln	10-72	.17
Iuka	00-13 FSL,L	.24	Lindy	00-10	.32 2
Iuka	00-13 LS	.17	Lindy	10-30	.32
Iuka	13-22	.28	Lipan	00-72	.32 5
Iuka	22-60	.20	Liv	00-9	.10 2
Jalmar	00-26	.17 5	Liv	09-38	.10
Jalmar	26-80	.24	Livia	00-6	.49 5
Jedd	00-17	.15 2	Livia	06-15	.43
Jedd	17-28	.15	Livia	15-80	.37
Jimenez	00-9	.10 1	Lofton	00-9	.32 5
Kaman	00-70	.32 5	Lofton	09-80	.32
Kamay	00-10	.37 5	Loghhouse	00-14	.10 5
Karnes	00-15	.28 5	Loghhouse	14-70	.10
Karnes	15-60	.28	Loire	00-8	.28 5
Katemcy	00-9	.32 2	Loire	08-80	.28
Katemcy	09-35	.32	Lomalta	00-53	.32 5
Katy	00-25	.37 5	Lomalta	53-72	.32
Katy	25-44	.32	Lozano	00-11	.24 5
Katy	44-80	.32	Lozano	11-35	.32
Kaufman	00-72	.32 5	Lozano	35-63	.32
Kavett	00-16	.32 1	Lozier	00-8	.10 1
Keese	00-19	.10 1	Lucien	00-10	.32 2
Kemp	00-65	.28 5	Lucien	10-15	.32
Kenney	00-60	.17 5	Luckenbach	00-18	.32 5
Kenney	60-80	.24	Luckenbach	18-38	.32

TABLE A.2 (continued)

SERIES	HOR. D. TEXTURES	K	T	SERIES	HOR. D. TEXTURES	K	T
Luckenbach	38-80	.28		Monahans	08-60		.28
Lucy	00-24	.17	5	Montell	00-72		.32 5
Lucy	24-35	.24		Monteola	00-72		.32 4
Lucy	35-70	.28		Moreland	00-12 SICL		.37 5
Lueders	00-13	.32	1	Moreland	00-12 SIL		.43 5
Lufkin	00-7	.43	5	Moreland	00-12 C,SIC		.32 5
Lufkin	07-46	.32		Moreland	12-40		.32
Lufkin	46-65	.37		Moreland	40-60		.32
Luling	00-70	.32	4	Morey	00-10		.37 5
Lupe	00-12	.15	5	Morey	10-40		.37
Lupe	12-32	.15		Morey	40-60		.37
Lupe	32-80	.15		Morganfield	00-50		.43 5
Lutie	00-11	.43	5	Morae	00-6		.37 4
Lutie	11-80	.43		Morae	06-60		.37
Luverne	00-5	.37	3	Motley	00-9		.28 5
Luverne	05-26	.28		Motley	09-80		.32
Luverne	26-41	.28		Muldrow	00-18 SIL		.49 5
Lyford	00-11	.24	5	Muldrow	00-18 SICL,CL		.43 5
Lyford	11-34	.24		Muldrow	18-70		.43
Lyford	34-63	.28		Muskogee	00-14		.43 5
Mabank	00-7	.43	5	Muskogee	14-26		.37
Mabank	07-70	.32		Muskogee	26-72		.32
Madrone	00-9	.10	2	Musquiz	00-7		.32 4
Madrone	09-36	.10		Musquiz	07-60		.32
Mainstay	00-3	.10	1	Mustang	00-72		.15 5
Mainstay	03-16	.10		Macogdoches	00-6		.32 5
Malbis	00-7	.28	5	Macogdoches	06-80		.32
Malbis	07-26	.28		Mageesi	00-62		.28 5
Malbis	26-54	.28		Nahatche	00-19		.28 5
Malbis	54-72	.28		Nahatche	19-29		.28
Maloterre	00-8	.15	1	Nahatche	29-80		.28
Mangum	00-62	.32	5	Harta	00-8		.49 5
Mansic	00-80	.32	4	Harta	08-36		.43
Mansker	00-12	.28	3	Harta	36-60		.43
Mansker	12-66	.28		Hebgen	00-9		.24 1
Mantachie	00-61	.28	5	Hido	00-15		.24 1
Marcelinas	00-12	.32	5	Himrod	00-27		.17 5
Marcelinas	12-48	.32		Himrod	27-80		.24
Marcelinas	48-68	.32		Hipsam	00-60		.32 5
Matagorda	00-14	.49	5	Mobscot	00-4		.17 5
Matagorda	14-22	.43		Mobscot	04-27		.17
Matagorda	22-31	.43		Mobscot	27-39		.20
Matagorda	31-76	.43		Mobscot	39-80		.17
Matamoros	00-50	.32	5	Nocken	00-8 FSL		.24 2
Mavco	00-12	.32	5	Nocken	00-8		.10
Mavco	12-29	.32		Nocken	08-37		.10
Mavco	29-70	.32		Normangee	00-7		.32 4
Maverick	00-5	.32	3	Normangee	07-44		.32
Maverick	05-21	.32		Normangee	44-64		.32
Maverick	21-26	.32		Norwood	00-11 SICL		.32
May	00-16	.37	5	Norwood	00-11		.43 5
May	16-42	.37		Norwood	11-34		.43
May	42-60	.37		Norwood	34-60		.43
Mayhew	00-7	.37	5	Nueces	00-32		.17 5
Mayhew	07-80	.32		Nueces	32-80		.24
McAllen	00-14	.24	5	Nugent	00-60		.17
McAllen	14-37	.28		Nuvalde	00-32		.28 5
McAllen	37-72	.28		Nuvalde	32-80		.32
McKamie	00-5 VFSL,FSL,SIL	.43	3	Oaklimeter	00-65		.43 5
McKamie	00-5 SICL	.37	2	Obaro	00-8		.43 3
McKamie	05-36	.32		Obaro	08-30		.43
McKamie	36-60	.37		Oben	00-5		.24 1
Medley	00-24	.24	5	Oben	05-19		.32
Medley	24-65	.28		Ochlockonee	00-44		.20
Medley	00-12	.43	5	Ochlockonee	44-72		.17
Meguín	12-62	.43		Ocilla	00-28		.17 5
Menard	00-10 LFS	.20		Ocilla	28-67		.24
Menard	00-10	.43	5	Odem	00-40		.24 5
Menard	10-80	.49		Odem	40-60		.24
Meno	00-24	.20	5	Okemah	00-21		.43 5
Meno	24-44	.32		Okemah	21-43		.43
Meno	44-60	.32		Okemah	43-79		.37
Mercedes	00-74	.32	5	Oklared	00-10 SICL		.28 5
Mereta	00-19	.32	1	Oklared	00-10 FSL,VFSL,L		.32 5
Mereta	23-60	.32		Oklared	10-60		.32
Midessa	00-10	.28	3	Oktibbeha	00-4 CL,C		.32
Midessa	10-60	.28		Oktibbeha	00-4 FSL,L,SIL		.32 3
Midland	00-7	.37	4	Oktibbeha	04-41		.32
Midland	07-60	.32		Oktibbeha	41-70		.32
Miguel	00-10	.43	5	Oktibbeha	41-80		.32
Miguel	10-33	.32		Olmíto	00-23		.32 5
Miguel	33-60	.32		Olmíto	23-63		.32
Miles	00-10 LFS	.20		Olmos	00-13		.10 1
Miles	00-10	.24	5	Olton	00-8		.32 5
Miles	10-80	.32		Olton	08-80		.32
Miller	00-10	.43	5	Ora	00-7		.32 3
Miller	00-60	.43	5	Ora	07-26		.37
Miller	10-35	.43		Ora	26-56		.32
Miller	35-60	.43		Orelia	00-5		.28 5
Miller, Saline	00-60	.55	5	Orelia	05-25		.32
Minco	00-40	.37	5	Orelia	25-60		.32
Minco	40-72	.37		Orif	00-80		.10 5
Mitre	00-4	.10	1	Ovan	00-80		.32 5
Mitre	04-14	.10		Owens	00-16		.32 1
Mobeetie	00-10	.24	3	Ozan	00-15		.32 5
Mobeetie	10-60	.24		Ozan	15-38		.43
Mollville	00-11	.32	5	Ozan	38-72		.43
Mollville	11-42	.32		Paducah	00-16		.43 5
Mollville	42-54	.32		Paducah	16-44		.37
Monahans	00-8	.24	3	Panola	00-8		.49 5

TABLE A.2 (continued)

SERIES	HOR. D. TEXTURES	K T	SERIES	HOR. D. TEXTURES	K T
Panola	08-20	.43	Rader	25-32	.32
Panola	20-72	.37	Rader	32-77	.32
Papalote	00-14	.32 5	Rahal	00-35	.17 5
Papalote	00-14 LFS	.32	Rahal	35-62	.32
Papalote	14-36	.32	Rahal	62-80	.24
Papalote	36-60	.32	Raino	00-35	.43 5
Parrita	00-9	.17 1	Raino	35-80	.32
Parrita	09-17	.24	Ramadero	00-12	.28 5
Patilo	00-50	.17 5	Ramadero	12-42	.32
Patilo	50-80	.24	Ramadero	42-80	.32
Patricia	00-17	.24 5	Randado	00-8	.24 1
Patricia	00-17 LFS	.10	Randado	08-16	.28
Patricia	17-80	.24	Randall	00-60	.32 5
Patrick	00-22	.32 2	Ratliff	00-10 FSL	.24
Patr6le	00-30	.43 3	Ratliff	00-10	.28 5
Patr6le	30-60	.28	Ratliff	10-80	.32
Payne	00-8	.32 5	Raymondville	00-14	.32 5
Payne	08-72	.32	Raymondville	14-37	.32
Pecos	00-56	.32 5	Raymondville	37-78	.32
Pedernales	00-11 LFS	.20	Reagan	00-30	.32 4
Pedernales	00-11	.32 5	Reagan	30-60	.32
Pedernales	11-37	.28	Real	00-13	.10 1
Pedernales	37-63	.28	Reap	00-65	.32 5
Pelham	00-27	.10	Redlake	00-42	.37 5
Pelham	27-68	.15	Redlake	42-72	.43
Penwell	00-80	.15 5	Reha	00-11	.15 3
Perico	00-7	.24 5	Reha	11-44	.15
Perico	00-7 LFS	.20	Reinach	00-84	.37 5
Perico	07-80	.32	Renick	00-19	.15 1
Pernitas	00-11	.20 3	Reynosa	00-14	.37 5
Pernitas	11-17	.20	Reynosa	14-73	.43
Pernitas	17-30	.28	Rickmore	00-8	.24 5
Pernitas	30-72	.32	Rickmore	00-8 LFS	.20
Perry	00-6 SICL	.32 5	Rickmore	08-32	.32
Perry	00-6 C,SIC	.24 5	Rickmore	32-80	.32
Perry	06-30	.28	Riesel	00-16	.10 5
Perry	30-60	.28	Riesel	16-56	.17
Pettus	00-17	.24 1	Riesel	56-62	.10
Pharr	00-17	.24 5	Rio	00-12	.32 5
Pharr	17-68	.32	Rio	12-38	.32
Pheba	00-21	.49 3	Rio	38-63	.32
Pheba	21-60	.43	Rio Grande	00-63	.49 5
Pickton	00-54	.17 5	Rioconcho	00-80	.32 5
Pickton	54-80	.24	Robertsdale	00-6	.24 3
Picosa	00-6	.28 1	Robertsdale	06-21	.28
Pintas	00-16	.32 3	Robertsdale	21-74	.28
Pintas	16-64	.32	Robinsonville	00-70	.32 5
Pitzer	00-6	.24 1	Robinsonville	00-5	.37 3
Placedo	00-62	.37 5	Rochelle	05-32	.32
Pledger	00-70	.32 5	Rochelle	32-60	.17
Plummer	00-50	.10	Rockhouse	00-12	.24 5
Plummer	50-72	.15	Rockhouse	12-60	.10
Point Isabel	00-12	.32 4	Rodessa	00-31	.43 5
Point Isabel	12-65	.32	Rodessa	31-72	.32
Polar	00-60	.10 2	Roebuck	00-72	.43
Pontotoc	00-33	.24 4	Roemer	00-30	.17 5
Pontotoc	33-67	.24	Roemer	30-61	.24
Port	00-20 FSL,L	.37 5	Rosalie	00-31	.17 5
Port	00-20 SIL,CL,SICL	.37 5	Rosalie	31-80	.24
Port	20-72	.37	Rosanky	00-8	.32 5
Portalto	00-58	.17 5	Rosanky	08-30	.37
Portalto	58-80	.24	Rosanky	30-46	.37
Porum	00-10	.49 5	Rosanky	46-64	.37
Porum	10-14	.49	Roscoe	00-45	.32 5
Porum	14-52	.43	Roscoe	45-75	.32
Porum	52-65	.32	Rotan	00-6	.32 5
Posey	00-10	.24 3	Rotan	06-48	.32
Posey	00-10 L	.28	Rotan	48-80	.32
Posey	10-80	.32	Rowena	00-10	.32 5
Poth	00-30	.24 5	Rowena	10-36	.32
Poth	30-74	.32	Rowena	36-70	.32
Potter	00-9	.28 1	Roxana	00-4	.37 5
Pratley	00-8	.32 2	Roxana	04-70	.37
Pratley	08-39	.32	Rumple	00-5	.17 2
Pryor	00-8	.32 4	Rumple	05-10	.17
Pryor	08-42	.37	Rumple	10-26	.10
Pryor	42-72	.37	Runge	00-14	.24 4
Puerta	00-9	.10 1	Runge	14-72	.32
Puerta	09-18	.10	Runn	00-55	.32 5
Pulaski	00-10 FSL,L	.32 5	Runn	55-65	.37
Pulaski	00-10 LFS	.17 5	Ruston	00-16 FSL,SL,LFS	.32 5
Pulaski	10-64	.32	Ruston	00-16 GR-FSL	.28 5
Pullman	00-6	.37 5	Ruston	16-41	.28
Pullman	06-80	.37	Ruston	41-47	.32
Pursley	00-66	.28 5	Ruston	47-92	.28
Purves	00-14	.32 1	Sabenyo	00-11	.32 5
Pyote	00-34	.17 5	Sabenyo	11-17	.32
Pyote	34-76	.24	Sabenyo	17-55	.32
Quanah	00-11	.37 4	Sabenyo	55-80	.32
Quanah	11-60	.37	Sabine	00-60	.15 5
Queeny	00-9	.17 1	Sacul	00-10	.32 3
Quemado	00-12	.10 1	Sacul	10-44	.32
Quihi	00-9	.10 2	Sacul	44-72	.37
Quihi	09-30	.10	Saffell	00-8 GRFSL,GRSL,GRLFS	.20 4
Quinlan	00-13 L,SIL,FSL	.32 2	Saffell	00-8 FSL,SL,LFS	.24
Quinlan	00-13 LVFS	.17 2	Saffell	08-15	.28
Quinlan	00-13 CL,SICL	.32 2	Saffell	15-50	.28
Racombes	00-13	.28 5	Saffell	50-60	.17
Racombes	13-72	.32	Sagerton	00-7	.32 5
Rader	00-25	.32 5	Sagerton	07-80	.32

TABLE A.2 (continued)

SPECIES	HOR. D. TEXTURES	K	T	SPECIES	HOR. D. TEXTURES	K	T	
Salge	00-6	.28	5	Straber	00-14	.24	5	
Salge	06-25	.28		Straber	14-48	.32		
Salge	25-80	.32		Straber	48-78	.32		
San Antonio	00-8	.32	4	Stratton	00-27	.24	5	
San Antonio	08-28	.32		Stratton	27-72	.32		
San Antonio	28-60	.32		Styx	00-33	.17	5	
San Saba	00-35	.32	2	Styx	33-80	.24		
Sanderson	00-60	.10	5	Summerfield	00-8	.49	3	
Sanelli	00-32	.28	3	Summerfield	08-29	.43		
Sanelli	32-50	.17		Summerfield	29-70	.37		
Sarita	00-48	.17	5	Sunev	00-12	.28	5	
Sarita	48-80	.24		Sunev	12-21	.28		
Sarnosa	00-16	.24	5	Sunev	21-72	.28		
Sarnosa	16-52	.24		Sunray	00-12	.32	5	
Sarnosa	52-80	.24		Sunray	12-60	.32		
Saspasco	50-62	.24		Sunweet	00-4	.32	2	
Savannah	00-11 SIL	.37	3	Sunweet	04-11	.37		
Savannah	00-11 SL	.24	3	Sunweet	11-60	.28		
Savannah	11-28	.28		Susquehanna	00-5	FSL, SL, SIL, L	.43	3
Savannah	28-68	.24		Susquehanna	00-5	LS	.17	3
Sawyer	00-5	.43	3	Susquehanna	05-77		.32	
Sawyer	05-29	.37		Sweetwater	00-24	.28	3	
Sawyer	29-80	.32		Sweetwater	24-60	.17		
Sayers	00-10	.17	5	Tabor	00-14	.43	5	
Sayers	10-60	.17		Tabor	14-45	.32		
Seawillow	00-22	.32	5	Tabor	45-72	.32		
Seawillow	22-54	.32		Talpa	00-7	.32	1	
Segno	00-14	.24	5	Tarrant	00-13	.20	1	
Segno	14-44	.32		Tascosa	00-60	.10	4	
Segno	44-85	.24		Tela	00-9	.28	5	
Seguin	00-13	.37	5	Tela	09-32	.32		
Seguin	13-62	.43		Tela	32-63	.32		
Sejita	00-40	.43	5	Telferner	00-15	.49	5	
Selden	00-10	.17	5	Telferner	15-52	.32		
Selden	10-62	.24		Telferner	52-80	.32		
Severn	00-10 L, SIL	.32	5	Teller	00-20	.37	5	
Severn	00-10 VFSL, FSL	.32	5	Teller	20-42	.32		
Severn	10-60	.32		Teller	42-70	.32		
Sharvana	00-6	.24	1	Tenaha	00-34	.17	3	
Sharvana	06-14	.32		Tenaha	34-47	.24		
Shep	00-25	.28	5	Terouge	00-72	.32		
Shep	25-80	.28		Texline	00-10	.32	5	
Sherm	00-5	.37	5	Texline	10-80	.32		
Sherm	05-80	.37		Thage	00-6	.37	5	
Shiner	00-6	.24	2	Thage	06-32	.43		
Shiner	06-16	.24		Thage	32-70	.37		
Ships	00-80	.32	5	Thenas	00-32	.24	5	
Shubuta	00-8	.37	5	Thenas	32-64	.20		
Shubuta	08-70	.28		Throck	00-6	.32	3	
Silatid	00-37	.17	5	Throck	06-38	.32		
Silatid	37-80	.24		Throck	38-50	.32		
Silvern	00-54	.10	5	Thurber	00-8	.43	5	
Silvern	54-76	.10		Thurber	08-38	.32		
Sinton	00-28	.28	5	Thurber	38-62	.32		
Sinton	28-72	.28		Tiak	00-8	.32	4	
Skeet	00-13	.10	1	Tiak	08-26	.37		
Slaughter	00-5	.32	1	Tiak	26-68	.32		
Slaughter	05-15	.32		Tigua	00-50	.32	4	
Smithdale	00-11 SL	.28	5	Tillman	00-6	.32	5	
Smithdale	00-11 LS	.17	5	Tillman	06-80	.32		
Smithdale	11-60	.24		Tiocano	00-66	.32	5	
Smithville	00-4	.24	5	Tipton	00-13	.37	5	
Smithville	06-16	.28		Tipton	13-72	.37		
Smithville	16-50	.32		Tivoli	00-7	.17	5	
Smithville	50-62	.32		Tivoli	07-60	.17		
Somervell	00-16	.10	2	Tobosa	00-80	.32	5	
Somervell	16-32	.10		Topia	00-7	.32	2	
Sorter	00-19	.43	5	Topia	07-27	.32		
Sorter	19-79	.49		Topia	27-30	.15		
Spade	00-30	.24	2	Tordia	00-44	.32	3	
Speck	00-8	.32	1	Toyah	00-16	.28	5	
Speck	08-18	.32		Toyah	16-55	.28		
Spires	00-6	.32	2	Travis	00-14	.24	5	
Spires	06-28	.28		Travis	14-50	.32		
Splendor	00-10	.37	5	Travis	50-75	.15		
Splendor	10-22	.37		Trawick	00-6	.37	4	
Splendor	22-80	.32		Trawick	06-46	.32		
Sproul	00-6	.32	2	Trawick	46-80	.32		
Sproul	06-26	.32		Treadway	00-7	.43	3	
Spur	00-15	.28	5	Treadway	07-50	.37		
Spur	00-15 FSL	.24		Trebloc	00-5	.37	3	
Spur	15-60	.28		Trebloc	05-65	.37		
Spurlock	00-7	.24	5	Tremona	00-28	.24	5	
Spurlock	00-7 L, CL	.28		Tremona	00-28 GR-LS	.20		
Spurlock	07-28	.32		Tremona	28-64	.28		
Stamford	00-35	.32	4	Trep	00-24	.17	5	
Stegall	00-7	.32	2	Trep	24-74	.24		
Stegall	07-28	.32		Trinity	00-80	.32	5	
Stephen	00-12	.32	1	Triomas	00-16	.17	5	
Stephenville	00-12 LFS	.20	3	Triomas	16-80	.24		
Stephenville	00-12 FSL	.24	3	Truce	00-8	.37	3	
Stephenville	12-34	.32		Truce	08-45	.32		
Stidham	00-26	.20	5	Truce	45-60	.32		
Stidham	26-45	.32		Tuckerman	00-9	.24	5	
Stidham	45-55	.32		Tuckerman	09-18	.24		
Stidham	55-70	.17		Tuckerman	18-34	.32		
Stoneburg	00-11	.24	2	Tuckerman	34-52	.24		
Stoneburg	11-35	.32		Tuckerman	52-62	.20		
Stowell	00-42	.15	5	Tulia	00-14	.24	3	
Stowell	42-78	.24		Tulia	00-14 L	.28		

TABLE A.2 (continued)

SPECIES	HOR. D. TEXTURES	K T	SPECIES	HOR. D. TEXTURES	K T
Tulia	14-80	.28	Willamar	00-5	.32 4
Tuscumbia	00-50	.28 3	Willamar	05-30	.32
Uhland	00-6	.32 5	Willamar	30-60	.32
Uhland	06-60	.43	Wilson	00-6	.43 5
Upton	00-13	.28 1	Wilson	06-80	.37
Urbo	00-9	.49	Windthorst	00-10 LVFS	.24
Urbo	09-71	.28	Windthorst	00-10 VFSL	.49 5
Uvalde	00-17	.28 4	Windthorst	10-38	.37
Uvalde	17-34	.28	Windthorst	58-60	.37
Uvalde	34-80	.28	Wink	00-24	.20 3
Vaiden	00-4	.32 4	Wink	00-24 FSL	.20
Vaiden	04-26	.32	Wink	24-60	.20
Vaiden	26-79	.32	Winters	00-10	.24 5
Valco	00-17	.28 1	Winters	10-50	.28
Valera	00-30	.32 2	Winters	50-78	.24
Valkaria	00-80	.15 5	Witherbee	00-80	.10 5
Vamont	00-80	.32 5	Wockley	00-22	.24 5
Varro	00-7	.28 5	Wockley	22-60	.32
Varro	07-60	.28	Woden	00-15	.20 5
Vashti	00-14 LFS	.24	Woden	15-80	.20
Vashti	00-14	.43 2	Wolfpen	00-27	.17 5
Vashti	14-36	.28	Wolfpen	27-45	.24
Veal	00-8 L,CL	.28	Wolfpen	45-80	.24
Veal	00-8	.24 4	Woodtell	00-6	.43 4
Veal	08-60	.28	Woodtell	00-6 LFS	.37
Venus	00-14	.28 5	Woodtell	06-29	.32
Venus	14-50	.28	Woodtell	29-45	.32
Venus	50-60	.28	Woodward	00-28	.37 3
Verdum	00-4	.55 2	Wrightsville	00-16 SIL,SL	.49 5
Verdum	04-24	.55	Wrightsville	00-16 SICL	.43
Verdum	24-60	.55	Wrightsville	16-50	.37
Verhalen	00-60	.32 5	Wrightsville	50-66	.43
Verick	00-6	.24 1	Yahola	00-11 FSL,L	.32 5
Verick	06-15	.24	Yahola	00-11 LFS	.17 5
Vernia	00-44	.10 5	Yahola	11-40	.32
Vernia	44-72	.10	Yahola	40-72	.32
Vernon	00-21	.32 2	Yates	00-6	.10 1
Vesey	00-24	.32 5	Yologo	00-12	.10 1
Vesey	24-52	.32	Yomont	00-60	.49 5
Vesey	52-68	.32	Zalla	00-63	.17 5
Veston	00-12	.49 5	Zaneis	00-11	.37 4
Veston	12-24	.49	Zaneis	11-40	.37
Veston	24-60	.32	Zaneis	40-52	.32
Viboras	00-24	.32 4	Zapata	00-8	.17 1
Viboras	24-63	.32	Zavala	00-60	.28 5
Victoria	00-72	.32 5	Zavco	00-16	.17 5
Vieja	00-8	.28 1	Zavco	16-36	.20
Vingo	00-18	.20 5	Zavco	36-72	.20
Vingo	18-48	.24	Zita	00-7	.28 4
Vingo	48-80	.32	Zita	07-60	.32
Voca	00-9	.37 3			
Voca	09-48	.28			
Volco	00-9	.10 1			
Volente	00-22	.32 5			
Volente	22-36	.32			
Volente	36-54	.32			
Voss	00-70	.17 5			
Wagram	00-24	.15 5			
Wagram	24-75	.20			
Waller	00-4	.43 5			
Waller	04-34	.43			
Waller	34-80	.37			
Warnock	00-5	.32 5			
Warnock	05-40	.32			
Warnock	40-50	.32			
Waskom	00-15	.28 5			
Waskom	15-32	.32			
Waskom	32-80	.32			
Waurika	00-12	.49 5			
Waurika	12-32	.37			
Waurika	32-57	.37			
Waurika	57-72	.37			
Weatherford	00-10	.43 3			
Weatherford	00-10 LFS	.32			
Weatherford	10-45	.49			
Webb	00-12	.32 5			
Weesatche	00-8	.32 5			
Weesatche	08-38	.32			
Weesatche	38-80	.32			
Wehaockee	00-8	.24			
Wehaockee	08-40	.32			
Wehaockee	40-50	.28			
Weymouth	00-30	.32 3			
Whakana	00-14	.32 5			
Whakana	14-46	.32			
Whakana	46-80	.32			
Wichita	00-10	.32 5			
Wichita	10-80	.32			
Wickett	00-14	.17 2			
Wickett	00-14 FSL	.20			
Wickett	14-30	.20			
Wicksburg	00-26 GR-COS	.15 5			
Wicksburg	00-26 LS,LFS,FS	.17 5			
Wicksburg	26-30	.20			
Wicksburg	30-65	.24			
Wilco	00-16	.20 5			
Wilco	16-32	.32			
Wilco	32-60	.32			
Willacy	00-14	.24 5			
Willacy	14-74	.32			

ABBREVIATIONS - TEXTURE	
C	Clay
CL	Clay loam
FS	Fine sand
FSL	Fine silt
FSI	Fine sandy loam
GR-COS	Gravelly coarse sand
GR-FSL	Gravelly fine sandy loam
GR-LFS	Gravelly loamy fine sand
GR-LS	Gravelly loamy sand
GR-SL	Gravelly sandy loam
L	Loam
LFS	Loamy fine sand
LS	Loamy sand
LVFS	Loamy very fine sand
SIC	Silty clay
SICL	Silty clay loam
SIL	Silty loam
SL	Sandy loam
STX-FSL	Extremely stone fine sandy loam
VFSL	Very fine sandy loam

TABLE A.3
SLOPE EFFECT TABLES (TOPOGRAPHIC FACTOR, LS)

Percent Slope	Slope Length in Feet													
	10	20	40	60	80	100	110	120	130	140	150	160	180	200
0.2	0.04	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10
0.3	0.04	0.05	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11
0.4	0.05	0.06	0.07	0.08	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11
0.5	0.05	0.06	0.08	0.08	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.12	0.12
1.0	0.06	0.08	0.10	0.11	0.12	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.16
2.0	0.10	0.12	0.15	0.17	0.19	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.24	0.25
3.0	0.14	0.18	0.22	0.25	0.27	0.29	0.30	0.30	0.31	0.32	0.32	0.33	0.34	0.35
4.0	0.16	0.21	0.28	0.33	0.37	0.40	0.42	0.43	0.44	0.46	0.47	0.48	0.51	0.53
5.0	0.17	0.24	0.34	0.41	0.48	0.54	0.56	0.59	0.61	0.63	0.66	0.68	0.72	0.76
6.0	0.21	0.30	0.43	0.52	0.60	0.67	0.71	0.74	0.77	0.80	0.82	0.85	0.90	0.95
8.0	0.31	0.44	0.63	0.77	0.89	0.99	1.04	1.09	1.13	1.17	1.21	1.25	1.33	1.40
10.0	0.43	0.61	0.87	1.06	1.23	1.37	1.44	1.50	1.56	1.62	1.68	1.73	1.84	1.94
12.0	0.57	0.81	1.14	1.40	1.61	1.80	1.89	1.98	2.06	2.14	2.21	2.28	2.42	2.55
14.0	0.73	1.03	1.45	1.78	2.05	2.29	2.41	2.51	2.62	2.72	2.81	2.90	3.08	3.25
16.0	0.90	1.27	1.80	2.20	2.54	2.84	2.98	3.11	3.24	3.36	3.48	3.59	3.81	4.01
18.0	1.09	1.54	2.17	2.66	3.07	3.43	3.60	3.76	3.92	4.06	4.21	4.34	4.61	4.86
20.0	1.29	1.82	2.58	3.16	3.65	4.08	4.28	4.47	4.65	4.83	5.00	5.16	5.47	5.77
25.0	1.86	2.63	3.73	4.56	5.27	5.89	6.18	6.45	6.72	6.97	7.22	7.45	7.90	8.33
30.0	2.52	3.56	5.03	6.16	7.11	7.95	8.34	8.71	9.07	9.41	9.74	10.06	10.67	11.25

TABLE A.3, CONTINUED

Percent Slope	Slope Length in Feet													
	300	400	500	600	700	800	900	1000	1100	1200	1300	1500	1700	2000
0.2	0.11	0.12	0.13	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.20
0.3	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.18	0.18	0.19	0.20	0.21	0.22
0.4	0.13	0.14	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.20	0.21	0.22	0.23
0.5	0.14	0.15	0.16	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21	0.22	0.23	0.24
1.0	0.18	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.32
2.0	0.28	0.31	0.33	0.34	0.36	0.38	0.39	0.40	0.41	0.42	0.43	0.45	0.47	0.49
3.0	0.40	0.44	0.47	0.49	0.52	0.54	0.56	0.57	0.59	0.61	0.62	0.65	0.67	0.71
4.0	0.62	0.70	0.76	0.82	0.87	0.92	0.96	1.01	1.04	1.08	1.12	1.18	1.24	1.33
5.0	0.93	1.07	1.20	1.31	1.42	1.52	1.61	1.69	1.78	1.86	1.93	2.07	2.21	2.40
6.0	1.17	1.35	1.50	1.65	1.78	1.90	2.02	2.13	2.23	2.33	2.43	2.61	2.77	3.01
8.0	1.72	1.98	2.22	2.43	2.62	2.81	2.98	3.14	3.29	3.44	3.58	3.84	4.09	4.44
10.0	2.37	2.74	3.06	3.36	3.62	3.87	4.11	4.33	4.54	4.74	4.94	5.30	5.65	6.13
12.0	3.13	3.61	4.04	4.42	4.77	5.10	5.41	5.71	5.99	6.25	6.51	6.99	7.44	8.07
14.0	3.98	4.59	5.13	5.62	6.07	6.49	6.88	7.26	7.61	7.95	8.27	8.89	9.46	10.26
16.0	4.92	5.68	6.35	6.95	7.51	8.03	8.52	8.98	9.42	9.83	10.24	11.00	11.71	12.70
18.0	5.95	6.87	7.68	8.41	9.09	9.71	10.30	10.86	11.39	11.90	12.38	13.30	14.16	15.36
20.0	7.07	8.16	9.12	9.99	10.79	11.54	12.24	12.90	13.53	14.13	14.71	15.80	16.82	18.24
25.0	10.20	11.78	13.17	14.43	15.59	16.66	17.67	18.63	19.54	20.41	21.24	22.82	24.29	26.35
30.0	13.78	15.91	17.79	19.48	21.04	22.50	23.86	25.15	26.38	27.55	28.68	30.81	32.80	35.57

TABLE A.4
COVER INDEX FACTORS C
CONSTRUCTION SITES

<u>TYPE OF COVER</u>	<u>FACTOR C</u>
None (bare, unprotected)	1.00
Seedings <u>1/</u>	
Permanent grasses	.01
Ryegrass (perennials)	.05
Ryegrass (annuals)	.10
Small Grain	.05
Millet or sudangrass	.05
Field bromegrass	.03
Grass sod	.01
Hay (2 tons/acre)	.02
Small grain straw (2 tons/acre)	.02
Corn residues (4 tons/acre)	.02
Woodchips (6 tons/acre)	.06
Wood cellulose fiber (1-3/4 tons/acre)	.10
Fiberglass (1,000 pounds/acre)	.05
Asphalt emulsion <u>2/</u> (1,250 gallons/acre)	.02

Gravel, stone, and fiber matting may also be used
as protective cover

1/ Values of seeded vegetation are based on a
fully established stand.

2/ For use on areas not planned for vegetation.

TABLE A.5
 APPROXIMATE WEIGHTS OF SOILS IN LBS. PER CUBIC FT. AND FACTORS
 FOR CONVERTING SOIL LOSSES (AIR DRY) FROM TONS TO CUBIC YARDS

<u>Soils</u>	<u>Volume Wt. lb./cu. ft.</u>	<u>Tons to Cu. Yds.</u>
Sands and loamy sands	110	0.67
Sandy loam	105	0.71
Fine sandy loam	100	0.74
Loam	90	0.82
Silt loam	85	0.87
Silty clay loam	80	0.93
Clay loam	75	0.99
Silty, sandy clay and clay	70	1.06

APPENDIX B

**EXAMPLE STORM WATER POLLUTION PREVENTION PLANS
FOR CONSTRUCTION ACTIVITIES**

Appendix B - EXAMPLE STORM WATER POLLUTION PREVENTION PLANS FOR CONSTRUCTION ACTIVITIES

INTRODUCTION

On September 14, 1998 EPA authorized Texas to develop and implement the Texas Pollutant Discharge Elimination System (TPDES) Program. Under the terms of this authorization, Texas Commission on Environmental Quality (TCEQ) assumed the role of storm water permitting authority for Industrial Activity, Construction Activity, and Municipal Separate Storm Sewer Systems (MS4s).

The Texas Pollutant Discharge Elimination System (TPDES) program implements the federal NPDES program in the state of Texas. The EPA Region 6 has administered the Phase I storm water general permit for construction activities disturbing 5 or more acres within the state of Texas until the TPDES permit was issued. On March 5, 2003, the TCEQ became the permitting authority for these discharges. This general permit also covers storm water discharges from Phase II construction activities that disturb at least 1 acre and less than 5 acres.

Large Construction Activity (5 or more acres)

For construction projects that will disturb 5 or more acres, including the larger plan of development:

Operators of large construction activities that will disturb 5 or more acres, including the larger plan of development must submit an NOI to obtain authorization under the TPDES Construction General Permit. The following steps must be completed to obtain authorization to discharge under the general permit:

1. Obtain a copy of the TPDES Construction General Permit (TPDES Permit No. TXR150000).
2. Develop and implement a Storm Water Pollution Prevention Plan (SWP3) according to the provisions of the general permit.
3. Complete and submit an NOI to the TCEQ (using TCEQ's form), and to the operator of any municipal separate storm sewer system receiving the discharge at least 2 days prior to commencing construction activities. Permit filing fees also apply. (Note: TCEQ also has provided for electronic submittal of the NOI and the associated filing fee. See TCEQ's website for additional details.)
4. Post a copy of the NOI and a copy of the construction site notice at the construction site.

To Terminate coverage, each operator that has submitted an NOI for authorization under the general permit must apply to terminate that authorization following the conditions described in the general permit, and submit a Notice of Termination (NOT) to TCEQ and provide a copy of the NOT to the operator of any MS4 receiving the discharge once the site has reached final stabilization.

Small Construction Activity (1 to less than 5 acres)

For construction projects that will disturb 1 or more acres, but less than 5 acres, including the larger common plan of development:

1. Obtain a copy of the TCEQ Construction General Permit (TPDES Permit No. [TXR150000](#)).
2. Develop and implement a Storm Water Pollution Prevention Plan (SWP3).
3. Complete and post a site notice.

Construction Activity on Less Than One Acre

For construction projects that will disturb less than one acre and are not part of a larger common plan of development, coverage under the Construction General Permit is not required, unless required by a state or local authority.

SWP3 CONTENTS

SWP3 contents must include, at a minimum, the information described in this section.

- 1.0 Site or Project Description
 - 2.0 Best Management Practices (BMPs)
 - 3.0 Structural Control Practices
 - 4.0 Permanent Storm Water Controls
 - 5.0 Other Controls
 - 6.0 Consistency with Approved State and Local Plans
 - 7.0 Maintenance
 - 8.0 Inspections of Controls (written documentation of inspections of controls required)
 - 9.0 Non-Storm Water Discharges
- Appendices

Retention of Records

The permittee must retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D of the Construction General Permit.

(Note: For activities that are not required to submit an NOT, records shall be retained for a minimum period of three (3) years from the date that either: final stabilization has been achieved on all portions of the site that is the responsibility of the permittee; or another permitted operator has assumed control according to over all areas of the site that have not been finally stabilized.)

Records include:

1. A copy of the SWP3.
2. All reports and actions required by this permit, including a copy of the Construction Site Notice.
3. All data used to complete the NOI.

All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).

The permittee has a duty to comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.

FEES

For large construction activity, an application fee of \$100 must be submitted to TCEQ with each NOI for coverage of a large construction activity. A fee is not required for submission of an NOT or NOC letter. Large construction activities authorized under the Construction General Permit must also pay TCEQ an annual Water Quality Fee of \$100 under Texas Water Code 26.0291 and according to TAC Chapter 205 (relating to General Permits for Waste Discharges). Local fees for construction activities also apply. The user should review local requirements for applicable fees.

EXAMPLE SWP3s

Three example Storm Water Pollution Prevention Plans (SWP3s) are provided in this appendix. These example SWP3s include, NOIs, Construction Site Notices, and NOTs for the following types of large construction activities:

- B.1 Residential Subdivision
- B.2 Roadway

The example SWP3 includes Construction Site Notice for the following small construction activity.

- B.3 Single-Family Residence

Notice of Intent and Notice of Termination

Please see the example Notice of Intent (NOI) and Notice of Termination (NOT) forms prepared for the example projects. (Note: Both the owner and general contractor may be considered as operators under the TPDES Construction General Permit. Review the Construction General Permit for specific projects to determine who should file the NOI(s) for the project.)

The NOIs and NOTs must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to TCEQ and the operator of the MS4 receiving the discharges from the construction activities. The NOI should be sent to the TCEQ at the following address (Note: TCEQ has also provided for electronic filing of the NOI form and associated filing fee):

*Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC-214
P.O. Box 13088
Austin, Texas 78711-3088*

A Construction Site Notice must be posted near the main entrance of the construction site with the following information (Note: This information must be provided in addition to the NOI.):

- *The TPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned.*
- *The name and telephone number of a local contact person.*

- A brief description of the project.
- The location of the SWP3 if the site is inactive or does not have an on-site location to store the plan.

An example of a Construction Site Notice which could be used for posting is provided after the example NOI.

After the project is complete and final stabilization is achieved, or if another operator takes over the project, the Notice of Termination (NOT) must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to the TCEQ and the operator of the MS4 receiving the discharges.

POST-CONSTRUCTION STORM WATER MANAGEMENT BEST MANAGEMENT PRACTICES (BMPs)

Although post-construction BMPs for Storm Water Management (permanent storm water quality controls) are beyond the scope of this Handbook, information on post-construction controls is needed when preparing a Storm Water Pollution Prevention Plan (SWP3) under provisions of the Construction General Permit.

Part III.F.4 of the Construction General Permit requires the SWP3 to 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. These structural measures should be placed on upland soils to the degree attainable. These structural measures may include:

- Storm water detention / retention structures
- Open vegetated swales or natural depressions
- Onsite infiltration
- Sequential systems (which combine several practices)

In addition, velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel for the purpose of providing a non-erosive velocity flow from the structure to the watercourse. The Storm Water Management Joint Task Force (JTF) has developed a guidance manual for permanent, post-construction storm water quality BMPs, entitled, *Storm Water Quality Management Guidance Manual*. The reader is directed to the *Storm Water Quality Management Guidance Manual* for further guidance on permanent storm water pollution control measures and management plans.

REGULATORY REQUIREMENTS

Construction projects must comply with applicable federal, state and local laws, including the Endangered Species Act and historic preservation laws. The City has implemented an ordinance and the County has implemented regulations for discharges associated with construction activity and for post-construction controls on new development and significant redevelopment. The reader is directed to the JTF website www.cleanwaterclearchoice.org for additional information and links to these documents.

LIMITATIONS

The examples are included to illustrate one possible approach toward preparation of SWP3s, Site Notices, NOIs, and NOTs, to control storm water runoff pollution from

construction activities. The examples were developed following the Construction General Permit requirements. The reader is strongly advised to review Construction General Permit and local regulations and guidelines to ensure consistency and compliance in preparing a SWP3, Site Notices, NOI and NOT for a specific project. The SWP3, Public Notices, NOI and NOT must be prepared in light of the specific requirements of a project, the particular site restraints and environmental considerations. The SWP3, Site Notices, NOI and NOT must also comply with applicable state and local storm water management regulations in effect at the time. Applicable agency requirements, including certification requirements, should be reviewed. Local storm water management regulations and requirements should also be reviewed.

B.1 EXAMPLE SWP3 FOR A SUBDIVISION

B.1 EXAMPLE STORM WATER POLLUTION PREVENTION PLAN FOR A SUBDIVISION PROJECT

The following is an example of a Storm Water Pollution Prevention Plan (SWP3) for construction activities associated with an infrastructure development project for a residential subdivision. The plan must be completed before submittal of the Notice of Intent (NOI), and updated as appropriate during the course of the project. A Notice of Termination (NOT) must be submitted when the project is completed and final stabilization or the conditions of Construction General Permit Part II.E. have been met.

SWP3 contents:

TABLE OF CONTENTS

- 1.0 SITE OR PROJECT DESCRIPTION
- 2.0 BEST MANAGEMENT PRACTICES (BMPS)
- 3.0 STRUCTURAL CONTROL PRACTICES
- 4.0 PERMANENT STORM WATER CONTROLS
- 5.0 OTHER CONTROLS
- 6.0 CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS
- 7.0 MAINTENANCE
- 8.0 INSPECTIONS OF CONTROLS
- 9.0 NON-STORM WATER DISCHARGES
- 10.0 RECORDKEEPING

APPENDICES

- Copy of TPDES Construction General Permit
- Forms (NOI, Construction Site Notice, NOT, Inspection and Maintenance Records)
- Standard Specifications (*Optional*)

1.0 SITE DESCRIPTION

Project Name and Location:

Name: Addicks Estates

Location: West Harris County

Owner Name and Address:

John R. Quality, President

Quality Associates

810 Travis, Suite 716

Houston, Texas 77006-0011

1.1 Description of the Construction Activity:

The project is the construction of underground utilities and roadway improvements for a 40-lot subdivision on 10.8 acres of a 13.2-acre site, to be done in two phases separated by approximately 2 weeks. Lots will be regraded to the extent necessary to provide positive drainage to the storm sewers in the new road. The 10.8-acre subdivision area will be disturbed. However, clearing and regrading operations will be sequenced and further phased so that no more than 8 acres will be disturbed at any one time. No development is being proposed for the 2.2 acre "L" shaped area in the southeast corner of the 13.2-acre site, which contains the Prairie Dawn.

1.2 Sequence of Major Activities:

The first major phase will take approximately 2 months. Utility construction will occur, including storm sewers, sanitary sewers, water lines and underground power distribution. This will require clearing and construction of underground utilities in the proposed street rights-of-way and the perimeter and internal utility easements. The temporary earth stockpile and filter fabric fencing will be set up at the commencement of excavation.

The second major phase is expected to be completed in a period of approximately 2 months, depending on the weather. The new roads will be constructed. Final street and lot grade lines will be established through cut and fill.

1.3 Estimated Total Site Area, Total Disturbed Area:

The total site area is 13.0 acres. The area of the site which will be disturbed is 10.8 ac. The "L" shaped, 2.2 acre southeast corner of the site containing the Prairie Dawn will remain undisturbed.

In the first major phase, the acreage disturbed will be 3.2 ac.

In the second major phase, the acreage disturbed will be 10.8 ac.; street and lot regrading operations will be staged so that no more than 8 acres will be disturbed at any one time.

Offsite borrow or filled areas, if used, will be identified prior to grading related construction activity. The SWP3, including borrow or fill area calculations, will be revised to include offsite borrow and fill areas not covered under a separate SWP3.

1.4 Runoff Coefficient:

The pre-construction run off coefficient "C" for the site is 0.17.

The weighted runoff coefficient "C" for the overall project after construction, including residential and reserved areas, is calculated at 0.24.

While not a part of this project, single family housing will eventually be constructed. The runoff coefficient of the single-family residential use will be approximately 0.40 (See Appendix A of the *Storm Water Management Handbook for Construction Activities*).

The soil type is described as Katy fine sandy loam, consisting of layers of medium acid, brown, fine sandy loam about 28 inches deep, over a layer of slightly acid clay loam that is very firm, extending to a depth of over 65 inches. (Extracted from *Soil Survey of Harris County, Texas*, USDA Soil Conservation Service, August 1976).

Calculations

Pre-construction Runoff Coefficient “C”:

<u>Area</u>	<u>“C”</u>
10.8 ac grassy meadow, clay loam, flat	0.17

Post-Construction Runoff Coefficient “C”:

<u>Area</u>	<u>“C”</u>
8.8 ac new lawn, sandy, flat	0.1
2.0 ac roads, concrete	0.9
10.8 ac total	

$8.8 / 10.8 * 0.1 = 0.08$

$2 / 10.8 * 0.9 = 0.16$

$0.08 + 0.16 = 0.24$ weighted runoff coefficient

1.5 Site and General Location Maps:

Site and general location maps are provided as required elements of the SWP3. Separate site maps for offsite support or staging areas may be provided as needed. General Location Maps will be revised to show known locations of offsite material, waste, borrow or equipment storage areas not covered by a separate SWP3. If any new site locations identified later during the construction, the General Location Map and/or SWP3 will be revised as appropriate.

1.6 Name of the Receiving Water:

West Creek is located south of the project area and receives storm water runoff from project site.

1.7 Construction General Permit requirements

A copy of the TPDES Construction General Permit is included in the Appendices.

2.0 BEST MANAGEMENT PRACTICES (BMPS)

2.1 Erosion and Sediment Controls

Major erosion and sediment controls are shown on the Site Map.

Short and Long Term Goals and Criteria

- Sediment will be retained on site to the extent practical.

- Control measures will be properly selected, installed, and maintained in accordance with manufactures' specifications and good engineering practice.
- If sediment escapes the site, off-site accumulations will be removed to minimize off-site impacts.
- Dewatering effluent should be routed through filtration controls.
- Sediment will be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.
- Litter, construction debris, and construction chemical exposed to storm water will be removed covered or otherwise prevented from becoming a pollutant source.
- Offsite materials storage areas if used by contractors (also including overburden and stockpiles of dirt, borrow areas, etc.) are considered a part of the project and will be addressed in the SWP3. Offsite areas also will be evaluated for listed species.

There are currently no plans for offsite material storage areas.

2.2 Stabilization Practices

The following stabilization practices will be used:

1. Construction road access, staging and parking areas will be stabilized using coarse aggregate.
2. The road construction phase is expected to begin within 2 weeks after utilities are completed. If the interim period between the phases is more than 21 days, the road rights-of-way will be mulched within 14 days.
3. After road completion, the newly graded lots and all exposed soils will be hydro-mulch seeded.
4. Newly graded lots will have textured soil surfaces to reduce sheet flow and improve surface water impoundment.
5. Landscaping will be provided for individual lots upon completion of building construction.

Sequence of Major Erosion and Sediment Control Activities

Phase 1:

Drainage swales, sediment traps, stabilized construction entrance and staging/parking area will be installed. Controls as specified by USFWS to protect the tract containing the Prairie Dawn will be installed. Utility construction, including storm sewers, sanitary sewers, water lines and underground power distribution, will take approximately 2 months. This will require clearing and construction of underground utilities in the proposed street rights-of-way and the perimeter and internal utility easements. The temporary earth stockpile and filter fabric fencing will be set up at the commencement of excavation.

Phase 2:

The second phase is expected to be completed in approximately 2 months, depending on the weather. The new roads will be constructed. Final street and lot grade lines will be established through cut and fill. All surplus excavated material is anticipated to be used for site fill. All disturbed soils will be hydro-mulch seeded. When all construction activity is complete and the site is stabilized, temporary structural controls will be removed, and soils disturbed by their removal will be reseeded.

3.0 STRUCTURAL CONTROL PRACTICES

3.1 Diversion Dikes and Swales

Diversion dikes and swales will be constructed along the north and west boundaries, after construction of the road access but before utility work begins, to intercept off-site overland flow. Storm water will be discharged as sheet flow to existing curbs and gutters. Hydro-mulch seeding will be used to line the channels. These dikes and swales will be left in place to protect the subdivision from overland flows from adjacent undeveloped areas.

Temporary diversion swales will be constructed along the north and west sides of the new road after placement of excess excavated material on the adjacent lots, to intercept runoff prior to road completion. Discharge will be directed to sediment traps at the ends of the diversions, with sheet discharge into existing curbs and gutters. Hydro-mulch seeding will be used to stabilize the channels. The diversion swales will be removed when the road and permanent storm drainage system is completed.

3.2 Filter Fabric Fences and Barriers

Filter fabric fences will be used around the temporary earth stockpile while it is in use.

Filter fabric barriers will be used on Stage I inlets.

Filter fabric fences will be placed along the street property lines of all lots with disturbed areas not under immediate construction.

3.3 Protective Fencing Around Trees

Protective fencing will be installed and maintained around the drip lines of specimen trees during the construction period.

4.0 PERMANENT STORM WATER CONTROLS

- (1) The majority of the lots are anticipated to be planted with lawn, shrubs and trees, providing flow attenuation and partial vegetative filtration. The areas which are not developed will be graded at less than 0.5:1 and have permanent seeding or plantings.
- (2) Storm water from residential lots will discharge by overland flow to the new curb and gutter system, then into an existing storm sewer system. There is no need for velocity dissipation devices.

5.0 **OTHER CONTROLS**

5.1 Waste Disposal

Waste Materials

All waste materials will be collected and stored in a securely lidded metal dumpster rented from the ABC Waste Management Company, which is a licensed solid waste management company in Houston. The dumpster will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The trash and debris will be hauled to an approved landfill. No construction waste material will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and Mr. Doe, the individual who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste

No hazardous waste is expected to be generated or encountered in this project. In the event that hazardous waste is encountered, all hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Mr. Doe, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be regularly collected from the portable units by the Sanichem Company, a licensed sanitary waste management contractor.

5.2 Offsite Vehicle Tracking

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments.

The paved streets adjacent to the site entrance will be cleaned daily to remove any excess mud, dirt or rock tracked from the site.

5.3 Demonstration of Compliance with State, Tribal and Local Regulations

The proposed project will be in compliance with applicable state and local waste disposal and sanitary sewer regulations.

5.4 Construction and Waste Materials

Describe construction and waste materials to be stored onsite. Also include a description of spill controls, and exposure minimization measures. This information to be updated when appropriate.

Refer to Section 9.0 Non-Storm Water Discharges. Substances expected to be on-site during construction include the following: concrete, detergents, fertilizer, fuels, lubricants and wood. Spill prevention measures include Good Housekeeping Practices, Hazardous Product Practices, Product Specific Practices, and Spill Prevention Practices.

5.5 Potential Pollutant Sources

Describe potential pollutant sources from support activities, and the controls for them.

All work will be conducted at the project site. If any support activities occur off site, the SWP3 will be amended to describe them and any additional control measures that may be needed beyond those described herein. The control measures described in Section 9.0. Non-Storm Water Discharges will apply to all support activities, as applicable. Should any support activity involve earth disturbance or movement of soils, filter fabric fencing will be used along the downhill side of the activity area to control sediment in runoff.

6.0 **CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS**

This SWP3 is consistent with approved state and local site plan requirements for storm water management and erosion and sediment control requirements.

No tribal land is known to occur at the site. However, if tribal land is found to occur at the site, then the information will be revised to reflect appropriate coordination.

7.0 **MAINTENANCE**

The following is a list of erosion and sediment controls to be used on this project.

Stabilization Practices

Stabilization of construction access, staging and parking areas.

Hydro-mulch seeding.

Textured soil surfaces on newly graded lots to reduce sheet flow and improve surface water impoundment.

Landscaping provided for individual lots upon completion of building construction.

Structural Practices

Diversion dikes and swales

Temporary diversion swales

Filter fabric fences

Filter fabric barriers on Stage I inlets

Bagged gravel barriers on Stage II inlets

Protective fencing will be installed and maintained around the drip lines of specimen trees.

Storm sewers and gutters.

To maintain the above practices, the following will be performed:

1. Maintenance and repairs will be conducted within 24 hours of inspection report (see Section 8.0 below) to maintain the effectiveness of the Best Management Practice (BMP). Note that this includes maintenance following all storm events of 0.5 inch or greater.
2. Sediment will be removed from behind the sediment fences when it becomes about 1/3 the height of the fence.

3. Sediment will be removed from the sediment trap when storage capacity has been approximately 50% filled.
4. All temporary controls will be removed after the disturbed areas have been stabilized.

8.0 INSPECTIONS OF CONTROLS

8.1 Designation of Qualified Person

Each contractor will designate a qualified person or persons to perform the following inspections:

- Disturbed areas and areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system.
- Erosion and sediment control measures identified in the plan will be observed to ensure that they are operating correctly.
- Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.
- Locations where vehicles enter or exit the site will be inspected for evidence of offsite sediment tracking.

The inspection will be conducted by the responsible person at least once every 14 calendar days and within 24 hours after a storm of 0.5 inch or greater.

After a portion of the site is finally stabilized, inspection will be conducted at least once every month.

8.2 SWP3 Revisions

Based on the results of the inspection, the site description (Section 1.0) and control measures (Section 2.0) of this SWP3 will be revised as appropriate, but in no case later than 7 calendar days following the inspection.

8.3 Inspection Reports

A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3, and actions taken in accordance Section 8.2 above will be made and retained as part of the SWP3 for at least three years from the date that the site is finally stabilized. The report will be signed in accordance with Part VI.6 of the Construction General Permit.

Copies of the forms to be used for the Inspection and Maintenance report are included in the following pages as a part of this SWP3 in the following pages.

9.0 NON-STORM WATER DISCHARGES

The following substances listed below are expected to be present onsite during construction:

Concrete	Fuels
Detergents	Lubricants
Fertilizers	Wood

Spill Prevention

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of the materials and substances described above to storm water runoff.

Good Housekeeping Practices

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough product required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations for proper use and disposal will be followed.
7. The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Product Practices

These practices will be used to reduce the risks associated with hazardous materials, if hazardous materials are used.

1. Products will be kept in original containers unless they are not resealable.
2. Original labels and material safety data will be retained.
3. If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

Product Specific Practices

The product specific practices to be followed are listed in Table 1.

Spill Prevention Practices

The spill prevention practices to be followed are listed in Table 1.

TABLE 1	
Product Specific Practices	
The following product specific practices will be followed onsite:	
Petroleum Products:	All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be sorted in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.
Fertilizers:	Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
Paints:	All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and local regulations.
Concrete Trucks:	Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.
Spill Prevention Practices	
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:	
<ul style="list-style-type: none"> • Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies. • Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose. • All spills will be cleaned up immediately after discovery. • The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance. • Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size. • The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included. • Mr. Doe, the site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite. 	

10.0 **RECORDKEEPING**

1. The permittee(s) will retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D. A copy of the SWP3.
2. All reports and actions required by this permit, including a copy of the construction site notice.
3. All data used to complete the NOI.

All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).

The permittee(s) will comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.

APPENDICES

TPDES Construction General Permit

(Insert Copy of Construction General Permit here.)

Forms

Example Forms required by the Construction General Permit are provided in the following pages.

Please see the example Notice of Intent (NOI) and Notice of Termination (NOT) forms prepared for the example subdivision project. (Note: Both the owner and general contractor may be considered as operators under the TPDES Construction General Permit. Review the Construction General Permit for specific projects to determine who should file the NOI(s) for the project.)

The NOIs and NOTs must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to TCEQ and the operator of the MS4 receiving the discharges from the construction activities. The NOI(s) should be sent to the TCEQ at the following address (Note: TCEQ has also provided for electronic filing of the NOI form and associated filing fee):

*Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC-214
P.O. Box 13088
Austin, Texas 78711-3088*

A Construction Site Notice must be posted near the main entrance of the construction site with the following information (Note: This information must be provided in addition to the NOI.):

- *The TPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned.*
- *The name and telephone number of a local contact person.*

- *A brief description of the project.*
- *The location of the SWP3 if the site is inactive or does not have an on-site location to store the plan.*

An example of a Construction Site Notice which could be used for posting is provided after the example NOI.

After the project is complete and final stabilization is achieved, or if another operator takes over the project, the Notice of Termination (NOT) must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to the TCEQ and the operator of the MS4 receiving the discharges.

EXAMPLE



Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES General Permit

TCEQ Office Use Only	
TPDES Permit Number: TXR15	_ _ _ _ _ _ _
GIN Number:	_ _ _ _ _ _ _ _ _
Fee Receipt No.	_____

IMPORTANT:

- Use the attached **INSTRUCTIONS** when completing this form.
- After completing this form, use the attached **CUSTOMER CHECKLIST** to make certain all items are complete and accurate.
- Missing, illegible, or inaccurate items may delay final acknowledgment or coverage under the general permit.

Application Fee: You must submit the \$100 NOI Application Fee to TCEQ under separate cover (see instructions) using the attached Application Fee submittal form. (DO NOT SEND A COPY OF THE NOI WITH THE APPLICATION FEE SUBMITTAL FORM)

Tell us how you paid for this fee:

Check/Money Order No.: 552	Name Printed on Check: City Center Construction, Inc.
----------------------------	---

A. OPERATOR

1. TCEQ Issued Customer Number (CN) (if available):

2. Legal Name (spelled exactly as filed with the Texas Secretary of State, County, or legal document that was used in forming the entity):
Center City Construction, Inc.

3. Mailing Address: 222 Austin Suite No./Bldg.No.: Suite 810

City: Houston	State: Texas	ZIP Code: 77008-0022
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4. Phone No.: (713) 323-7655 Extension:

5. FAX No. (713) 323-7650 E-mail Address: ccc@centercityconst.com

6. Type of Operator:

<input type="checkbox"/> Individual	<input type="checkbox"/> Sole Proprietorship-D.B.A.	<input type="checkbox"/> Partnership
<input checked="" type="checkbox"/> Corporation	<input type="checkbox"/> Federal Government	<input type="checkbox"/> State Government
<input type="checkbox"/> County Government	<input type="checkbox"/> City Government	<input type="checkbox"/> Other: _____

7. Independent Operator: Yes No (If governmental entity or a subsidiary or part of a larger corporation, check "NO")

8. Number of Employees: 0-20; 21-100; 101-250; 251-500; or 501 or higher

9. Business Tax and Filing Numbers (not applicable to Individuals, Government, General Partnerships, and Sole Proprietorship-D.B.A.):

State Franchise Tax ID Number: If Applicable Federal Tax ID: If Applicable

TX SOS Charter (filing) Number: If Applicable DUNS Number: If Applicable (If known)

B. BILLING ADDRESS (The Operator is responsible for paying the annual fee.)

Same As Operator (check if address is the same, then proceed with Section C.)

1. Billing Mailing Address: Suite No./Bldg.No.:

City:	State:	ZIP Code:
-------	--------	-----------

2. Billing Contact (Attn or C/O):

3. Country Mailing Information (if outside USA) Territory: Country Code: Postal Code:

4. Phone No.: () -	Extension:
5. FAX No.	E-mail Address:

C. APPLICATION CONTACT (If TCEQ needs additional information regarding this application, who should be contacted?)		
1. Name: Joseph Contractor	Title: Vice President	Company: Center City Construction, Inc.
2. Phone No.: (713) 323-7655	Extension:	
3. FAX No. (713) 323-7650	E-mail Address: joseph.contractor@centercityconst.com	
D. REGULATED ENTITY (RE) INFORMATION ON PROJECT OR SITE		
1. TCEQ Issued RE Reference Number (RN) (if available):		
2. Name of Project or Site: Addicks Estates		
3. Physical Address of Project or Site: (enter in spaces below)		
Street Number: 3500	Street Name: Addicks Estates Pkwy.	
City (nearest to the site): Houston	ZIP Code (nearest to the site): 77082-0000	County (Counties if >1): Harris
4. If no physical address (Street Number & Street Name), provide a written location access description that can be used for locating the site: (Ex.: 2 miles west from intersection of Hwy 290 & IH35 on Hwy 290 South)		
5. Latitude: 29.85 N	Longitude: 95.6667 W	
6. Standard Industrial Classification (SIC) code: 1521		
7. Describe the activity related to the need for this authorization at this site (<i>do not repeat the SIC and NAICS code</i>): Single family residential construction		
8. Is the project/site located on Indian Country Lands? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, you must obtain authorization through EPA, Region VI.		
E. SITE MAILING ADDRESS (address for receiving mail at the site)		
<input type="checkbox"/> Same As Operator (check if address is the same, then proceed with Section F.)		
Mailing Address: 2536 Addicks Dr.		Suite No./Bldg.No.:
City: Houston	State: Texas	ZIP Code: 77081-0000
F. GENERAL CHARACTERISTICS		
1. Has a Pollution Prevention Plan been prepared as required in the general permit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No, coverage may be denied as the PPP is required at the time the NOI is submitted to TCEQ.		
2. Provide the estimated area of land disturbed (to the nearest acre): _____ 13 _____ Acres		
3. Provide the name of the receiving water body (local stream, lake, drainage ditch), MS4 Operator (if applicable) and the segment number where storm water runoff will flow from the construction site. MS4 Operator: Harris County Receiving Water Body: West Creek Segment: _____		

G. CERTIFICATION

I, Joseph Contractor Vice President
Typed or printed name *Title (Required)*

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 gather and evaluate 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 there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signature: "Not valid without appropriate signature." Date: _____
(Use Blue Ink)

EXAMPLE

**Texas Commission on Environmental Quality
General Permit Payment Submittal Form**

Use this form to submit your Application Fee.

- Complete items 1 through 4 below:
- Staple your check in the space provided at the bottom of this document.
- Do not mail this form with your NOI form.
- Do not mail this form to the same address as your NOI. Instead, mail this form and your check to:

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, TX 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, TX 78753

To confirm receipt of payment, call the Cashier's office at 512/239- 0357 or 239-0187.

Fee Code: **GPA**

General Permit: **TXR150000**

1. Check / Money Order No: 552

2. Amount of Check/Money Order: \$100

3. Date of Check or Money Order: 09/05/03

4. Name on Check or Money Order: City Center Construction, Inc.

5. NOI INFORMATION

If the check is for more than one NOI, list each Project/Site (RE) Name and Physical Address exactly as provided on the NOI. **DO NOT SUBMIT A COPY OF THE NOI WITH THIS FORM AS IT COULD CAUSE DUPLICATE PERMIT ENTRIES.**

See Attached List of Sites *(If more space is needed, you may attach a list.)*

Project/Site (RE) Name: Addicks Estates

Project/Site (RE) Physical Address: 3500 Addicks Estates Parkway, Houston, Texas 77082-0000

Staple Check In This Space



CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	Joseph E. Contractor Work (713) 323-7655 Fax (713) 323-7650
Project Description: <small>(Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)</small>	The project site is an irregularly shaped, 13.027 acre. plat in west Harris County, lying northwest of the intersection of West Main Rd. and Addicks Estates Pkwy (3500 Addicks Estates Pkwy). Construction is estimated to start on 10/09/03 and end 2/09/04. The project includes construction of underground utilities and roadway improvements. There will be 40 lots in the subdivision. Lots will be regraded to the extent necessary to provide positive drainage to the storm sewers in the new road. In the first major phase, the acreage disturbed will be 3.2 acres. In the second major phase, the total acreage will be 10.8 acres; street and lot regrading operations will be staged so that no more than 8 acres will be disturbed at any one time.
Location of Storm Water Pollution Prevention Plan :	The SWPPP is located on-site at 3500 Addicks Estates Pkwy.

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I Joseph E. Contractor (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

"Not valid without appropriate signature."

Signature and Title

Date



Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

TCEQ Office Use Only

TPDES Permit Number: TXR15__ __ __ __ __ NO
GIN Number: __ __ __ __ __ __ __ __

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20023-Instructions).

A. TPDES Permit Number: TXR15 3456

B. Construction Site Operator

Customer Reference Number: CN 600123456

Name: Center City Construction, Inc.

Mailing Address: 222 Austin, Suite 810

City: Houston State: TX Zip Code: 77008-0022

Country Mailing Information (if outside USA) Territory: _____ Country Code: _____ Postal Code: _____

Phone Number: (713) 323-7655 Extension: _____ Fax Number: (713) 323-7650

E-mail Address: ccc@centercityconst.com

C. Project / Site Information

Regulated Entity Reference Number: RN 100456789

Name: Addicks Estates

Physical Address: 3500 Addicks Estates Pkwy.

Location Access Description: Turn west off of the 3500 block of Addicks Estates Pkwy.

City: Houston County: HARRIS Zip Code: 77082-0000

D. Contact - If the TCEQ needs additional information regarding this termination, who should be contacted?

Name: Joseph Contractor Title: Vice President

Phone Number: (713) 323-7655 Extension: _____ Fax Number: (713) 323-7650

E-mail Address: joseph.contractor@centercityconst.com

E. Certification

I certify under penalty of law that authorization under the TPDES Construction General Permit (TXR150000) is no longer necessary based on the provisions of the general permit. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with construction activity under the general permit TXR150000, and that discharging pollutants in storm water associated with construction activity to waters of the U.S. is unlawful under the Clean Water Act where the discharge is not authorized by a TPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Construction Site Operator Representative:

Prefix: Mr. First: Joseph Middle: E.

Last: Contractor Suffix: _____

Title: Vice President

Signature: "Not valid without appropriate signature." Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671. Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOT must be mailed to the following address:

**Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087**

STORM WATER POLLUTION PREVENTION PLAN
Inspection and Maintenance Report

Project: _____
 Phase: _____
 Inspector: _____ Date: _____
 Number of Days Since Last Rainfall: _____ Amount of Last Rainfall: _____
 _____ Inches

STABILIZATION MEASURES

Area	Days Since Last Disturbance	Date of Next Disturbance	Stabilized?	Stabilized with?	Condition

Stabilization Required: _____

To Be Performed By: _____ On or Before: _____
 Corrected By: _____ On: _____

STRUCTURAL CONTROLS

Filter Fabric Fence	Bottom of Fabric Still Buried?	Fabric Torn or Sagging?	Posts Tipping Over?	How Deep is the Sediment?

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____
 Corrected By: _____ On: _____

(Insert BMP)

Location	In Place? Condition?	Depth of Sediment	Condition of Inlet

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____
 Corrected By: _____ On: _____

OTHER CONTROLS

(Insert BMP)

Location	In Place? Condition?	How Deep is Sediment?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

Stabilized Construction Exit

Does much sediment get tracked onto road?	Entry surface clean or sediment filled?	Does all traffic use entrance?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

Changes Required to the Storm Water Pollution Prevention Plan:

Reasons for Changes:

I certify that the Construction Site is in compliance with the TCEQ TXR150000 Permit, except where noted above.

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

Inspector's Signature: _____ Date: _____

Standard Specifications (Optional)

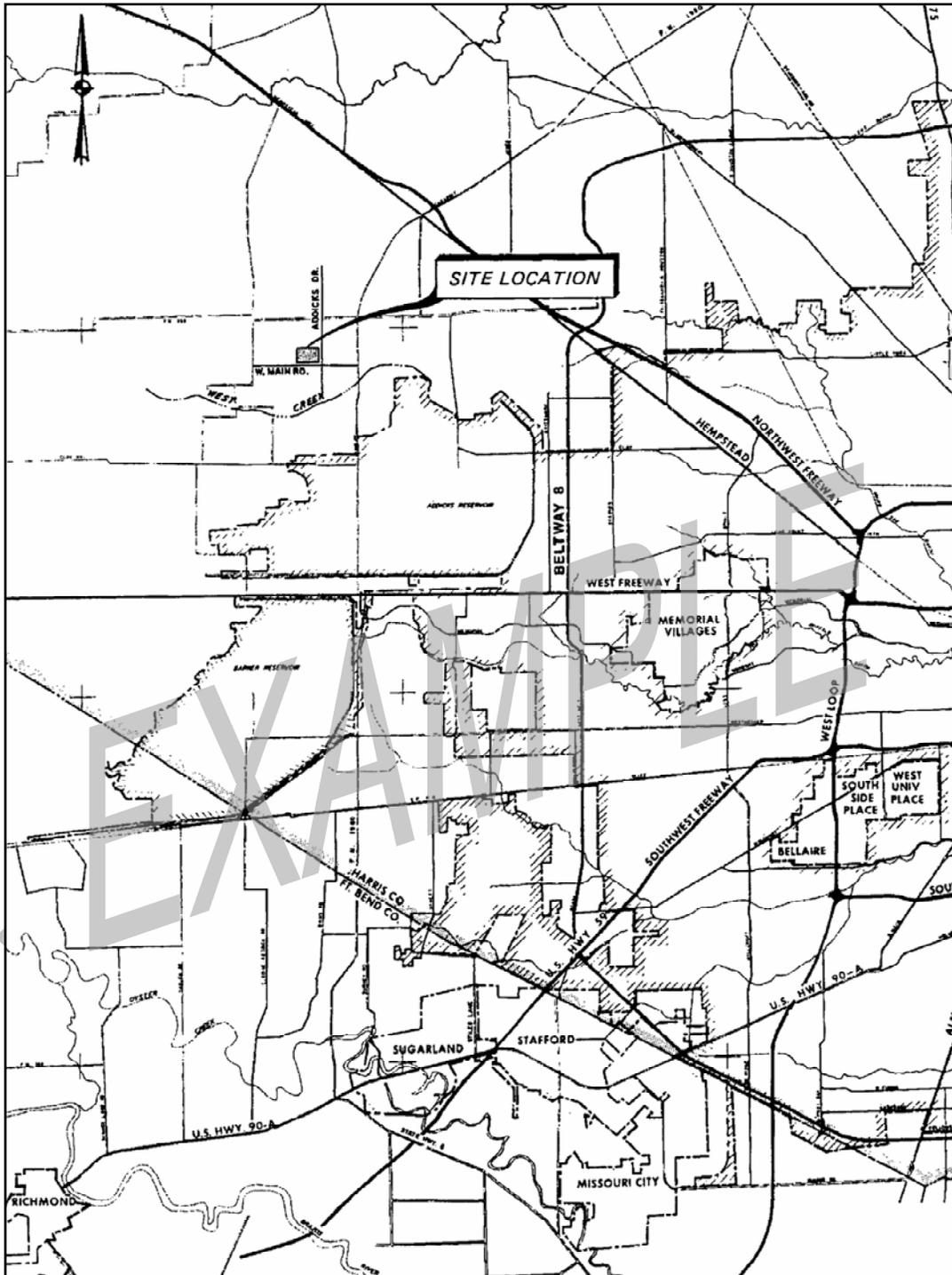
This section is not required by the Construction General Permit, but is included for informational purposes.

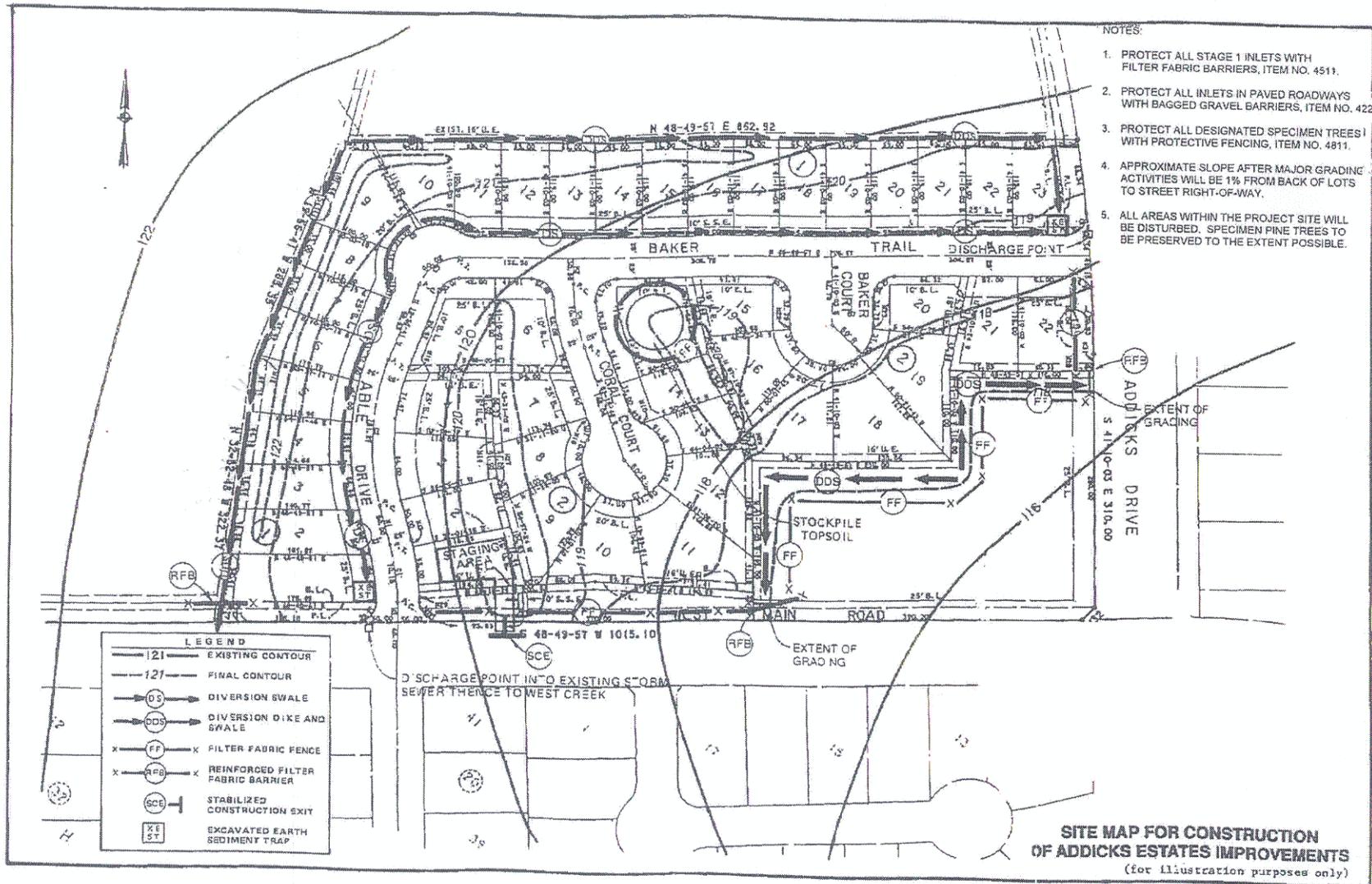
A list of control measures which have corresponding standard specifications in the *Storm Water Management Handbook for Construction Activities* are given below, together with their specification item numbers. Modifications are noted:

ITEMS SPECIFIED

- 4113 Diversion Swale (modification: V-shaped temporary channel)
- 4115 Diversion Dikes and Swales
- 4211 Filter Fabric Fence
- 4241 Hydro-mulch Seeding
- 4311 Filter Fabric Barrier
- 4322 Excavated Earth Outlet Sediment Trap
- 4351 Bagged Gravel Barrier
- 4511 Inlet Protection Barriers
- 4711 Stabilized Construction Exit
- 4811 General Source Controls (Protection of Trees in Construction Areas)

VICINITY MAP
(For illustration purposes only)





B.2 EXAMPLE SWP3 FOR A ROADWAY PROJECT

B.2. EXAMPLE STORM WATER POLLUTION PREVENTION PLAN FOR A ROADWAY PROJECT

The following is an example of a Storm Water Pollution Prevention Plan (SWP3) for construction activities associated with a roadway construction project. The plan must be completed before submittal of the Notice of Intent (NOI), and updated as appropriate during the course of the project. The Notice of Termination (NOT) must be submitted when the project is completed and final stabilization or Part II.E. conditions of Construction General Permit have been met.

SWP3 contents:

TABLE OF CONTENTS

- 1.0 SITE OR PROJECT DESCRIPTION
- 2.0 BEST MANAGEMENT PRACTICES (BMPS)
- 3.0 STRUCTURAL CONTROL PRACTICES
- 4.0 PERMANENT STORM WATER CONTROLS
- 5.0 OTHER CONTROLS
- 6.0 CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS
- 7.0 MAINTENANCE
- 8.0 INSPECTIONS OF CONTROLS
- 9.0 NON-STORM WATER DISCHARGES
- 10.0 RECORDKEEPING

APPENDICES

- Copy of TPDES Construction General Permit
- Forms (NOI, Construction Site Notice, NOT, Inspection and Maintenance Records)
- Standard Specifications (*Optional*)

1.0 SITE DESCRIPTION

	<u>Project Name and Location:</u>	<u>Owner Name and Address:</u>
Name:	Cay Road Widening	Fort Harris County
Location:	Cay Road, between Messner and Holley Roads in Fort Harris County	Engineering Department 101 Forbes, 7th Floor Richmond, Texas 77702

1.1 Description of the Construction Activity:

The project site is a 4000-foot segment of Cay Road running east-west between Messner and Holley Roads. The existing right-of-way is 60 feet wide with a 24-foot wide asphalt pavement and open ditch drainage. The shoulders and drainage ditches are grass covered. The right of way will be expanded to 100 ft. The road will be widened to 4 lanes with a median strip, and will have concrete pavement. Curbs, gutters and 4-foot wide sidewalks will be provided. Existing driveways and utilities in Cay Road will be relocated or adjusted.

1.2 Sequence of Major Activities:

The project is expected to take approximately 9 months, depending on weather conditions.

The stabilized construction access, staging, parking and wash areas will be constructed first.

The north half of Cay Road will then be temporarily widened, and traffic will be diverted to the north half while work proceeds on the south half of Cay Road. A new storm sewer will be constructed in the south half. Other utilities will be relocated or reconstructed.

After paving work is completed on the south half, traffic will be diverted to the south half, and work will proceed on the north half. Utilities will be relocated or reconstructed. After paving work is completed, all unpaved areas will be planted with sod.

1.3 Estimated Total Site Area, Total Disturbed Area

The total area in the construction project will be 9.2 ac. All of this area will be disturbed at one time or another during the project. Under the traffic routing plan, only half of this area (approximately 4.6 ac) will be disturbed at any one time.

1.4 Runoff Coefficient

The existing rainfall-runoff coefficient "C" prior to construction is approximately 0.57. The rainfall-runoff coefficient "C" following completion of the road expansion project will be approximately 0.63. Calculations are given below.

There will be a net export of excavated soils from the site, due to regrading to lower finished elevations. Offsite borrow and fill areas have not been identified at this time, but will be included in the SWP3 prior to earthwork.

Soils testing indicates there is a medium density sandy clay layer of about 2-foot depth, underlain by stiff to very stiff sandy clay to a depth of 17 feet. Below the

sandy clay is silty sand. Water was found at depths ranging from 4 to 8 feet. A soils report has been prepared for this project and is on file in the Fort Harris County Engineering Department.

Calculations for Runoff Coefficient “C” Prior to Road Expansion:

Landscaping

144,000 sf (3.3 ac.) grassed shoulders and ditches, “C” = 0.35 for steep lawn, clay soil (See Appendix A of the *Storm Water Management Handbook for Construction Activities*)

Pavement

96,000 sf (2.2 ac.) asphalt, “C” = 0.90

Total area = 3.3 + 2.2 = 5.5 ac.

$$(3.3/5.5) \times 0.35 = 0.36$$

$$(2.2/5.5) \times 0.90 = 0.21$$

$$\text{Total weighted “C”} = 0.36 + 0.21 = 0.57$$

Calculations for Runoff Coefficient “C” Following Roads Expansion:

Landscaping:

44,000 sf planting strip area, sides

104,000 sf median planting area

148,000 sf (3.4 ac) planted area (sod), “C” = 0.17 for flat lawn, clay soil

Pavement, curbs:

8,000 sf curbs

32,000 sf concrete sidewalk

192,000 sf concrete roadway

20,000 sf of left turn lane

252,000 sf (5.8 ac) concrete paved area, “C” = 0.90

148,000 + 252,000 = 400,000 sf (9.2 ac) total roadway area

$$(3.4 / 9.2) * 0.17 = 0.0628$$

$$(5.8 / 9.2) * 0.9 = 0.567$$

weighted “C” = 0.629, approx. 0.63

1.5 Site and General Location Maps:

Site and general location maps are attached.

1.6 Name of the Receiving Water:

The site drains to Buffalo Bayou, which is approximately 1 mile to the north.

1.7 Construction General Permit Requirements

A copy of the TCEQ Construction General Permit is attached.

2.0 **BEST MANAGEMENT PRACTICES (BMPS)**

2.1 Erosion and Sediment Controls

Major erosion and sediment controls are shown on the Site Map.

Short and Long Term Goals and Criteria

- Sediment will be retained on site to the extent practical.
- Control measures will be properly selected, installed, and maintained in accordance with manufactures specifications and good engineering practice.
- If sediment escapes the site, off-site accumulations will be removed to minimize off-site impacts.
- Sediment will be removed from sediment traps or sedimentation ponds
- Litter, construction debris, and construction chemical exposed to storm water will be prevented from becoming a pollutant source.
- Offsite materials storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) if used will be incorporated into the SWP3.

2.2 Stabilization Practices

The following stabilization practices will be used:

1. Stabilized construction exits will be provided at major access points using coarse aggregate.
2. The onsite staging and parking area will be stabilized using coarse aggregate.
3. In completed pavement sections, all disturbed land between the property line and the gutter will be stabilized with sod to minimize erosion and sediment as soon as possible.
4. At the end of paving work, all disturbed areas that are not paved will be planted with sod.

Sequence of Major Erosion and Sediment Control Activities

The construction will proceed in segments. The stabilized construction access, staging, parking and wash areas will be constructed first.

The north half of Cay Road will then be temporarily widened, and traffic will be diverted to the north half while work proceeds on the south half of Cay Road. Temporary diversion swales will be built before trenching or roadwork proceeds. A new storm sewer will be constructed in the south half. Other utilities will be relocated or reconstructed. After paving work is completed on the south half, the exposed soil between the gutters and sidewalks will be planted with sod.

Upon completion of the south half, traffic will be diverted to the south half, and work will proceed on the north half, beginning with the temporary diversion swales. Utilities will be relocated or reconstructed. After paving work is completed, all unpaved areas will be planted with sod.

Completion of the project is expected in approximately 9 months, depending on weather conditions.

3.0 STRUCTURAL CONTROL PRACTICES

3.1 Swales

Temporary diversion swales will be built along the road edge to divert overland flow from adjacent properties and capture flow off the road surface. Reinforced filter fabric barriers will be used in the diversion swales to remove sediments from runoff.

3.2 Stabilized Vehicle/Equipment Wash Area

A vehicle/equipment wash area stabilized with coarse aggregate will be established near the staging/parking area for trucks and equipment leaving the site. Wash water will be directed to a sediment trap, and then released into a diversion swale.

Water pumped from trenches during dewatering operations will be discharged into a sediment tank with eventual discharge into the drainage swales.

3.3 Trench Excavation

Trench excavation spoils not immediately hauled off will be backfilled into the trenches in a continuous operation. Excavated material required for backfilling will be placed next to the trenches, but no closer than half the depth of the trench, for safety reasons.

3.4 Storm Inlet Sediment Traps

The stage I storm sewer inlets will have storm inlet sediment traps to collect sediment before runoff enters the inlets.

4.0 PERMANENT STORM WATER CONTROLS

- (1) Due to site restrictions, detention, retention and infiltration systems for storm water treatment are not attainable. The vegetated median strips and sodded landscaping strips along walkways will be used to the extent practicable for flow attenuation purposes.
- (2) Storm water from the roadway and properties within approximately 150 feet will discharge into the new curb and gutter system, then will tie into an existing storm sewer. No velocity dissipation devices are needed.

5.0 OTHER CONTROLS

5.1 Waste Disposal

Waste Materials

All waste materials will be collected and stored in securely lidded metal dumpsters rented from the ABC Waste Management Company, which is a licensed solid waste management company in Houston. The dumpsters will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpsters. The trash and debris will be hauled to an approved landfill. No construction waste material will be buried

onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and Mr. Doe, the individual who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste

No hazardous waste is expected to be generated or encountered in this project. In the event that hazardous waste is encountered, all hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Mr. Doe, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be regularly collected from the portable units by the Sanichem Company, a licensed sanitary waste management contractor.

5.2 Offsite Vehicle Tracking

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments.

A stabilized vehicle/equipment washing area has been provided to help remove dirt and loose material from vehicles and equipment. Wash water will be directed to sediment traps, with eventual discharge into drainage swales.

Street sweeping will be done on a daily basis during the construction period on all paved street surfaces in the project site, and to the extent necessary to keep adjacent streets clean of construction debris and soils.

5.3 Demonstration of Compliance with State, Tribal or Local Plans

The proposed project will be in compliance with applicable state and local waste disposal and sanitary sewer regulations.

5.4 Construction and Waste Materials

Describe construction and waste materials to be stored onsite. Also include a description of spill controls, and exposure minimization measures. This information to be updated when appropriate.

Refer to Section 9.0 Non-Storm Water Discharges. Substances expected to be onsite during construction include the following: concrete, detergents, fertilizer, fuels, lubricants, and wood. Spill prevention measures include Good Housekeeping, Hazardous Product Practices, Product Specific Practices, and Spill Prevention Practices.

5.5 Potential Pollutant Sources

Describe potential pollutant sources from support activities, and the controls for them.

All construction activity will be at the work site. The concrete source will be identified by the contractor and noted in the SWP3 prior to paving activity. Due to the relatively small size of the paving project, concrete will likely be provided by a vendor via concrete delivery trucks. The concrete delivery trucks will tend

to have small residual amounts of concrete after unloading (approximately 1 to 1.5 cu. ft.). This residual concrete must be washed out at the site. A stabilized ramp with a sediment basin to retain wash water will be provided at one end of the project site. No wash water will be allowed to drain from the site. At the end of the project, the concrete contractor will be required to clean up the wash area and properly dispose waste materials and any remaining wash water.

If any support activities occur off the site, the SWP3 will be amended to describe them and any additional control measures that may be needed beyond those already described herein. The control measures described in Section 9.0 Non-Storm Water Discharges will apply to all support activities, as applicable. Should any support activity involve earth disturbance or movement of soils, filter fabric fencing will be used along the downhill side of the activity area to control sediment in runoff.

6.0 CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS

This SWP3 is consistent with approved state and local site plan requirements for storm water management and erosion and sediment control requirements.

No tribal land is known to occur at the site. However, if tribal land is found to occur at the site, then the information will be revised to reflect appropriate coordination.

7.0 MAINTENANCE

The following is a list of erosion and sediment controls to be used on this project.

Stabilization Practices

Stabilized main construction access point

Stabilized onsite staging and parking areas

Sod planted on disturbed land between the property line and the gutter as soon as possible

Sod planted on all disturbed areas that are not paved, upon completion of paving work.

Structural Practices

Diversion swales with reinforced filter fabric barriers or bagged gravel barriers.

Stabilized vehicle/equipment wash area, with wash water directed to a sediment trap, and then released into a diversion swale.

Sediment tank for discharged water from dewatering operations.

Immediate removal of trench excavation spoils or backfilling in a continuous operation.

Storm sewers, gutters, and storm inlet sediment traps for the stage I storm sewer inlets.

To maintain the above practices, the following will be done:

1. Maintenance and repairs will be conducted within 24 hours of inspection report (see Section 8.0 below) to maintain the effectiveness of the Best Management

Practice. Note that this includes maintenance following all storm events of 0.5 inches or greater.

2. Sediment will be removed from behind the reinforced filter fabric barriers or other device when it becomes about 1/3 the height of the device.
3. Sediment will be removed from the sediment trap when storage capacity has been approximately 50% filled.
4. Any sediment in the storm sewer inlets will be removed.
5. All temporary controls will be removed after the disturbed areas have been stabilized.

8.0 INSPECTIONS

8.1 Designation of Qualified Person

Each contractor will designate a qualified person or persons to perform the following inspections:

- Disturbed areas and areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system.
- Erosion and sediment control measures identified in the plan will be observed to ensure that they are operating correctly.
- Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.
- Locations where vehicles enter or exit the site will be inspected for evidence of offsite sediment tracking.
- The vehicle/equipment wash area will be inspected for loss of aggregate, proper drainage, and proper maintenance of sediment trap and washing equipment.

The inspection will be conducted by the responsible person at least once every 14 calendar days and within 24 hours after a storm of 0.5 inch or greater.

After a portion of the site is finally stabilized, inspection will be conducted at least once every month.

8.2 SWP3 Revisions

Based on the results of the inspection, the site description (Section 1.0) and control measures (Section 2.0) of this SWP3 will be revised as appropriate, but in no case later than 7 calendar days following the inspection.

8.3 Inspection Reports

A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance Section 8.2 above will be made and retained as part of the storm water pollution prevention plan for at least three years from the date

that the site is finally stabilized. The report will be signed in accordance with Part VI.6 of the Construction General Permit.

Copies of the forms to be used for the Inspection and Maintenance report are included in the following pages as a part of this SWP3 in the following pages.

9.0 **NON-STORM WATER DISCHARGES**

The following substances listed below are expected to be present onsite during construction:

Concrete	Detergents
Paints	Fertilizers
Fuels	Cleaning solvents
Lubricants	Wood

Spill Prevention

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping Practices

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough product required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations for proper use and disposal will be followed.
7. The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products Practices

These practices will be used to reduce the risks associated with hazardous materials, if hazardous materials are used.

1. Products will be kept in original containers unless they are not resealable.
2. Original labels and material safety data will be retained.
3. If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

Product Specific Practices

The product specific practices to be followed are listed in Table 1.

Spill Prevention Practices

The spill prevention practices to be followed are listed in Table 1.

EXAMPLE

TABLE 1	
Product Specific Practices	
The following product specific practices will be followed onsite:	
Petroleum Products:	All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be sorted in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.
Fertilizers:	Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
Paints:	All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and local regulations.
Concrete Trucks:	Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.
Spill Prevention Practices	
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:	
<ul style="list-style-type: none"> • Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies. • Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose. • All spills will be cleaned up immediately after discovery. • The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance. • Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size. • The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included. • Mr. Doe, the site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite. 	

10.0 **RECORDKEEPING**

The permittee(s) will retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D.

1. A copy of the SWP3.
2. All reports and actions required by this permit, including a copy of the construction site notice.
3. All data used to complete the NOI.

All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).

The permittee(s) will comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.

APPENDICES

TPDES Construction General Permit

(Insert Copy of Construction General Permit here.)

Forms

Example Forms required by the Construction General Permit are provided in the following-pages.

Please see the example Notice of Intent (NOI) and Notice of Termination (NOT) forms prepared for the example roadways project. (Note: Both the owner (county) and general contractor may be considered as operators under the TPDES Construction General Permit. Review the Construction General Permit for specific projects to determine who should file the NOI(s) for the project.)

The NOIs and NOTs must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to TCEQ and the operator of the MS4 receiving the discharges from the construction activities. The NOI(s) should be sent to TCEQ at the following address (Note: TCEQ has also provided for electronic filing of the NOI form and associated filing fee):

*Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC-214
P.O. Box 13088
Austin, Texas 78711-3088*

A Construction Site Notice must be posted near the main entrance of the construction site with the following information (Note: This information must be provided in addition to the NOI):

- *The TPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned.*
- *The name and telephone number of a local contact person.*

- *A brief description of the project.*
- *The location of the SWP3 if the site is inactive or does not have an on-site location to store the plan.*

An example of a Construction Site Notice that could be used for posting is provided after the example NOI.

After the project is complete and final stabilization is achieved, or if another operator takes over the project, the Notice of Termination (NOT) must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to the TCEQ and the operator of the MS4 receiving the discharges.

EXAMPLE

C. APPLICATION CONTACT (If TCEQ needs additional information regarding this application, who should be contacted?)		
1. Name: Joseph Contractor	Title: Vice President	Company: Center City Construction, Inc.
2. Phone No.: (713) 323-7655	Extension:	
3. FAX No. (713) 323-7650	E-mail Address: joseph.contractor@centercityconst.com	
D. REGULATED ENTITY (RE) INFORMATION ON PROJECT OR SITE		
1. TCEQ Issued RE Reference Number (RN) (if available):		
2. Name of Project or Site: Cay Road		
3. Physical Address of Project or Site: (enter in spaces below)		
Street Number: 47000	Street Name: Cay Rd.	
City (nearest to the site): Houston	ZIP Code (nearest to the site): 77044-0000	County (Counties if >1): Harris
4. If no physical address (Street Number & Street Name), provide a written location access description that can be used for locating the site: (Ex.: 2 miles west from intersection of Hwy 290 & IH35 on Hwy 290 South)		
Project site between Messner and Holley Road on Cay Road		
5. Latitude: 29.6667 N	Longitude: 95.65 W	
6. Standard Industrial Classification (SIC) code: 1611		
7. Describe the activity related to the need for this authorization at this site (do not repeat the SIC and NAICS code): Street Construction		
8. Is the project/site located on Indian Country Lands? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, you must obtain authorization through EPA, Region VI.		
E. SITE MAILING ADDRESS (address for receiving mail at the site)		
<input type="checkbox"/> Same As Operator (check if address is the same, then proceed with Section F.)		
Mailing Address: 101 Forbes	Suite No./Bldg.No.: 7th Floor	
City: Houston	State: Texas	ZIP Code: 77002-0000
F. GENERAL CHARACTERISTICS		
1. Has a Pollution Prevention Plan been prepared as required in the general permit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No, coverage may be denied as the PPP is required at the time the NOI is submitted to TCEQ.		
2. Provide the estimated area of land disturbed (to the nearest acre): <u> 9 </u> Acres		
3. Provide the name of the receiving water body (local stream, lake, drainage ditch), MS4 Operator (if applicable) and the segment number where storm water runoff will flow from the construction site. MS4 Operator: <u> Harris County </u> Receiving Water Body: <u> Buffalo Bayou </u> Segment: <u> 1014 </u>		

G. CERTIFICATION

I, Joseph Contractor
Typed or printed name

Vice President
Title (Required)

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 gather and evaluate 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 there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signature: "Not valid without appropriate signature." Date: _____
(Use Blue Ink)

**Texas Commission on Environmental Quality
General Permit Payment Submittal Form**

Use this form to submit your Application Fee.

- Complete items 1 through 4 below:
- Staple your check in the space provided at the bottom of this document.
- Do not mail this form with your NOI form.
- Do not mail this form to the same address as your NOI. Instead, mail this form and your check to:

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, TX 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, TX 78753

To confirm receipt of payment, call the Cashier's office at 512/239- 0357 or 239-0187.

Fee Code: **GPA**

General Permit: **TXR150000**

1. Check / Money Order No: **626**

2. Amount of Check/Money Order: **\$100.00**

3. Date of Check or Money Order: **12/08/03**

4. Name on Check or Money Order: **City Center Construction, Inc.**

5. NOI INFORMATION

If the check is for more than one NOI, list each Project/Site (RE) Name and Physical Address exactly as provided on the NOI. **DO NOT SUBMIT A COPY OF THE NOI WITH THIS FORM AS IT COULD CAUSE DUPLICATE PERMIT ENTRIES.**

See Attached List of Sites (If more space is needed, you may attach a list.)

Project/Site (RE) Name:
Cay Road

Project/Site (RE) Physical Address:
47000 Cay Rd., Houston, Texas 77044-0000

Staple Check In This Space



CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	Joseph E. Contractor Work (713) 323-7655 Fax (713) 323-7650
Project Description: <small>(Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)</small>	The project site is a 4000-foot segment of Cay Rd. running east-west between Messner and Holley Roads. Construction is estimated to start on 12/15/03 and end 7/09/06. The road will be widened to 4 lanes with a median strip, and will have concrete pavement. The right of way will be expanded to 100 ft. The pavement will consist of dual 24-foot roadway sections with a 32-foot median. Curbs, gutters and 4-foot wide sidewalks will be provided. New storm sewers will be provided to replace the existing roadside drainage ditches. The drainage area for the storm sewers will generally extend to 150 feet from the road. Street gutter drainage will be directed to inlets. The gutter grades will be a min. of 0.25% grade.
Location of Storm Water Pollution Prevention Plan :	The SWPPP is located on-site at 47000 Cay Rd.

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I, Joseph E. Contractor (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

"Not valid without appropriate signature."

 Signature and Title

 Date



Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20023-Instructions).

TCEQ Office Use Only

TPDES Permit Number: TXR15-.. .. NO

GIN Number:

A. TPDES Permit Number: TXR15 1234

B. Construction Site Operator

Customer Reference Number: CN 600123456

Name: Center City Construction, Inc.

Mailing Address: 222 Austin, Suite 810

City: Houston State: TX Zip Code: 77008-0022

Country Mailing Information (if outside USA) Territory: _____ Country Code: _____ Postal Code: _____

Phone Number: (713) 323-7655 Extension: _____ Fax Number: (713) 323-7650

E-mail Address: ccc@centercityconst.com

C. Project / Site Information

Regulated Entity Reference Number: RN 100123456

Name: Cay Road

Physical Address: 47000 Cay Rd.

Location Access Description: Project site between Messner and Holley Roads on Cay Road.

City: Houston County: HARRIS Zip Code: 77044-0000

D. Contact - If the TCEQ needs additional information regarding this termination, who should be contacted?

Name: Joseph Contractor Title: Vice President

Phone Number: (713) 323-7655 Extension: _____ Fax Number: (713) 323-7650

E-mail Address: joseph.contractor@centercityconst.com

E. Certification

I certify under penalty of law that authorization under the TPDES Construction General Permit (TXR150000) is no longer necessary based on the provisions of the general permit. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with construction activity under the general permit TXR150000, and that discharging pollutants in storm water associated with construction activity to waters of the U.S. is unlawful under the Clean Water Act where the discharge is not authorized by a TPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Construction Site Operator Representative:

Prefix: Mr. First: Joseph Middle: E.

Last: Contractor Suffix: _____

Title: Vice President

Signature: "Not valid without appropriate signature." Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671. Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOT must be mailed to the following address:

**Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087**

**STORM WATER POLLUTION PREVENTION PLAN
Inspection and Maintenance Report**

Project: _____

Phase: _____

Inspector: _____ Date: _____

Number of Days Since Last Rainfall: _____ Amount of Last Rainfall: _____
Inches

STABILIZATION MEASURES

Area	Days Since Last Disturbance	Date of Next Disturbance	Stabilized?	Stabilized with?	Condition
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Stabilization Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

STRUCTURAL CONTROLS

Reinforced Filter Fabric Barrier

Location	Bottom of Fabric Still Buried?	Fabric Torn or Sagging?	Posts Tipping Over?	How Deep is the Sediment?
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

(Insert BMP)

Location	In Place? Condition?	Depth of Sediment	Condition of Inlet
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

OTHER CONTROLS

(Insert BMP)

Location	In Place? Condition?	How Deep is Sediment?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

Stabilized Construction Exit

Does much sediment get tracked onto road?	Entry surface clean or sediment filled?	Does all traffic use entrance?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

Changes Required to the Storm Water Pollution Prevention Plan:

Reasons for Changes:

I certify that the Construction Site is in compliance with the TCEQ TXR150000 Permit, except where noted above.

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

Inspector's Signature: _____ Date: _____

Standard Specifications (Optional)

This section is not required by the Construction General Permit, but is included for informational purposes.

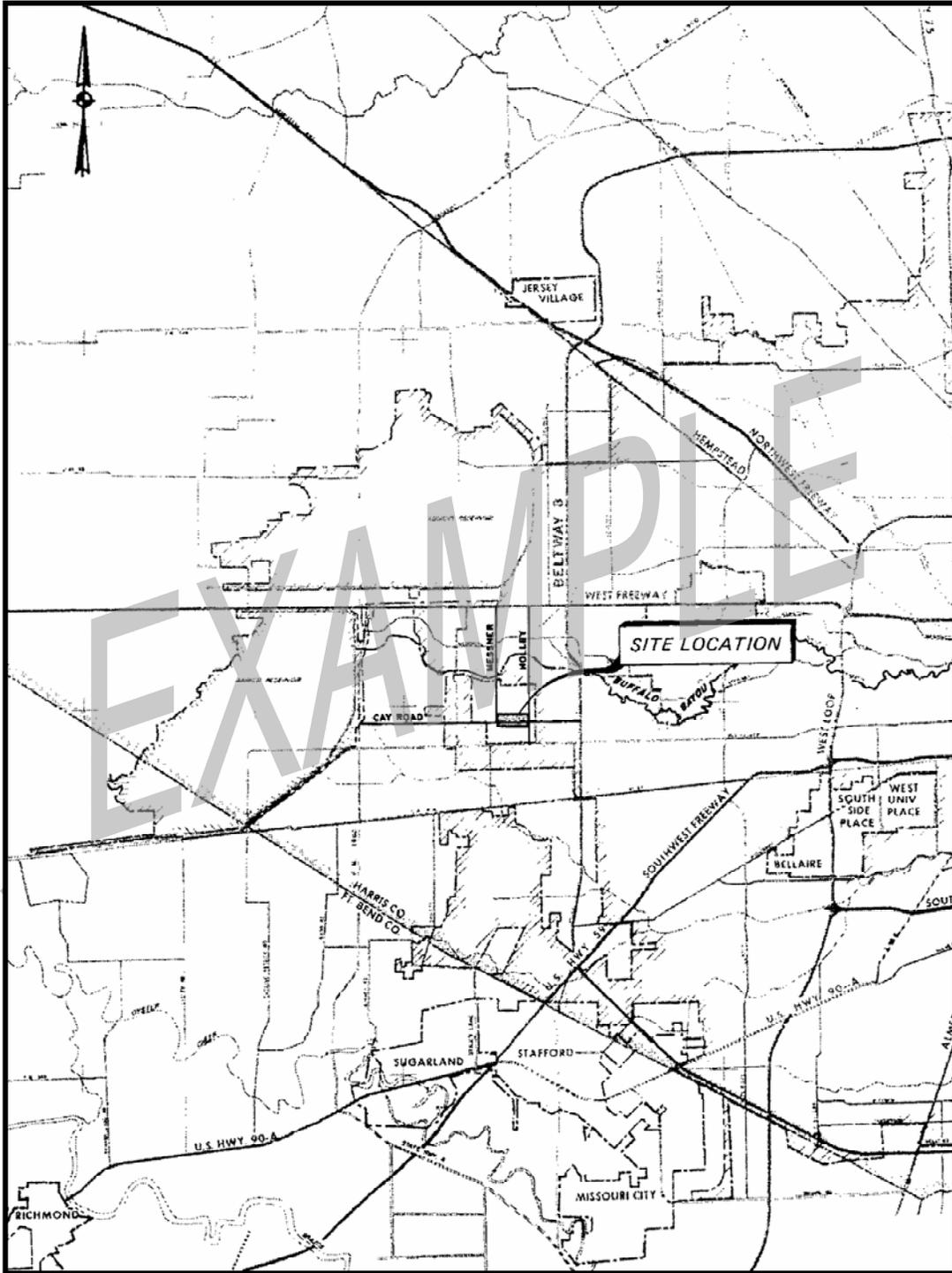
A list of control measures which have corresponding standard specifications in the *Storm Water Management Handbook for Construction Activities* are given below, together with their specification item numbers.

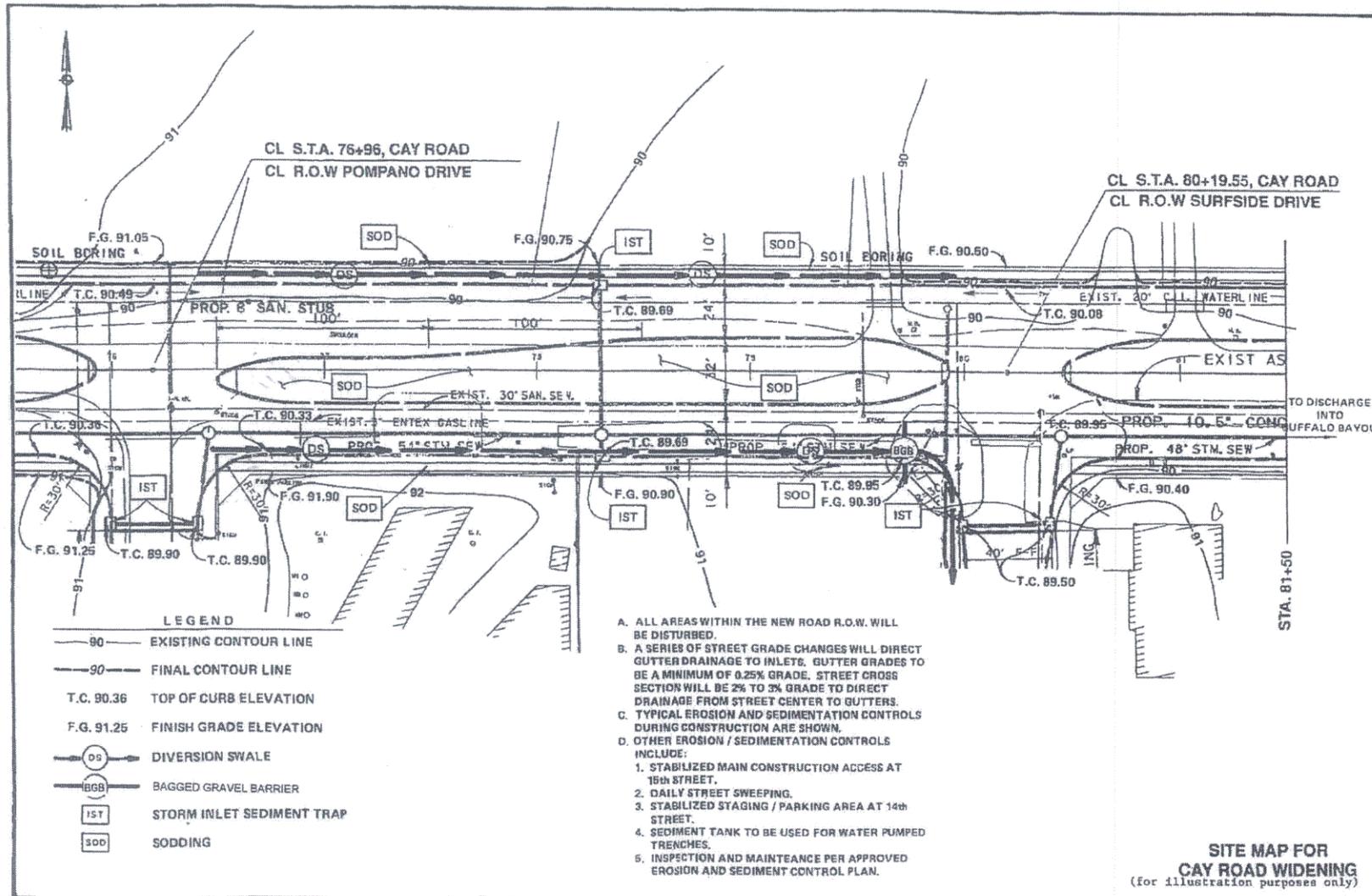
ITEMS SPECIFIED

4113	Diversion Swale
4311	Reinforced Filter Fabric Barrier
4322	Excavated Earth Outlet Sediment Trap
4351	Bagged Gravel Barrier
4421	Sodding
4531	Storm Inlet Sediment Trap
4621	Sediment Tank
4711	Stabilized Construction Exit
4811	General Source Controls

EXAMPLE

VICINITY MAP
(For illustration purposes only)





B.3 EXAMPLE SWP3 FOR A SINGLE-FAMILY RESIDENCE

B.3 EXAMPLE STORM WATER POLLUTION PREVENTION PLAN FOR SINGLE-FAMILY RESIDENCE

The following is an example of a construction Storm Water Pollution Prevention Plan (SWP3) for construction activities associated with a single-family residence in the residential subdivision in the example B.1. Please note that a storm water permit normally is not required for the construction of a single-family residence, since its area is substantially less than 5 acres. However, according to the TCEQ regulations, when the single-family residence is a part of a larger (> 5 acres) common plan of development or sale, its construction activity may require a storm water permit. For this reason, an example NOI, NOT and SWP3 were prepared for a single family residence. The plan must be completed before submittal of the Notice of Intent (NOI), and updated as appropriate during the course of the project. A Notice of Termination (NOT) must be submitted when the project is completed and final stabilization or the conditions of Construction General Permit Part II.E. have been met.

SWP3 contents:

TABLE OF CONTENTS

- 1.0 SITE OR PROJECT DESCRIPTION
- 2.0 BEST MANAGEMENT PRACTICES (BMPS)
- 3.0 STRUCTURAL CONTROL PRACTICES
- 4.0 PERMANENT STORM WATER CONTROLS
- 5.0 OTHER CONTROLS
- 6.0 CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS
- 7.0 MAINTENANCE
- 8.0 INSPECTIONS OF CONTROLS
- 9.0 NON-STORM WATER DISCHARGES
- 10.0 RECORDKEEPING

APPENDICES

- Copy of TPDES Construction General Permit
- Forms (Construction Site Notice, Inspection and Maintenance Records)
- Standard Specifications (*Optional*)

1.0 SITE DESCRIPTION

	<u>Project Name and Location:</u>	<u>Owner/Contractor Name and Address:</u>
Name:	Quality Builder	John R. Quality, President
Location:	21152 Baker Trail West Harris, TX 78006	Quality Builder 810 Travis, Suite 716 Houston, Texas 77006-0011

1.1 Description of the Construction Activity:

The project is the construction of a single-family residence. The 6,325 sq. ft. lot will be partially regraded to provide a building pad and minor internal drainage modifications. Most of the site (approximately 6,000 sq. ft.) will be disturbed. Two existing loblolly pines in the backyard will be retained. Disturbed areas will be replanted with lawn, shrubs and trees.

1.2 Sequence of Major Activities:

The project will take approximately 5 months for construction of the house, driveway and landscaping.

Site preparation will include slight regrading to provide a rear yard swale to divert flow around the building pad. A temporary soil stockpile will be established in the rear yard. A temporary driveway will be established of wood planks or steel grating. Utilities will be extended to the house site. A slab foundation will then be poured and building construction will proceed.

When the house is completed, the temporary driveway will be removed and the permanent concrete driveway will be poured. The soil stockpile will then be used for topsoiling. The lawns and landscaping will then be planted.

1.3 Estimated Total Site Area, Total Disturbed Area, Borrow or Fill Area:

The total area of the site is 6,325 sq. ft. (0.15 ac.). Most of the site will be disturbed during the project (approximately 6,000 sq. ft.). The areas around the two pines in the rear yard will remain undisturbed.

1.4 Runoff Coefficient:

The runoff coefficient prior to construction is approximately 0.17 for grassy planted area (lawn) on clay soil. Following construction of the single-family residence, the runoff coefficient will be approximately 0.40 (see Appendix A of this handbook).

1.5 Site, and General Location Maps:

Site and vicinity maps are attached.

1.6 Name of the Receiving Water:

West Creek.

1.7 Reference Construction General Permit Requirements

A copy of the TCEQ Construction General Permit is attached.

2.0 BEST MANAGEMENT PRACTICES (BMPS)

2.1 Erosion and Sediment Controls

Erosion and sediment controls are shown on the Site Map.

Short and Long Term Goals and Criteria

- Sediment will be retained on site to the extent practicable.
- Control measures will be properly selected, installed, and maintained in accordance with manufactures specifications and good engineering practice.
- If sediment escapes the site, off-site accumulations will be removed to minimize off-site impacts.
- Sediment will be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.
- Litter, construction debris, and construction chemical exposed to storm water will be removed covered or otherwise prevented from becoming a pollutant source.
- Offsite materials storage areas if used (also including overburden and stockpiles of dirt, borrow areas, etc.) would be considered a part of the project and will be addressed in the SWP3. There are currently no plans for offsite material storage areas.

2.2 Stabilization Practices

The following stabilization practices will be used:

1. The two existing loblolly pines in the rear yard will be retained and protected during construction.
2. A temporary construction access/driveway will be provided for stabilized access.
 - A timber plank or grated steel temporary driveway will be used for construction access until the permanent driveway is built.
 - Bagged gravel barrier will be placed at the downstream (east) side of the driveway during the construction period, to intercept tracked sediments.
3. Landscaping will be installed after construction is completed. All exposed soils will be planted. Landscaping will include lawn, the two existing pine trees, and ornamental shrubs and trees planted by the owner.

Sequence of Major Erosion and Sediment Control Activities

The two trees in the rear will be fenced before construction begins. Site preparation will include slight regrading to provide a rear yard swale to divert flow around the building pad. A temporary soil stockpile will be established in the rear yard, and will have a plastic cover and filter fabric fence. Immediately following regrading, filter fabric fences will be set up along the east lot line and along the street in front of the site. A temporary driveway will be established of wood planks or steel grating. Utilities will be extended

to the house site. A slab foundation will then be poured and building construction will proceed.

When the house is completed, the temporary driveway will be removed and the permanent concrete driveway will be poured. Following this, the fencing around the trees will be removed, and the soil stockpile will be used for topsoiling. The lawns will then be planted, and all structural erosion and sediment controls will be removed.

3.0 STRUCTURAL CONTROL PRACTICES

3.1 Soil Stockpile Controls

A temporary soil stockpile will be established in the rear yard.

The stockpile will be located at least 10 feet from the dripline of either pine tree.

The stockpile will be covered with a 3-mil thick plastic sheet, or similar or better protective covering, when not in active use.

A filter fabric fence will be placed along the southeast side of the stockpile.

3.2 Swales

Drainage will be diverted around the house to the front using shallow grassed swales in the rear and side yards.

A filter fabric fence will be placed on the east property line, where the rear yard swale turns into the east side yard, to screen any excess runoff.

Filter fabric fences will be placed along the curbside to screen runoff flowing offsite from the side yards and front yard.

4.0 PERMANENT STORM WATER CONTROLS

- (1) The lot will be planted with lawn, shrubs and trees, providing flow attenuation and partial vegetative filtration. The areas which are not developed will be graded at less than 0.5:1 and have permanent seeding or plantings.
- (2) Storm water from the lot will discharge by overland flow to the new curb and gutter system, then into an existing storm sewer system. There is no need for velocity dissipation devices.

5.0 OTHER CONTROLS

5.1 Waste Disposal

Waste Materials

All waste materials will be collected and stored in a securely lidded metal dumpster rented from the ABC Waste Management Company, which is a licensed solid waste management company in Houston. The dumpster will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as necessary, and the trash and debris will be hauled to an approved landfill. No construction waste material will be buried onsite. All personnel will

be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted at the site in a conspicuous location and Mr. Doe, the site supervisor who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste

All hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Site personnel will be instructed in these practices. Mr. Doe, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be collected from the portable unit by the Sanichem Company, a licensed sanitary waste management contractor.

5.2 Offsite Vehicle Tracking

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments.

By the end of each day, soil tracked onto the road will be swept or scraped up.

5.3 Demonstration of Compliance with State, Tribal or Local Regulations

The proposed project will be in compliance with applicable state and local waste disposal and sanitary sewer regulations.

5.4 Construction and Waste Materials

Describe construction and waste materials to be stored onsite. Also include a description of spill controls, and exposure minimization measures. This information to be updated when appropriate.

Refer to Section 9.0 *Non-Storm Water Discharges*. Substances expected to be on-site during construction include the following: concrete, detergents, fertilizer, fuels, lubricants and wood. Spill prevention measures include Good Housekeeping practices, Hazardous Product practices, Product specific Practices, and Spill Prevention Practices.

5.5 Potential Pollutant Sources

Describe potential pollutant sources from support activities, and the controls for them.

All work will be conducted at the project site. If any support activities occur off site, the Pollution Prevention Plan will be amended to describe and any additional control insurance that may be needed beyond above described herein. The control measure described in Section 9.0 *Non-Storm Water Discharge* will apply to all support activities, as applicable. Should any support activity involve earth disturbance or movement of soils, filter fabric fencing will be used along the downhill side of the activity area to control sediment in runoff.

6.0 **CONSISTENCY WITH APPROVED STATE AND LOCAL PLANS**

This SWP3 is consistent with approved state and local site plan requirements for storm water management and erosion and sediment control requirements.

No tribal land is known to occur at the site. However, if tribal land is found to occur at the site, then the information will be revised to reflect appropriate coordination.

7.0 **MAINTENANCE**

The following is a list of erosion and sediment controls to be used on this project.

Stabilization Practices

Retention of two existing loblolly pines in the rear yard.

Landscaping, including sodding, shrubs, existing and new trees.

Stabilized temporary access/driveway constructed of timber plank or grated steel.

Structural Practices

Plastic sheeting

Filter fabric fences

Drainage swales

Bagged gravel barriers on Stage II inlets

To maintain the above practices, the following will be performed:

1. Maintenance and repairs will be conducted within 24 hours of inspection report (see Section 8.0 below) to maintain effectiveness of the Best Management Practices. Note this includes maintenance following all storm events of 0.5 inch or greater.
2. Sediment will be removed from behind the sediment fences when it becomes about 1/3 the height of the fence.
3. Soil washed off-site by storm runoff will be cleaned up as soon as possible.
4. All temporary controls will be removed after the disturbed areas have been stabilized.

8.0 **INSPECTIONS**

8.1 Designation of Qualified Person

The contractor will designate a qualified person or persons to perform the following inspections:

- Disturbed areas and areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system.
- Erosion and sediment control measures identified in the plan will be observed to ensure that they are operating correctly.
- Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

- Locations where vehicles enter or exit the site will be inspected for evidence of offsite sediment tracking.

The inspection will be conducted by the responsible person at least once every 14-calendar days and within 24 hours after a storm of 0.5 inch or greater.

After a portion of the site is finally stabilized, inspection will be conducted at least once every month.

8.2 SWP3 Revisions

Based on the results of the inspection, the site description (Section 1.0) and control measures (Section 2.0) of this SWP3 will be revised as appropriate, but in no case later than 7 calendar days following the inspection.

8.3 Inspection Reports

A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance Section 8.2 above will be made and retained as part of the storm water pollution prevention plan for at least three years from the date that the site is finally stabilized. The report will be signed in accordance with Part VI.6 of the Construction General Permit.

Copies of the forms to be used for the Inspection and Maintenance report are included in the following pages as a part of this SWP3.

9.0 NON-STORM WATER DISCHARGES

The following substances listed below are expected to be present onsite during construction:

Concrete	Detergents
Paints (enamels and latex)	Metal studs
Fertilizers	Fuels
Cleaning solvent	Lubricants
Wood	Masonry block
Roofing shingles	Brick
Mortar	

Spill Prevention

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of the materials and substances described above to storm water runoff.

Good Housekeeping Practices

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough products required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.

3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations for proper use and disposal will be followed.
7. The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products Practices

These practices will be used to reduce the risks associated with hazardous materials, if hazardous materials are used.

1. Products will be kept in original containers unless they are not resealable.
2. Original labels and material safety data will be retained.
3. If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

Product Specific Practices

The product specific practices to be followed are listed in Table 1.

Spill Prevention Practices

The spill prevention practices to be followed are listed in Table 1.

TABLE 1	
Product Specific Practices	
The following product specific practices will be followed onsite:	
Petroleum Products:	All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.
Fertilizers:	Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
Paints:	All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and local regulations.
Concrete Trucks:	Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.
Spill Prevention Practices	
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:	
<ul style="list-style-type: none"> • Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies. • Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose. • All spills will be cleaned up immediately after discovery. • The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance. • Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size. • The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included. • Mr. Doe, the site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite. 	

10.0 **RECORDKEEPING**

The permittee(s) will retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D.

1. A copy of the SWP3.
2. All reports and actions required by this permit, including a copy of the construction site notice.
3. All data used to complete the NOI.

All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).

The permittee(s) will comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.

APPENDICES

TPDES Construction General Permit

(Insert Copy of Construction General Permit here.)

Forms

Example Forms required by the Construction General Permit are provided in the following pages.

The Construction Site Notice must be signed in accordance with Part VI.6 of the Construction General Permit (see Section 5.0 of this Handbook), and submitted to the operator of the MS4 receiving the discharges from the construction activities.

A Construction Site Notice must be posted near the main entrance of the construction site with the following information.

- *The TPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned.*
- *The name and telephone number of a local contact person.*
- *A brief description of the project.*
- *The location of the SWP3 if the site is inactive or does not have an on-site location to the store plan.*



CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	Joseph E. Contractor Work (713) 323-7655 Fax (713) 323-7650
Project Description: (Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	The project site is an irregularly shaped, 13.027 acre. plat in west Harris County, lying northwest of the intersection of West Main Rd. and Addicks Estates Pkwy (3500 Addicks Estates Pkwy). Construction is estimated to start on 10/09/03 and end 2/09/04. The project includes construction of underground utilities and roadway improvements. There will be 40 lots in the subdivision. Lots will be regraded to the extent necessary to provide positive drainage to the storm sewers in the new road. In the first major phase, the acreage disturbed will be 3.2 acres. In the second major phase, the total acreage will be 10.8 acres; street and lot regrading operations will be staged so that no more than 8 acres will be disturbed at any one time.
Location of Storm Water Pollution Prevention Plan :	The SWPPP is located on-site at 3500 Addicks Estates Pkwy.

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I Joseph E. Contractor (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

"Not valid without appropriate signature."

 Signature and Title

 Date

**STORM WATER POLLUTION PREVENTION PLAN
Inspection and Maintenance Report**

Project: _____

Phase: _____

Inspector: _____ Date: _____

Number of Days Since Last Rainfall: _____ Amount of Last Rainfall: _____
Inches

STABILIZATION MEASURES

Area	Days Since Last Disturbance	Date of Next Disturbance	Stabilized?	Stabilized with?	Condition
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Stabilization Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

STRUCTURAL CONTROLS

Filter Fabric Fence

Location	Bottom of Fabric Still Buried?	Fabric Torn or Sagging?	Posts Tipping Over?	How Deep is the Sediment?
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

(Insert BMP)

Location	In Place? Condition?	Depth of Sediment	Condition of Inlet
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

OTHER CONTROLS

(Insert BMP)

Location	In Place? Condition?	How Deep is Sediment?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

(Insert BMP)

Does much sediment get tracked onto road?	Entry surface clean or sediment filled?	Does all traffic use entrance?
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Required: _____

To Be Performed By: _____ On or Before: _____

Corrected By: _____ On: _____

Changes Required to the Storm Water Pollution Prevention Plan:

Reasons for Changes:

I certify that the Construction Site is in compliance with the TCEQ TXR150000 Permit, except where noted above.

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

Inspector's Signature: _____ Date: _____

Standard Specifications (Optional)

This section is not required by the Construction General Permit, but is included for informational purposes.

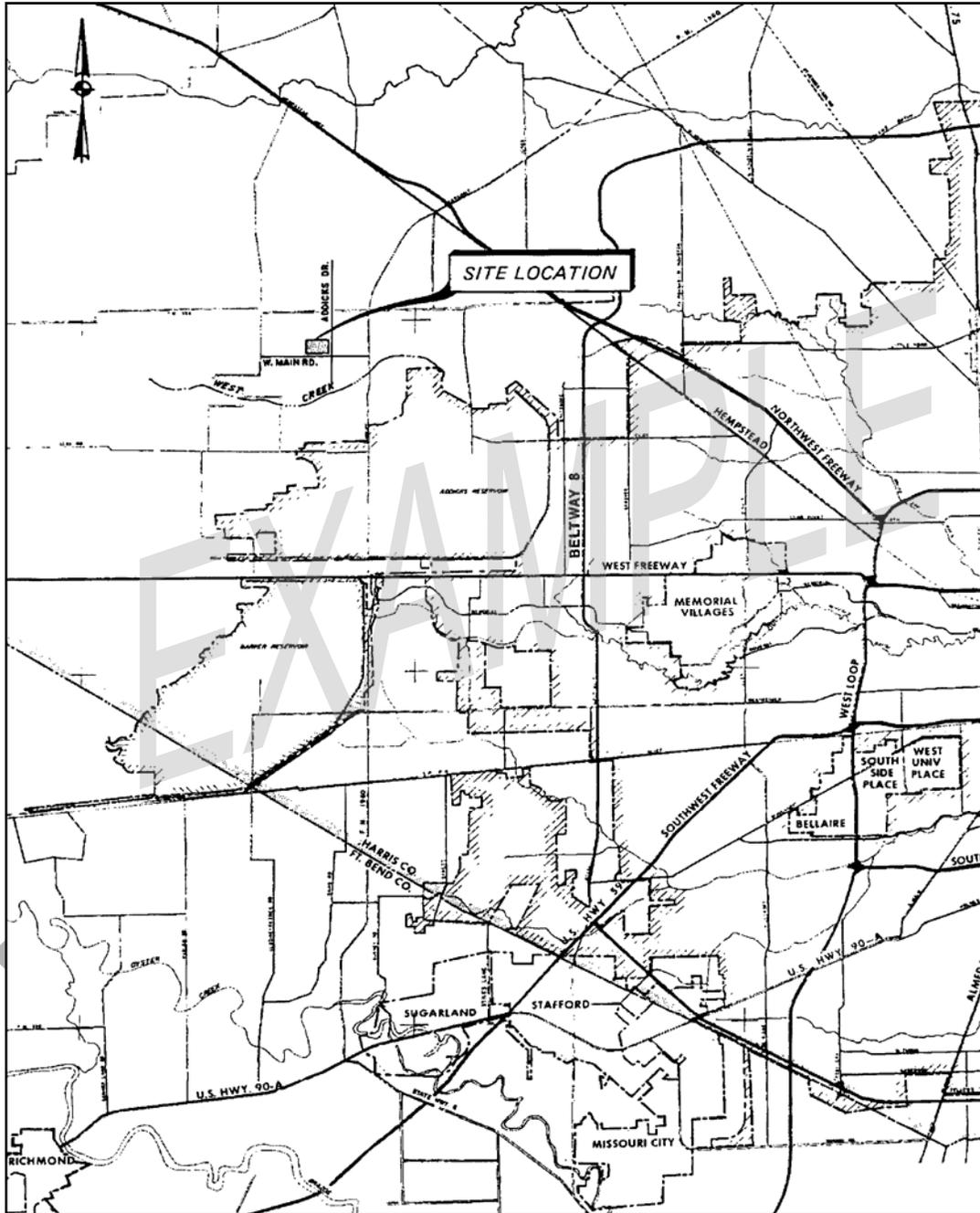
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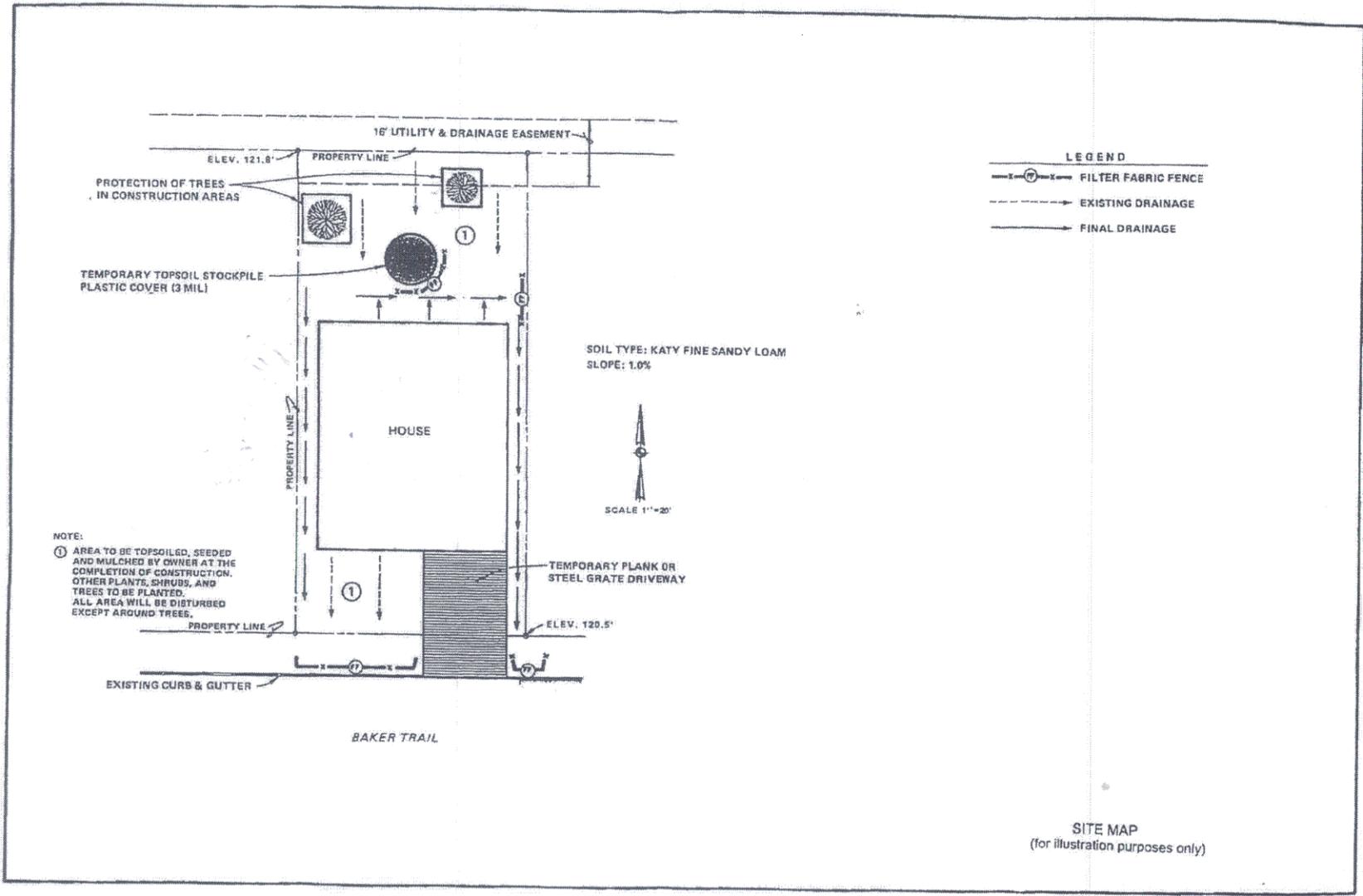
ITEMS SPECIFIED

- | | |
|------|-------------------------|
| 4211 | Filter Fabric Fence |
| 4811 | General Source Controls |

EXAMPLE

VICINITY MAP
(For illustration purposes only)





APPENDIX C

GUIDANCE FOR TECHNICAL SPECIFICATIONS

GUIDANCE ON TECHNICAL SPECIFICATIONS

INTRODUCTION

DIVERTING FLOW

- Item No. 4111 - Diversion Dikes
- Item No. 4112 - Interceptor Dikes
- Item No. 4113 - Diversion Swales
- Item No. 4114 - Interceptor Swales
- Item No. 4115 - Diversion Dikes and Swales
- Item No. 4121 - Downspout Extender
- Item No. 4131 - Pipe Slope Drain
- Item No. 4141 - Paved Flume
- Item No. 4151 - Level Spreader

MANAGING OVERLAND FLOW

- Item No. 4211 - Filter Fabric Fence
- Item No. 4212 - Triangular Filter Fabric Fence
- Item No. 4221 - Hay Bale Fence
- Item No. 4231 - Brush Berm
- Item No. 4241 - Hydro-Mulch Seeding
- Item No. 4251 - Turf Sod Vegetated Sediment Filter Strip
- Item No. 4252 - Temporary Erosion Control Seeding
- Item No. 4253 - Permanent Grass Matrix and Forb/Wildflower Seeding
- Item No. 4254 - Planting and Plant/Seeding Maintenance

TRAPPING SEDIMENT IN CHANNELIZED FLOW

- Item No. 4311 - Reinforced Filter Fabric Barrier
- Item No. 4312 - Sandbag Barrier
- Item No. 4321 - Stone Outlet Sediment Trap
- Item No. 4322 - Excavated Earth Outlet Sediment Trap
- Item No. 4323 - Embankment Earth Outlet Sediment Trap
- Item No. 4331 - Sediment Basins with Pipe Outlet
- Item No. 4332 - Sediment Basin with Stone Outlet
- Item No. 4351 - Bagged Gravel Barrier

ESTABLISHING PERMANENT DRAINWAYS

- Item No. 4421 - Sodding

PROTECTING INLETS

- Item No. 4511 - Inlet Protection Barriers
- Item No. 4521 - Drop Inlet Insert Baskets
- Item No. 4531 - Storm Inlet Sediment Traps

TRAPPING SEDIMENT DURING SITE DEWATERING

- Item No. 4621 - Portable Sediment Tank
- Item No. 4631 - Sediment Sump Pit
- Item No. 4641 - Dewatering Bag

PREVENTING TRACKING

- Item No. 4711 - Stabilized Construction Exit
- Item No. 4721 - Street Cleaning

POLLUTION SOURCE CONTROLS ON CONSTRUCTION PROJECTS

- Item No. 4811 - General Source Controls
- Item No. 4821 - Temporary and Equipment Fueling Area

INTRODUCTION

Appendix C presents guidance on technical specifications for the Best Management Practices (BMPs) discussed in this handbook. **The specifications in this Appendix are provided as general guidance and should be adapted to site-specific conditions as needed. This information has been compiled from a number of sources. Careful consideration must be given when adapting this information to specific projects.**

When the technical specification items are used in the format presented in this handbook, it is anticipated that construction contracts will typically include Item 4811 – GENERAL SOURCE CONTROLS. Additionally, one or more of the other technical specification items will be included to describe the specific BMPs required during construction.

A three-part format has been used to present a general description of the item, to identify the products required for implementation, and to discuss the requirements for execution.

ITEM NO. 4111 - DIVERSION DIKES

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control diversion dikes utilized during construction operations and prior to the final stabilization of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install diversion dikes at locations specified on the PLANS in accordance with applicable drawings enclosed.
- B. Unless otherwise indicated, maintain a minimum dike height of 18 inches, measured from existing or graded ground at the upslope toe to the top of the dike.
- C. Flow from dike shall be diverted to sediment basins, stabilized outlets, or sediment trapping devices of the types and at locations shown on PLANS. The grades for dikes shall be as shown on PLANS, or, if not specified, provide positive drainage with maximum grade of 1% to outlet or basin.
- D. Area under dike shall be cleared, grubbed, and stripped of vegetation and root material. All trees, brush, stumps, roots, woody vegetation, oversized stones and rocks, obstructions, organic, and other objectionable material shall be removed and disposed of from compacted soil used as fill material for dikes, including soil obtained from swale construction. Dike side slopes shall be 2:1 or flatter. Compact embankments by mechanically blading, tamping, and rolling soil in maximum lifts of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- E. Inspect dikes at least once every 14 calendar days and within 24 hours of the end of storm event of 0.5 inches or greater; or at a minimum of . The SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. Maintain dikes at the required depth, grade, and cross section as specified on PLANS or in drawings. Remove projections or other irregularities which will impede normal flow.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4112 - INTERCEPTOR DIKES

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control interceptor dike utilized during construction operations and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install interceptor dikes at locations specified on the PLANS in accordance with applicable drawings enclosed.
- B. Unless otherwise indicated, maintain a minimum dike height of 18 inches, measured from existing or graded ground at the upslope toe to the top of the dike.
- C. Flow from dike shall be diverted to sediment basins, stabilized outlets, or sediment trapping devices of the types and at locations shown on PLANS. The grades for dikes shall be as shown on PLANS, or, if not specified, provide positive drainage with maximum grade of 1% to outlet or basin.
- D. Area under dike shall be cleared, grubbed, and stripped of vegetation and root material. All trees, brush, stumps, roots, woody vegetation, oversized stones and rocks, obstructions, organic, and other objectionable material shall be removed and disposed of from compacted soil used as fill material for dikes, including soil obtained from swale construction. Dikes slopes shall be 2:1 or flatter. Compact embankments by mechanically blading, tamping, and rolling soil in maximum lifts of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- E. Inspect dikes at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain dikes at the required depth, grade, and cross section as specified on PLANS or in drawings. Remove projections or other irregularities which will impede normal flow.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4113 - DIVERSION SWALES

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control diversion swales utilized during construction operations and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in Item.

3.02 Construction Methods

- A. Install diversion swales at locations specified on the PLANS in accordance with applicable drawings enclosed.
- B. Flow from swales shall be diverted to sediment basins, stabilized outlets, or sediment trapping devices of the types and at locations shown on PLANS. The grades for swales shall be as shown on PLANS, or, if not specified, provide positive drainage with maximum grade of 1% to outlet or basin.
- C. Excavation for swale construction shall be carried out in such a manner that erosion and water pollution be minimal. The minimum depth and bottom width shall be 1 foot and 4 feet, respectively, with the swale bottom constructed to level. Excavation slopes shall be 2:1 or flatter. Excavation area shall be cleared, grubbed, and stripped of vegetation and root material.
- D. Inspect swales at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain dikes and swales at the required depth, grade, and cross section as specified on PLANS or in drawings. Remove projections or other irregularities which will impede normal flow.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4114 - INTERCEPTOR SWALES

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control interceptor swales utilized during construction operations and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install interceptor swales at locations specified on the PLANS in accordance with applicable drawings enclosed.
- B. Flow from swales shall be diverted to sediment basins, stabilized outlets, or sediment trapping devices of the types and at locations shown on PLANS. The grades for dikes shall be as shown on PLANS, or, if not specified, provide positive drainage with maximum grade of 1% to outlet or basin.
- C. Excavation for swale construction shall be carried out in such a manner that erosion and water pollution be minimal. The minimum depth and bottom width shall be 1 foot and 4 feet, respectively, with the swale bottom constructed to level. Excavation slopes shall be 2:1 or flatter. Excavation area shall be cleared, grubbed, and stripped of vegetation and root material.
- D. Inspect swales at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain dikes and swales at the required depth, grade, and cross section as specified on PLANS or in drawings. Remove projections or other irregularities which will impede normal flow.
- E. The spacing of interceptor swales shall be placed as shown on PLANS.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4115 - DIVERSION DIKES AND SWALES

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control diversion dikes and swales utilized during construction operations and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in this Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide diversion dikes and swales at locations specified on the PLANS in accordance with applicable drawings enclosed.
- B. Unless otherwise indicated, maintain a minimum dike height of 18 inches, measured from existing or graded ground at the upslope toe to the top of the dike.
- C. Dike and Swale Stabilization: When indicated on PLANS, stone stabilization shall be placed in a layer a minimum of 3 inches in thickness and embedded into the soil (6 inches if truck crossing is expected). The stone lining shall extend across the bottom and up the both sides of the channel a minimum height of 8 inches vertically, above the bottom. The stone lining on the dike side shall extend up the upslope side of the dike a minimum height of 8 inches, measured vertically from the interface of the existing or graded ground and the upslope toe of the dike, as shown in the Drawing. Coarse aggregate may be used in place of stone.
- D. Flow from swales shall be diverted to sediment basins, stabilized outlets, or sediment trapping devices of the types and at locations shown on PLANS. The grade for dikes and swales shall be as shown on PLANS, or, if not specified, provide positive drainage with maximum grade of 1 percent to outlet or basin.
- E. Area under dike shall be cleared, grubbed, and stripped of vegetation and root material. All trees, brush, stumps, roots, woody vegetation, oversized stones and rocks, obstructions, organic, and other objectionable material shall be removed and disposed of from compacted soil used as fill material for dikes, including soil obtained from swale construction. Dike side slopes shall be 2:1 or flatter. Compact embankments by mechanically blading, tamping, and rolling soil in maximum lifts of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- F. Excavation for swale construction shall be carried out in such a manner that erosion and water pollution be minimal. The minimum depth and bottom width shall be 1 foot and 4 feet, respectively, with the swale bottom constructed to level. Excavation slopes shall be 2:1 or flatter. Excavation area shall be cleared, grubbed, and stripped of vegetation and root material.
- G. Inspect dike and swale at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain dikes and swales at the required depth, grade, and cross section as specified on PLANS or in drawings. Remove projections or other irregularities which will impede normal flow.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

SECTION 4121 - DOWNSPOUT EXTENDER

PART 1 GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control downspout extenders utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturer's catalogue sheets and other pertinent information on pipe and connections of type proposed.

PART 2 PRODUCTS

Provide materials as specified in PART 3.

PART 3 EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install downspout extenders for building roof drains at locations specified on PLANS in accordance with enclosed drawing.
- B. The downspout extender shall have a slope of approximately 1 percent. Pipe diameter shall be 4 inches or as indicated on PLANS.
- C. Downspout shall be constructed of plastic pipe, flexible tubing or similar material.
- D. Inspect downspout at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair damaged downspout extenders. Redress and replace stone, sod or other stabilizing material at the outlet as needed.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4131 - PIPE SLOPE DRAIN

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control pipe slope drains utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturer's catalogue sheets and other pertinent information on corrugated metal pipe, flexible tubing, connecting band, and grommet materials.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a

maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.

- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install Slope Drains at locations specified on PLANS in accordance with enclosed drawing.
- B. Soil around and under entrance section shall be tamped to the top of the embankment in lifts appropriately sized for the method of compaction utilized.
- C. Subgrade shall be constructed to the required elevations. All soft sections and unsuitable material shall be removed and replaced. Compact subgrade thoroughly and shaped to a smooth, uniform surface.
- D. Fill material for embankment shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matters. Area under embankment shall be cleared, grubbed, and stripped of vegetation and root mat.
- E. The inlet pipe shall have a slope of 1 percent or greater. Pipe diameter shall be as indicated on PLANS.
- F. The top of embankment over the inlet pipe and those carrying water to pipe shall be at least 1 foot higher at all points than the top of the inlet pipe.
- G. Unless otherwise specified, the pipe shall be corrugated galvanized metal pipe with watertight connection bands.
- H. Pipe shall be secured with hold-down grommets spaced 10 feet on centers.
- I. Depth of riprap apron shall be equal to the pipe diameter with 2:1 side slopes and placed in minimum 12 inch thick layers.
- J. Inspect slope drains at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair damaged slope drain sections. Redress and replacing stone at the outlet as needed to replenish depleted stone. Remove sediment from riprap apron when the sediment has accumulated to one-half pipe diameter or one foot, whichever is less, for pipe slope drain.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4141 - PAVED FLUME

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control paved flumes utilized temporarily during construction or permanently for the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

- A. Sieve analysis of aggregates conforming to requirements of this Item.
- B. Concrete mix design.

PART 2 - PRODUCTS

2.01 Concrete

Concrete shall be bituminous concrete, Portland cement concrete, or comparable non-erodible material.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project area installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush

into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in this Item.

3.02 Construction Methods

- A. Install Slope Drains at locations specified on PLANS in accordance with enclosed drawing. The size group (A or B) and the bottom width (b) of the flume will be designated on the PLANS.
- B. Soil around and under entrance section shall be tamped to the top of the embankment in lifts appropriately sized for the method of compaction utilized.
- C. Subgrade shall be constructed to the required elevations. All soft sections and unsuitable material shall be removed and replaced. Compact subgrade thoroughly and shaped to a smooth, uniform surface.
- D. Fill material for embankment shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matters. Area under embankment shall be cleared, grubbed, and stripped of vegetation and root mat.
- E. Paved flumes to be utilized on a temporary basis during construction may be constructed without reinforcing steel. Permanent paved flumes shall be constructed in accordance with applicable agency requirements. Slope shall be as indicated on the construction PLANS.
- F. Inspect paved flumes at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair damaged sections. Redress and replacing stone at the outlet as needed to replenish depleted stone.
- G. Remove sediment from riprap apron when the sediment has accumulated to a depth of one foot.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4151 - LEVEL SPREADER

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control level spreaders utilized during construction operations and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install level spreaders at locations specified on the PLANS in accordance with drawing enclosed.
- B. Construct the level spreader on undisturbed soil and not on fill. Ensure that the spreader lip is level for uniform spreading of storm runoff.
- C. Excavation for level spreader construction shall be carried out in such a manner that erosion and water pollution be minimal. Excavation area shall be cleared, grubbed, and stripped of vegetation and root material.
- D. Inspect level spreaders at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain at the required depth, grade, and cross section as specified on PLANS or in drawing. Remove sediment deposits as well as projections or other irregularities which will impede normal flow.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4211 - FILTER FABRIC FENCE

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control filter fabric fences utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturers' catalog sheets and other pertinent information on geotextile fabric.

PART 2 - PRODUCTS

2.01 Filter Fabric

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have a grab strength of 90 lbs in any principal direction (ASTM D 4632), and the apparent opening size between 50 and 140 for soils with more than 15 percent by weight passing a No. 200 sieve and between 20 and 50 for soil with less than 15 percent by weight passing a No. 200 sieve; and permittivity of 0.05 sec^{-1} (ASTM D 4491). Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide an expected usable life comparable to the anticipated construction period. Ultraviolet stability shall exceed 70% after 500 hours of exposure (ASTM D 4355).

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent

to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. When installed in vehicular traffic areas, adjacent to such areas, or where vehicular traffic hazards exist (e.g. parking lots, roadways, etc.) orange filter fabric material (or another high-visibility color) shall be used.
- H. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- I. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide filter fabric fence systems at locations specified on PLANS in accordance with enclosed drawing. Filter fabric fence systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the filter fabric to 2-inch by 2-inch wooden stakes spaced a maximum of 3 feet apart and embedded a minimum of 1 foot. The wooden stakes shall be installed at a slight angle toward the source of anticipated runoff.
- C. Trench in the toe of the filter fabric fence with a spade or mechanical trencher so that the downward face of the trench is flat and perpendicular to the direction of flow or for V-trench configuration as shown on the attached drawing. Trench shall be a minimum of 6-inch by 6-inch or 4" deep for V-trench. Lay filter fabric along the edge and bottom of the trench. Backfill and compact material in trench.
- D. The filter fabric should be provided in continuous rolls and cut to the length of the Filter fabric fence to minimize the use of joints. When joints are necessary, the fabric should be spliced together only at a support post with a minimum 6 inch overlap.
- E. Inspect sediment filter barrier systems at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the fence in depth.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

SECTION 4212 - TRIANGULAR FILTER FABRIC FENCE

PART 1 GENERAL

1.01 DESCRIPTION

This Item describes the installation of erosion and sedimentation control triangular filter fabric fences utilized during construction and prior to the final development of the site.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturers' catalogue sheets and other pertinent information on geotextile fabric.

PART 2 PRODUCTS

2.01 FILTER FABRIC

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have a grab strength of 90 lbs in any principal direction (ASTM D 4632), and the apparent opening size. Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide an expected usable life comparable to the anticipated construction period. Ultraviolet stability shall exceed 70% after 500 hours of exposure (ASTM D 4355).

PART 3 EXECUTION

3.01 GENERAL

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to the start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized

in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. When installed in vehicular traffic areas, adjacent to such areas, or where vehicular traffic hazards exist (e.g. parking lots, roadways, etc.) orange filter fabric material (or another high-visibility color) should be used.
- H. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- I. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 CONSTRUCTION METHODS

- A. Provide triangular filter fabric fence systems at locations specified on PLANS in accordance with enclosed drawing. Filter fabric fence systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the filter fabric to fence structure fashioned from 6 gauge, 6-inch by 6-inch wire mesh, 18 inches on each side as shown on attached drawing. The fabric cover and skirt should be continuous wrapping of fabric. The skirt should form a continuous extension of the fabric on the upstream side of the fence.
- C. The triangular fabric filter fence may be secured in place using one of the following methods:
 - 1. The skirt may be toed-in 6 inches with mechanically compacted material;
 - 2. the skirt may be weighted down with a continuous layer of 3-inch to 5-inch graded rock; or
 - 3. the entire structure may be trenched-in 4 inches.
- D. The triangular fabric filter fence structure and skirt, if provided, should be anchored securely in place using 6-inch wire staples on 2-foot centers on both edges and on the skirt, or staked using 18-inch by 3/8-inch diameter re-bar with tee ends.
- E. The fabric filter material should be lapped over 6 inches to cover the segment joints. The joints should be fastened with galvanized shoat rings.
- F. Inspect sediment filter barrier systems at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to

restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the fence in depth.

3.03 MEASUREMENT AND PAYMENT

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4221 - HAY BALE FENCE

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control hay bale fences utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owners directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct

all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide hay bale fences at locations specified on PLANS in accordance with enclosed drawing.
- B. Hay bale fences shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- C. Bales shall be bound by either wire, nylon, or polypropylene rope tied across the hay bales. Jute or cotton binding is not allowed.
- D. Bales shall be placed in a row with ends tightly abutting the adjacent bales. Place bales with bindings parallel to ground surface.
- E. Each bale shall be embedded in the soil a minimum of 4 inches, where possible.
- F. Bales shall be securely anchored in place by 2 #3 rebar stakes driven through the bales a minimum of 18" into the ground. The first stake in each bale shall be angled toward previously laid bale to force bales together.
- G. Fill the gaps between bales with hay to prevent water from escaping between bales. Wedge carefully in order not to separate bales.
- H. Inspect hay bale fences at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the fence in depth.
- I. Replace with new hay bale fence every two months.

3.03 Measurement and Payment

Measurement and Payment requirements shall be developed as appropriate for each project.

ITEM NO. 4231 - BRUSH BERM

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control bush berms utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct

all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide brush berms at locations specified on PLANS in accordance with applicable drawings listed below.
- B. Brush berms shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated. The Brush Berm shall be constructed along contour lines by hand placing method. Machine placement of the Brush Berm is not permitted.
- C. Use woody brush and branches having diameter less than 2-inches with 6-inches overlap. Avoid incorporation of annual weeds and soil into Brush Berm.
- D. The height shall be 18 inches minimum, measured from the top of existing ground at the upslope toe to the top of the berm. The top width shall be 24 inches minimum and the side slope shall be 2:1 or flatter.
- E. The Brush Berm shall be embedded into the soil a minimum of 4 inches and anchored using either wire, nylon, or polypropylene rope across the berm with a minimum tension of 50 pounds. The rope shall be tied securely to 18-inch x 3/8-inch diameter rebar stakes driven into the ground on 4-foot centers on both sides of the berm.
- F. Inspect brush berms at least once every 14 calendar days and within 24 hours of the end of storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third the height of berm or one foot, whichever is less.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4241 - HYDRO-MULCH SEEDING

PART 1 - GENERAL

1.01 Description

- A. Scope: The work covered by this Item consists of furnishing all plant, labor, materials, equipment, supplies, supervision and tools, and performing all work necessary for topsoiling, smoothing, seeding, fertilizing, watering, maintenance, and cleanup of all areas disturbed during construction, all in accordance with the drawings and TECHNICAL SPECIFICATIONS.
- B. General: The hydro-mulch seeding operations, together with all other necessary related work, to conform to the requirements specified in this Item. The area to be hydro-mulch seeded to be noted on PLANS.

PART 2 - PRODUCTS

2.01 Materials

- A. Seed: All seed must meet the requirements of U.S. Department of Agriculture Rules and Regulations as set forth in Federal Seed Act and Texas Seed Law. Use seed which has been treated with an approved fungicide. Container labels should show locality and date of harvest, percent purity, percent germination, name and type of seed, and sources of origin. Type of seed, purity and germination requirements, rate of application, and planting dates are as follows:

SEED	RATE OF APPLICATION IN POUNDS PER ACRE (PURE LIVE SEED)	PLANTING DATE
TYPE 'A'		
Hulled Bermuda Grass	30	
Unhulled Bermuda Grass	20	October 1 to
Annual Rye Grass (Gulf) or KY-31 Tall Fescue	15	April 15
TYPE 'B'		
Hulled Bermuda Grass	60	April 15 to
Foxtail Millet	15	October 1

- B. Fertilizer: Fertilizer to be water soluble with analysis of 10 percent nitrogen, 20 percent phosphate, and 10 percent potash (10:20:10 N:P:K). Rate of application to be 300 pounds per acre except during the periods of April 15 through June 15, when the rate will be increased to 400 pounds per acre.
- C. Mulch: Provide commercial quality wood fiber mulch consisting of wood mulch made from recovered wood materials. Rate of application to be 2,000 pounds per acre. Provide organic biodegradable tackifier manufactured from mucilloids or guar gum. Apply at a rate recommended by the manufacturer. Other soil binder compounds may be applied at the direction of the Owner.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

After areas to receive hydro-mulch seeding have been completed to lines, grades, and sections shown on PLANS, apply seed, fertilizer and mulch at uniform average rates indicated in Paragraph 2.01 Materials.

3.03 Maintenance

The hydro-mulch seeding to be adequately watered until established. Any areas damaged by erosion or areas that do not have an acceptable turfing to be reseeded. An acceptable turfing area is when at least 70 percent of the seeded area is established.

Inspect seeded area at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section.

3.04 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4251 - TURF SOD VEGETATED SEDIMENT FILTER STRIP

PART 1 - GENERAL

1.01 Description

This Item specifies applies to the installation of turf sod for establishment of continuous vegetated sediment filter strips around construction sites.

1.02 Related Work

Planting and Plant/Seeding Maintenance (Item 4254).

PART 2 - PRODUCTS

2.01 Materials

- A. Commercially available turf sod pallets shall be locally available and in good, healthy, and free from pests.
- B. Turf sod species should conform to the following species list:
 - buffalo grass
 - bermuda grass
 - zoysia grass
 - bahia grass
 - crested wheatgrass
 - hard fescue
 - sheep fescue
 - tall fescue
 - red fescue
- C. St. Augustine sod is not recommended. Other turf species with shallow root systems are also not recommended.

PART 3 - EXECUTION

3.01 General

Prepare the vegetated filter strip area as specified in section 3.02, Seedbed Preparation, in Item 4353 - *Permanent Grass Matrix and Forb/Wildflower Seeding*.

3.02 Installation

- A. After vegetated filter strip area has been prepared, water topsoil to create moist soil condition, then lay turf sod strips according to grower's instructions.
- B. Lay sod strips flat, even, and adjacent to each other leaving no gaps.
- C. Apply even, slight compression to obtain good, firm contact between turf sod roots, and moist soil. Turf sod to be placed root side down. Water in thoroughly. Maintain moist soil conditions until sod strips establish strong root system.

3.03 Maintenance

- A. The sodded area shall be adequately watered. Any area damaged by erosion or areas that do not have an acceptable turfing to be resodded. An acceptable turfing area is where at least 70 percent of the sodded area is established.

- B. Inspect sod system at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore requirements of this item.

3.04 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM 4252 - TEMPORARY EROSION CONTROL SEEDING

PART 1 - GENERAL

1.01 Description

Scope: Seeding of vegetated filter strip within a project construction site. Work area covered by this Item should be indicated on PLANS. Temporary seeding intended to germinate and establish within 10-14 days. The species used in this seeding are not permanent, so should be integrated with a permanent seeding or planting. When shown on PLANS, provide soil retention protection such as loose hay mulch or erosion control/soil retention fabric blanket.

1.02 Related Work

Permanent Grass Matrix and Forb/Wildflower Seeding (Item 4253); and Planting and Planting/Seeding Maintenance (Item 4254).

PART 2 - PRODUCTS

2.01 Materials

- A. Seeds: Conform to requirements of U.S. Department of Agriculture Rules and Regulations as set forth in Federal Seed Act and Texas Seed Law. Use seed which has been treated with an approved fungicide. Container labels to show purity, germination, name and type of seed, and source of origin. Planting date, type, and rate of application as follows:

Type	Rate of Application in Pounds per Acre	Planting Date
Unhulled Bermuda Grass/oats/winter rye	20	Jan. 1 to Apr. 1
Hulled Bermuda Grass/lovegrass	12	Apr. 1 to Oct. 1
Mix Bermuda and Annual Rye in Following Proportions	12:200	Oct. 1 to Jan. 1
Annual Millet Grass	35-40	Apr. 1 to Nov.1

- B. Fertilizer: Use pellet or granular fertilizer with analysis of 16 percent nitrogen, 20 percent phosphoric acid, and zero percent potash (or 10-10-5), unless otherwise required as determined by soil analysis. Determine percent by methods of Association of Official Agricultural Chemists. Container labels to show analysis. Powdered or caked fertilizer not permitted.
- C. Hay Mulch: Use loose hay of oat or rice stems, native prairie grass hay, bermuda grass, or other approved straw. Do not use mulch containing Johnson grass or other noxious weeds and foreign materials.
- D. Erosion Control Soil Retention Fabric: Use a biodegradable hay and cotton twine based blanket or approved substitute.

PART 3 - EXECUTION

3.01 Construction Methods

A. General

Fertilizing and Seeding: After the vegetated strip areas are finely graded and completed to lines, grades, and sections shown on PLANS, apply fertilizer at uniform average rate of 500 pounds per acre or as required based on soil analysis. Thoroughly mix upper 4 inches of topsoil with fertilizer until a uniform mixture of fertilizer and topsoil is obtained. Sprinkle areas to be seeded with water, using fine spray to avoid washing or erosion of soil. Broadcast seed with sowing equipment or hand cast at rate specified above, using care to obtain uniform distribution. After broadcasting, lightly rake seeds into soil to a depth not to exceed 1/2 inch. Complete seeding by rolling with roller developing 15 to 25 pounds per inch of tread. Keep seeded areas moist for a period of 10 to 14 days immediately following placement. When watering seeded areas, use fine spray to prevent erosion of seeds or soil. Reseed any areas damaged by erosion. Do not apply seeds when weather is too windy, hot or drying, or other adverse conditions exist.

B. Hay Mulch or Soil Retention Blanket

1. **Mulch Application:** Immediately upon completion of planting of seed and fertilizing, spray or hand spread hay mulch uniformly over the area at the rate of 200 pounds of hay or hay mulch per acre. When watering seeded areas, use fine spray to prevent erosion of seeds or soil. Reseed any areas damaged by erosion for any reason. Mulching operation to follow seeding and fertilizing immediately in continuous operation. Care must be taken not to drive mulching equipment on seeded/planted areas.
2. **Soil Retention Blanket:** Roll blanket over newly prepared and seeded area. Attach as per manufacturers' instructions.

3.02 Maintenance

- A. The seeding must be adequately watered until established. Any areas damaged by erosion or areas that do not have an acceptable turfing to be reseeded. An acceptable turfing area is when at least 70 percent of the seeded area is established.
- B. Inspect seeded area at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore requirements of this Item.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4253 - PERMANENT GRASS MATRIX AND FORB/WILDFLOWER SEEDING

PART 1 - GENERAL

1.01 Summary

This Item specifies requirements for installing a permanent grass and forb/wildflower seed mix on the vegetated filter strip area. Grass and forb/wildflower seeds to be furnished by the Contractor.

1.02 Related Work

Temporary Erosion Control Seeding (Item 4252), and Planting and Plant/Seeding Maintenance (Item 4254).

PART 2 - PRODUCTS

2.01 General

Products discussed in the Item to be in accordance with the following:

- A. Item 4252 - Temporary Erosion Control Seeding
- B. Seed sources shall be local to Texas and species utilized indigenous or native to project site.
- C. Seeds for this Item should be "Pure Live Seed" (PLS). The percentage of purity, germination, and dormant seeds, as shown on seed tag, shall be used to determine actual application rate of bulk material to obtain required amount of PLS per acre. $PLS = (\% \text{ germination} + \% \text{ dominant seed}) \times \% \text{ purity}$.

PART 3 - EXECUTION

3.01 General

Permanent grass and wildflower seeding to be conducted in accordance with the seeding PLANS.

3.02 Seedbed Preparation

- A. Within the limits shown on PLANS, Contractor is responsible for achieving fine grading and working with adequate slopes and berm heights and widths to detain sediment. Finish final grades with placement of 4 to 6 inches of loose, fertile topsoil. Do not compact.
- B. Topsoil is clean, friable soils capable of sustaining vigorous plant growth. It shall contain no less than 1.5 percent organic matter as determined by ASTM D 2974.
- C. Topsoil should be obtained primarily from stockpiled material from clearing and grubbing operations. The pH range of the topsoil should be 5.0 to 6.0. Topsoil not within this range should be amended.
- D. Topsoil shall be free of stones larger than 2 inches, roots, rubbish, and other objectionable materials such as weeds and weed seeds including cocklebur, poison ivy, and Johnson grass.

- E. Vegetated filter strip area should be raked or smoothed prior to seeding and hay mulch or blanket application.

3.03 Application of Fertilizer and Seeding

- A. Fertilizer to be applied in accordance with Item 4252 - Temporary Erosion Control Seeding.
- B. Fertilizer to be spread evenly and uniformly over the surface of areas to be seeded.
- C. Use a complete fertilizer with a low nitrogen content and a ratio of 1:3:2 (Nitrogen:Phosphate:Potash) or similar applied at a rate of no more than 20 pounds Nitrogen/acre, or as directed in Item 4252.
- D. Fertilizer is not be mixed with seed but incorporated into topsoil prior to seeding.
- E. Seed to be mixed with topsoils (4 pounds soil: 1 pound seed) to aid in even distribution from a fertilizer/seed spreader. Do not mix seed with fertilizer.
- F. Lightly water seedbed after completion of seeding.
- G. Grass and Forb/Wildflower Mix: as indicated in dry prairie plant list.
- H. Seeding application should be as follows: Install seed when average daily air temperature for the preceding two calendar weeks is less than 75°F.
- I. Seeding dates may vary with construction work schedule. The compliment of seed mix may then vary depending upon fall or spring seeding installation time.
- J. Follow seeding application with application of loose hay mulch at an application rate of 200 pounds per acre or soil retention blanket as per manufacturer's instructions.

Recommended Plant List
Storm Water Management Planted Vegetated Filter Strips
Houston-Galveston Gulf Coast Area
Source: Collins, 1993

(Note: Specific site conditions, regarding soils, hydrology, salinities, and loading rates will influence final plant selection per project.)

Dry Prairie Grass & Wildflower Forbs

Scientific Name	Common Name	Condition
Andropogon gerardii	Big bluestem	seed
Aster subulatus	Annual aster	seed
Aster texanus	Texas aster	seed
Bifora Americana	Prairie bishop's weed	seed
Bouteloua curtipendula	Sideoats grama	seed
Bouteloua curtipendula var. curtipendula	Tall grama	seed
Bouteloua gracilis	Blue grama	seed
Bouteloua hirsute	Hairy grama	seed
Bouteloua trifida	Red grama	seed
Bouteloua texana	Texas millet	seed
Bouteloua texensis	Texas brome	seed
Buchloe dactyloides	Buffalograss	seed
Castilleja indivisa	Texas paintbrush	seed
Chasmanthium latifolia	Broadleaf woodoats	seed
Claytonia virginica	Springbeauty	seed or corm
Coreopsis tinctoria	Plains coreopsis	seed
Echinacea sanguinea	Purple coneflower	seed
Eragrostis (sp.)	Sand lovegrass	seed
Euphorbia bicolor	Snow-on-the-prairie	seed/packet
Gaillardia pulchella	Indian blanket	seed
Hymenoxys scaposa	Plains yellow daisy	seed
Liatis mucronata	Narrow-leaf gayfeather	seed
Liatis squarrosa	Blazing star	seed
Lupinus texensis	Bluebonnet	seed
Monarda citriodora	Lemon mint	seed
Monarda lindheimeri	Lindheimer Beebalm	seed/packet
Oenothera speciosa	Evening primrose	seed/packet
Panicum virgatum	Switchgrass	seed
Rudbeckia amplexicaulis	Clasping coneflower	seed
Rudbeckia hirta	Black-eyed Susan	seed
Schizachyrium scoparius	Little bluestem	seed
Sisyrinchium pruinsum	Dotted blue-eyed grass	seed
Sorghastrum nutans	Indiangrass	seed
Thelesperma (sp.)	Greenthread	seed
Tripsacum dactyloides	Eastern gama grass	seed
Verbena bipinnatifida	Prairie verbena	seed

3.04 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4254 - PLANTING AND PLANT/SEEDING MAINTENANCE

PART 1 - GENERAL

1.01 Summary

- A. This Item specifies the requirements for maintaining undisturbed vegetated sediment filter strips or planted strips that utilize seeds or trees, shrubs, and herbaceous plants such as grasses and low ground covers in a healthy and vigorous condition.
- B. The plant maintenance period to commence upon satisfactory completion of the planting and seeding establishment as determined by the ENGINEER/LANDSCAPE ARCHITECT, after final inspection of the vegetated sediment filter strip areas.
- C. All plants shall be the responsibility of the CONTRACTOR. Plants that are sick, damaged, stolen, or dead shall be replaced at CONTRACTOR's expense regardless of the cause. Maintenance will also require inspection and potential removal of sediment that has moved from the construction work area.
- D. Work under this Item consists of furnishing all labor, materials, equipment, and supervision necessary to maintain existing trees, shrubs, herbaceous plants, and/or planted materials in accordance with this Specification.

1.02 Related Requirements

Related work as called for on PLANS or specified elsewhere in this or other Specifications.

1.03 Definitions

Planting Season

The planting season is the time of the year when trees, shrubs, and herbaceous plants to be planted or replanted and seeding can occur based upon weather conditions, soil temperature conditions, and other climatic factors affecting plant growth such as precipitation. The planting season for the Houston area is year round.

1.04 SUBMITTALS

Submit the following to the ENGINEER/LANDSCAPE ARCHITECT:

1. Manufacturer's information, product safety data, application instruction and rate, and instruction on storage, handling, transporting, installing, and containment of fertilizer, herbicides, insecticides, pesticides, fungicides, and other chemicals used in this Contract.
2. The maintenance plan and schedule. This plan should be included in the project's erosion control plan.
3. Progress report or maintenance records should be kept to provide direction over time for each scheduled maintenance.

1.05 Scheduling

Maintenance

1. The CONTRACTOR is to develop a maintenance plan and schedule necessary to achieve the required one hundred (100) percent tree and shrub survivability rate at the end of the maintenance period.
2. The CONTRACTOR is to develop a maintenance plan and schedule necessary to achieve the minimum required seventy (70) percent coverage by herbaceous plants at the end of the maintenance period.
3. CONTRACTOR is to perform tree, shrub, and herbaceous plant maintenance in accordance with the schedule set forth in CONTRACTOR's maintenance schedule submittal. If necessary, CONTRACTOR may perform additional maintenance between periods scheduled. However, in no case shall CONTRACTOR be allowed to skip a scheduled maintenance.
4. CONTRACTOR is to have planted vegetated sediment filter strip fully established prior to initiation of construction.

PART 2 - PRODUCTS

2.01 Materials and/or Equipment

A. Materials

1. All trees, shrubs, and herbaceous plants and seeds used for initial filter strip establishment or replanting shall be native and acquired from local Texas sources and grown in accordance with good/standard horticultural practices as specified by ANSI Z60.1, *American Standard for Nursery Stock*.
2. All plants to be sound, healthy, vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insects, pests, eggs, or larvae and have a healthy, well-developed root system. They shall be free from physical damage or conditions that would prevent thriving growth.
3. Chemical, fertilizers, mulches, shrub collar, tree stakes, tree paint, equipment, and topsoil are the responsibility of the CONTRACTOR.
4. Herbicides, insecticides, pesticides, fungicides, and any other chemicals used in the contracts must be registered and accepted by the Texas Department of Agriculture and the U.S. Environmental Protection Agency. All applicators must be licensed with the Texas Department of Agriculture or the Structural Pest Board, whichever applies.
5. The mixture ratio recommended by CONTRACTOR for commercial fertilizer application shall be based on result if actual topsoil testing.
6. Lawn mowers to be of rotary type, such as mechanical push, mechanical drive mower type. Mowers shall be adjusted for a maximum cutting height of six (6) inches and a minimum of two (2) inches. All mowers to be equipped with safety chain (minimum of 3/8-inch in size) and side protector to prevent cutting into plants.
7. Handtools, such as weed eaters, sickle mowers, or other approved equipment may be used for cutting grass, removal of brush, weeds, and debris around plants.

B. Equipment

1. All vehicles and equipment used to have rubber tires as their wheels.
2. CONTRACTOR is to park all vehicles inside project site property boundary.
3. Access to project area to be limited to the entrance indicated by the OWNER or shown on PLANS.

PART 3 EXECUTION

3.01 Erection/Installation/Application and/or Construction

A. Tree and Shrub Planting

1. Backfill plant pits using the stockpiled soil to compacted depth to receive plant root ball, so top of root ball is two (2) inches above finished grade.
2. Remove plant container and carefully lower plant into pit with backhoe or other approved method and adjust elevation. Prune away girdled roots and tease root hair masses. Carefully fill pit and compact soil by watering in to support root ball.
3. During planting, distribute slow release fertilizer evenly in plant pits when backfilled up to two-thirds (2/3) of the pits, at the rate of one (1) tablet per one-half (1/2) inch caliper or one (1) foot of depth, whichever is less.
4. Apply root stimulator necessary to ensure tree survival, in accordance with manufacturer's recommendations.
5. Form saucer with three (3) inch high berm around plants twenty-four (24) inches wider than ball diameter to retain water.
6. Water all plants immediately after planting until no additional water can be absorbed. CONTRACTOR shall be responsible for acquiring any permits for such water from regulatory agencies.
7. Spread Organic Mulch over the saucer formed to the compacted depth of two (2) inches. Cover Organic Mulch with a minimum of two (2) inches of Gravel Mulch. Taper mulches down to existing grade at outer perimeter.
8. For shrubs, provide shrub-collar from top of rootball to within six (6) to ten (10) inches above existing ground.

B. Staking

1. Trees to be erected vertically as shown in planting details. CONTRACTOR to be responsible for maintaining tree in such a posture during the maintenance period.
2. All trees shall be supported by stakes and guy wires and remain properly staked for the first twelve (12) months from the date when they were planted. After the first twelve (12) months, CONTRACTOR is to remove stakes when tree no longer requires staking to remain plumb and straight.
3. Prior to Final Acceptance at the end of the maintenance period, the CONTRACTOR is to remove all remaining staking materials from trees.

C. Herbaceous Plant Planting

1. Herbaceous plants to be hand planted with the root down. Substrate to be well moistened, if not saturated, and must not be allowed to dry after planting. Plants to be placed so that the previous soil line (discoloration on plant stalk) is level with the new soil line, but deep enough to prevent floating out when the area is flooded.
2. Water all plants immediately after planting until no additional water can be absorbed. CONTRACTOR to be responsible for acquiring any permits for such water from regulatory agencies.

D. Site Cleanup

1. Upon completion of work, CONTRACTOR is to restore work Area to a condition equal to or better than that initially encountered.
2. CONTRACTOR shall re-establish plant cover immediately on all areas left exposed or damaged by project operation.
3. Control weeds and excessive grass around planted trees and shrubs by mowing, trimming, using approved equipment, or using herbicides that would not have a detrimental effect on planted trees and shrubs.
4. Any damage to existing utilities or project improvements to be restored or replaced to the original condition, to the satisfaction of the OWNER, at no additional cost.

E. Maintenance Period

1. CONTRACTOR to be responsible for maintaining all trees, shrubs, and herbaceous plants planted under this Contract in a healthy and flourishing condition of active growth, and control of weeds for the construction period or as specified in the contract after planting operations have been completed.
2. A one hundred (100) percent survivability rate will be maintained for trees and shrubs during each planting season within the maintenance period. The CONTRACTOR is to replace, without additional cost, all damaged, diseased, or dead plants and all plants not in vigorous, thriving condition. Plants shall be free of dead or dying branches and branch tips, and is to bear foliage of a normal density, size, and color. Replacement is to be of the same species and is to be in accordance with the requirements of the plant list.
3. At the conclusion of the maintenance period, the Area shall have seventy (70) percent coverage by herbaceous plants as indicated on the PLANS. The CONTRACTOR is to replace, without additional cost, all damaged, diseased, or dead herbaceous plants and all herbaceous plants not in vigorous, thriving condition. Replacement is to be of the same species and is to be in accordance with the requirements of the plant list.

F. Plant Protection

1. Check shrub collar for damage caused by shrub growth, browsing animal, mowers, string trimmers, or other causes. Replace or repair damaged shrub collars.

2. Check tree staking support for damage. Replace or repair damaged components.
3. CONTRACTOR may employ additional safety measures to protect planted trees and shrubs. Such measures may include installation of shrub ring, or wire cage.

G. Tree and Shrub Maintenance

1. Replenish depleted topsoil and bark to the level specified in PLANS.
2. Control weeds around planted tree and shrub areas by mowing, trimming, or use of herbicides.
3. Fertilize trees and shrubs as necessary to ensure growth.
4. Control insects by using acceptable insecticide products.
5. Control tree and shrub disease by spraying, pruning, or removing disease-damaged plant material.
6. Application of herbicides, insecticides, pesticides, fungicides, and other chemicals used in this Contract must be registered and acceptable for use in tree agriculture by Texas Department of Agriculture and U.S. Environmental Protection Agency (EPA). Apply these chemicals in accordance with respective manufacturer's recommendations and in conformance with applicable regulatory agencies requirements. CONTRACTOR to be responsible for all damages arising from the use of chemicals, regardless of causes or reasons.
7. All chemical applicators to be licensed by the Texas Department of Agriculture or the Structural Pest Control Board, as appropriate.
8. Tree and shrub trimming and pruning for disease control to be done only under supervision of a professional tree surgeon.
9. CONTRACTOR to be responsible for providing necessary water to assure survival of trees and shrubs. CONTRACTOR to be responsible for acquiring any permits for such water from regulatory agencies.

H. Tree and Shrub Replanting

1. Replanting of lost, damaged, killed, or diseased trees and shrubs in the planting area shall be at CONTRACTOR's expense. ENGINEER/LANDSCAPE ARCHITECT reserves the right to determine if damaged or diseased trees and shrubs need to be replaced.
2. Replanting of trees and shrubs shall be done annually during the planting season defined in paragraph 1.03 of this Item.

I. Herbaceous Plants Maintenance

Invasive species shall be controlled.

J. Herbaceous Plants Replanting

1. Replanting, if required, of lost, damaged, killed, or diseased herbaceous plants shall be at CONTRACTOR's expense. ENGINEER/LANDSCAPE ARCHITECT reserves the right to determine if damaged or diseased herbaceous plants need to be replaced.
2. Replanting, if required, of herbaceous plants is to be done annually during the planting season defined in 1.04 of this Section.

K. Site Maintenance

1. Remove all trash, excess waste materials, coarse debris, and accumulated sediment offsite.
2. CONTRACTOR is to minimize pollution and erosion generated during maintenance.
3. No chemicals (including pesticides, herbicides and fertilizer), materials, or equipment may be stored in the work area during the period between maintenance activities.
4. CONTRACTOR is to reestablish plant cover within two days in all areas left exposed or damaged by CONTRACTOR's operation.
5. Any damage to existing utilities or project improvements is to be restored or replaced to the original condition, to the satisfaction of the OWNER, at no additional cost.

3.02 Field Quality Control

Final Inspection/Acceptance

1. At the conclusion of the maintenance period, the Area is to have an average density of healthy and vigorous trees and shrubs of at least one hundred (100) percent. Remove all tree stakings and shrub collars at end of one full growing season. No dead, damaged, or diseased trees will be accepted. ENGINEER/LANDSCAPE ARCHITECT retains the right to make final judgment on the acceptability.
2. At the conclusion of the maintenance period, the Area shall have seventy (70) percent coverage by herbaceous plants. Replant to one hundred (100) percent coverage if final inspection reveals that the coverage is less than the above-specified. No dead, damaged, or diseased herbaceous plants will be accepted. ENGINEER/LANDSCAPE ARCHITECT retains the right to make final judgment on the acceptability.
3. Work under this contract will be accepted by ENGINEER/LANDSCAPE ARCHITECT upon satisfactory completion of all work. Upon Final Acceptance, the OWNER will assume responsibility for maintenance of the trees, shrubs, and herbaceous plants planted.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4311 - REINFORCED FILTER FABRIC BARRIER

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control of filter fabric barriers which must be utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturers' catalogue sheets and other pertinent information on geotextile fabrics.

PART 2 - PRODUCTS

2.01 Filter Fabric

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have a minimum grab strength of 90 lbs in any principal direction (ASTM D 4632), apparent opening size between 50 and 140 for soils with more than 15 percent by weight passing a No. 200 sieve and between 20 and 50 for soils with less than 15 percent by weight passing a No. 200 sieve; and permittivity of 0.05 sec^{-1} (ASTM D 4491). Filter fabric material shall contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.

- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soils in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. When installed in vehicular traffic areas, adjacent to such areas, or where vehicular traffic hazards exist (e.g. parking lots, roadways, etc.) orange filter fabric material (or another high-visibility color) should be used.
- H. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- I. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide filter fabric barrier systems at locations specified on PLANS in accordance with enclosed drawing. Filter fabric barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the woven wire support to 2" x 2" wooden posts or steel fence posts (min. of 1.25 lbs. per linear foot & Brinell Hardness greater the 140) spaced 6 feet apart and embedded a minimum of 1 foot. Maximum spacing of 8 feet is allowed if posts are made of hot rolled steel, at least 4 feet long with Tee or Y-bar sections with the surface painted or galvanized. Provide safety caps on top of metal posts. The steel posts shall be installed at a slight angle toward the source of the anticipated runoff.
- C. Trench in the toe of the filter fabric barrier with a spade or mechanical trencher so that the downward face of the trench is flat and perpendicular to the direction of flow as shown on the attached drawing. Trench shall be a minimum of 6-inch by 6-inch lay filter fabric along the edges of the trench. Backfill and compact trench.
- D. Woven wire shall be galvanized 2"x 4" welded wire fabric, 14 gauge. Securely fasten the filter fabric material to the woven wire with tie wires.
- E. The filter fabric should be provided in continuous rolls and cut to the length of the Filter fabric fence to minimize the use of joints. When joints are necessary, the fabric should be spliced together only at a support post with a minimum 6 inch overlap, and sealed securely.

- F. When used in swales, ditches, or diversions, the elevation of the barrier at the top of the filter fabric at the flow line location in the channel shall be lower than the bottom elevation of the filter fabric at the ends of the barrier or the top of bank, whichever is less, in order to keep storm water discharge in the channel from overtopping the bank.
- G. Inspect sediment filter barrier systems at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the barrier in depth.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4312 - SANDBAG BARRIER

PART 1 - GENERAL

1.01 DESCRIPTION

This Item describes the installation of erosion and sedimentation control of sandbag barriers, which must be utilized during construction and prior to the final development of the site.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturers' catalog sheets and other pertinent information on filter fabrics.

PART 2 - PRODUCTS

2.01 SANDBAG MATERIAL

Provide woven sandbag material made of polypropylene, polyethylene, or polyamide material. Sandbag material shall have a minimum unit weight of four (4) ounces per square yard, minimum grab strength of 90 lbs in any principal direction (ASTM D 4632), and ultraviolet stability exceeding 70 percent.

2.02 SANDBAG

Provide sandbag with length approximately 18 to 24 inches, width 12 to 18 inches, and thickness six (6) to eight (8) inches. Weight not to exceed 75 pounds.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent

to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Contractor shall prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 CONSTRUCTION METHODS

- A. Provide sandbag barriers at locations specified on PLANS. Sandbag barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Inspect sandbag barrier systems at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the barrier in depth.

3.03 MEASUREMENT AND PAYMENT

Measurement and Payment requirements shall be developed as appropriate for each project.

ITEM NO. 4321 - STONE OUTLET SEDIMENT TRAP

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control stone outlet sediment traps utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturer's catalogue sheets and other pertinent information on filter fabrics showing that they meet or exceed requirements of this Item.

PART 2 - PRODUCTS

2.01 Geotextile Fabric Wrap

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have a grab strength exceeding 270 psi (ASTM D 4632) and apparent opening size. Filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F. Both the geotextile and threads shall be resistant to chemical attack, mildew and rot.

2.02 Rock and Stone

Use open-graded rock with most of the fines removed. Rock shall be a minimum of 3 inches in diameter and less than 1/2 cubic foot in volume, unless otherwise specified on PLANS and drawings in this Item. Use only clean, hard rocks free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the

erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.

- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install rock outlet sediment traps at locations specified on PLANS in accordance with enclosed drawing.
- B. Fill material for embankment shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matter. Area under embankment shall be cleared, grubbed, and stripped of vegetation and root mat.
- C. Limit of excavation and outlet length and height shall be as specified on PLANS. The side slopes shall be 2:1 or flatter.
- D. Maintain a minimum of 6 inches between top of core material and top of Stone Outlet, a minimum of 4 inches between bottom of core material and existing ground, and a minimum of 1 foot between top of stone outlet and top of embankment.
- E. Rock shall be embedded a minimum of 4 inches into existing ground.
- F. Core shall be a minimum of 1 foot in height and in width and shall be wrapped in a triple layer of geotextile fabric.
- G. Inspect rock outlet sediment traps and outlets at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or a minimum of once every seven (7) calendar days. Repair or replace damaged trap components to restore the requirements of this Item. Redress and replace stone as needed to replenish depleted stone. Remove sediment deposit and restore traps to original dimensions when the sediment has accumulated to one-half the design depth of the trap or one foot, whichever is less.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4322 - EXCAVATED EARTH OUTLET SEDIMENT TRAP

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control excavated earth outlet sediment traps utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturers' catalog sheets and other pertinent information on filter fabrics showing that they meet or exceed requirements of this Item.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install excavated outlet sediment traps at locations specified on PLANS in accordance with enclosed drawing.
- B. Fill material for embankment shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matter. The area under the embankment shall be cleared, grubbed, and stripped of vegetation and root material.
- C. Limit of excavation and outlet length and height shall be as specified on PLANS. The side slopes shall be 2:1 or flatter.
- D. Inspect excavated earth outlet sediment traps and outlets at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged trap components to restore the requirements of this Item. Remove sediment deposit and restore traps to original dimensions when the sediment has accumulated to one-half the design depth of the trap or one foot, whichever is less.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4323 - EMBANKMENT EARTH OUTLET SEDIMENT TRAP

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control embankment earth outlet sediment traps utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Unless otherwise indicated, compact embankment and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.

- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install embankment earth outlet sediment traps at locations specified on PLANS in accordance with enclosed drawing.
- B. Fill material for embankment shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matter. Area under embankment shall be cleared, grubbed, and stripped of vegetation and root material.
- C. Limit of excavation and outlet length and height shall be as specified on PLANS. The side slopes shall be 2:1 or flatter.
- D. Inspect embankment earth outlet sediment traps and outlets at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged trap components to restore the requirements of this Item. Remove sediment deposit and restore traps to original dimensions when the sediment has accumulated to one-half the design depth of the trap or one foot, whichever is less.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4331 - SEDIMENT BASIN WITH PIPE OUTLET

PART 1 GENERAL

1.01 DESCRIPTION

This Item describes the installation of sediment basins with pipe outlets utilized during construction and prior to the final development of the site.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturer's catalogue sheets and other pertinent information on outlet pipe, perforated riser, and connectors.

PART 2 PRODUCTS

2.01 PIPE

Use corrugated metal pipe for outlet pipe and riser pipe.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in this Item.

3.02 CONSTRUCTION METHODS

- A. Provide sediment basins at locations specified on PLANS. Sediment basin shall be constructed in accordance with construction drawings shown on PLANS.
- B. Installation of sediment basins shall not be started until permits from governmental agencies, where required, have been obtained.
- C. Fill material for embankment for pipe outlet shall be free of roots, woody vegetation, oversized stones or rocks, or organic or other objectionable matter. Area under embankment shall be cleared, grubbed, and stripped of vegetation and root material.
- D. Install outlet pipe and riser as shown on attached drawing.
- E. Inspect sediment basin at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain basin dimensions necessary to obtain the required basin volume as shown on PLANS. Repair and replace damaged components of the basin.
- F. Remove sediment deposits when design basin volume is reduced by one-third or sediment level is one foot below the principal spillway crest, whichever is less.

3.03 MEASUREMENT AND PAYMENT

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4332 - SEDIMENT BASIN WITH STONE OUTLET

PART 1 GENERAL

1.01 DESCRIPTION

This Item describes the installation of sediment basins with stone outlets utilized during construction and prior to the final development of the site.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturers' catalogue sheets and other pertinent information on filter fabrics showing that they meet or exceed requirements of this item.

PART 2 PRODUCTS

2.01 GEOTEXTILE FABRIC WRAP

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile shall have a grab strength exceeding 270 psi (ASTM D 6832) and apparent opening size. Both the geotextile and threads shall be resistant to chemical attack, mildew and rot.

2.02 ROCK AND STONE

Use open-graded rock with most of the fines removed. Rock shall be a minimum of 3 inches in diameter and less than 1/2 cubic foot in volume, unless otherwise specified on PLANS and drawings with this item. Use only clean, hard rocks free from adherent coatings, salt, alkalis, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter. Crushed concrete in the size range specified be used for this purpose.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing systems.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner.

Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.

- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at a location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a minimum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in this Item.

3.02 CONSTRUCTION METHODS

- A. Provide sediment basins at locations specified on PLANS. Sediment basin shall be constructed in accordance with construction drawings shown on PLANS.
- B. Installation of sediment basins shall not be started until permits from governmental agencies, where required, have been obtained.
- C. Install stone outlet for sediment basin at location specified on PLANS and in accordance with enclosed drawing.
- D. Inspect sediment basin at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Maintain basin dimensions necessary to obtain the required basin volume as shown on PLANS. Repair and replace damaged components of the basin.
- E. Remove sediment deposits when design basin volume is reduced by one-third or sediment level is one foot below the principal spillway crest, whichever is less.

3.03 MEASUREMENT AND PAYMENT

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4351- BAGGED GRAVEL BARRIER

PART 1 - GENERAL

1.01 DESCRIPTION

This Section includes the furnishing, installation and maintenance of bagged gravel barriers for sedimentation control at inlets or across channels or rights-of-way during construction operations and prior to the final site stabilization.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturers' catalog sheets and other pertinent information on filter fabrics.

PART 2 - PRODUCTS

2.01 BAG MATERIAL

Provide woven bag material made of polypropylene or polyethylene material. Bag material shall have a minimum unit weight of four (4) ounces per square yard, minimum grab strength of 90 lbs in any principal direction (ASTM D 4632), and ultraviolet stability exceeding 70 percent after 500 hours of exposure.

2.02 BAG

Provide bag with length approximately 18 to 24 inches, width 12 to 18 inches, and thickness six (6) to eight (8) inches. Weight not to exceed 75 pounds.

2.03 AGGREGATES

Aggregate material is to consist of gravel, composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic or injurious matter.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the

erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.

- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed in accordance with existing federal, state, and local regulations.
- F. Contractor shall prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 CONSTRUCTION METHODS

- A. Provide bagged gravel barriers at locations specified on PLANS. Bagged gravel barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. When installed for Stage II inlet protection barriers on paved surfaces, the barrier shall be installed in such a manner that surface runoff will percolate through the system prior to entering the storm sewer and allow sediment to be retained and accumulated.
- C. Inspect bagged gravel barrier systems at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when sediment reaches one-third of the height of the barrier in depth.

3.03 MEASUREMENT AND PAYMENT

Measurement and Payment requirements shall be developed as appropriate for each project.

ITEM NO. 4421 - SODDING

PART 1 - GENERAL

1.01 Description

- A. Scope: Furnish plants, materials, labor, equipment and appliances, and perform all operations in connection with the planting of sod within the areas designated on the PLANS for the purpose of surface stabilization, channel stabilization and/or vegetation buffer strips.
- B. Related work as called for on PLANS as specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.02 Quality Assurance

The following documents, used as standards, are to be considered a part of these specifications.

- A. American Joint Committee on Horticultural Nomenclature, "Standardized Plant Names," Second Edition, 1942.
- B. American Association of Nurserymen, Inc. "American Standard for Nursery Stock."

PART 2 - PRODUCTS

2.01 Materials

- A. Sod: Certified grade cultivated turf sod; with strong, fibrous root system; free from stones and burned or bare spots.
- B. Topsoil: Fertile, agricultural soil typical of locality and capable of sustaining vigorous plant growth; from well drained site that is free of flooding; free from admixture of subsoil, slag or clay, stones, lumps, live plants and their roots, sticks and other extraneous matter; pH value of minimum 5.4 and maximum 7.0. Use topsoil excavated from site only if conforming to specified requirements.
- C. Fertilizer: Commercial type conforming to FS 0-F-241, Type 1, Grade A recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in analysis.
- D. Wooden Pegs: Of sufficient size and length to ensure satisfactory anchorage of sod on slope in excess of 2:1.
- E. Roll Lite Erosion Control Mulching Fabric as manufactured by Gulf States Paper Corporation or equal.
- F. Water: Clean, fresh, and free of substances or matter which would inhibit vigorous growth of grass.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner.
- C. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way.
- D. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- E. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item.

3.02 Preparation of Subgrade

- A. Fine grade subgrade, eliminating uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, undesirable plants and their roots, stones, and debris. Do not bury foreign material beneath areas to be sodded. Remove and replace subsoil which has been contaminated with petroleum products.
- C. Cultivate subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.03 Placing Topsoil

- A. Spread topsoil to a depth of minimum 2 inches over entire area to be sodded.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Grade to eliminate rough and low areas, ensuring positive drainage. Maintain levels, profiles, and contours of subgrade.
- D. Remove stones, roots, grass, weeds, debris, and other foreign nonorganic material while spreading.

3.04 Fertilizing

- A. Apply fertilizer at rate recommended by manufacturer. Apply after fine grading and prior to compaction. Mix thoroughly into upper 2 inches of topsoil.

- B. Lightly water to aid the breakdown of fertilizer.
- C. Apply fertilizer within 48 hours before laying sod.

3.05 Laying Sod

- A. Lay sod as soon as possible after delivery to prevent deterioration.
- B. Full Sodding: Lay sod closely knit together with no open joints visible, and pieces not overlapped. Stagger sod units to avoid continuous seams. Lay smooth and flush with adjoining grass areas, paving, and top surfaces of curbs.
- C. Strip Sodding: Lay sod in the following patters: 3-inch continuous sod strip, 12-inch topsoil, 3-inch continuous sod strip. See dirt areas between sod strips.
- D. On slopes 2:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- E. Prior to placing sod, on slopes 3:1 or where indicated, place Hold/Gro or Roll/Lite or equal over topsoil. Securely anchor in place with posts sunk firmly into the ground at maximum 16 feet on center along pitch of slope and equal to width of wire mesh horizontally across slopes.
- F. Immediately water sodded areas after installation. Water in sufficient amounts to saturate sod and upper 4 inches of soil.
- G. After sod and soil has dried sufficiently to prevent damage, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Ensure rolling equipment weight not over 250 pounds or less than 150 pounds.

3.06 Maintenance

- A. Begin maintenance of plant materials immediately after planting and continue maintenance until issuance of Certificate of Acceptance of project.
- B. Maintenance to include measures necessary to establish and maintain plants in a vigorous and healthy growing condition, including the following.
 - 1. When herbicides are used for weed control, apply in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
 - 2. Watering sufficient to saturate root system.
 - 3. Disease and insect control.

3.07 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4511 - INLET PROTECTION BARRIERS

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control inlet protection barriers utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturers' catalog sheets and other pertinent information on filter fabrics showing that they meet or exceed requirements of this Item.

PART 2 - PRODUCTS

2.01 Reinforced Filter Fabric Fence

For filter fabric inlet protection barriers, products shall comply with Item 4311 - *Reinforced Filter Fabric Barrier*.

2.02 Bagged Gravel Barrier

For bagged gravel barriers, products shall comply with Item 4351 - *Bagged Gravel Barrier*.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized

in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state, and local regulations.

- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install inlet protection barriers of the type specified on PLANS in accordance with enclosed drawings and in accordance with the following TECHNICAL SPECIFICATIONS, as applicable.

- Item 4311 - *Reinforced Filter Fabric Barrier*
- Item 4313 - *Bagged Gravel Barrier*

Other options may be used with approval of agency with jurisdiction.

- B. Inspect inlet protection barriers at least once every 14 calendar days and within 24 hours at the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged barrier components to restore the requirements of this Item. Remove sediment deposit when the sediment has accumulated to one-half the height of the barrier.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4521 - DROP INLET INSERT BASKETS

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control drop inlet baskets utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

Manufacturers' catalog sheets and other pertinent information on filter fabrics showing that they meet or exceed requirements of this Item.

PART 2 - PRODUCTS

2.01 Filter Fabric

Provide geotextile filter fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have a grab strength of 90 lbs in any principal direction (ASTM D 4632), and apparent opening size. Filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.

2.02 Metals

Provide steel frame members in accordance with ASTM A 36.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent

to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install drop inlet baskets at locations specified on PLANS.
- B. The inlet insert basket shall fit into the inlet without gaps around the insert.
- C. The support for the inlet insert basket shall consist of fabricated metal. The basket shall be approximately 14 inches in depth.
- D. The top frame of the basket shall be constructed with two short sides of 2 inch by 2 inch and single long side of 1 inch by 1 inch, 1/8 inch angle iron. The basket hangars shall be constructed of 2 inch by 1/4 inch iron bars. The bottom frame shall be constructed of 1 inch by 1/4 inch iron bar or 1/4 inch plate with center 3 inches removed.

The sides of the inlet basket shall be a minimum 1/4 inch diameter iron rods or equivalent. A minimum of 14 rods shall be welded in place between the top frame/basket hanger and the bottom frame. Exact dimensions for top frame and insert basket will be determined based on the dimensions of the type of inlet being protected.

- E. The filter fabric shall be pushed down and formed to the shape of the basket. The sheet of fabric shall be large enough to be supported by the basket frame when holding sediment and extend at least 6 inches past the frame. Slits shall be cut in the fabric near the top of the frame for high-flow events, as shown in the drawings. The inlet grate shall be placed over the basket/frame; serving as a fabric anchor.
- F. Inspect drop inlet baskets at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged basket components to restore the requirements of this Item. Remove sediment deposit after each storm event.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4531 - STORM INLET SEDIMENT TRAPS

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control storm inlet sediment traps utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in PART 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owners directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct

all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Excavate storm inlet sediment traps at locations specified on PLANS in accordance with enclosed drawing.
- B. Limit of excavation and outlet length and height shall be as specified on PLANS. The side slopes shall be 2:1 or flatter.
- C. Inspect rock inlet sediment traps and inlets at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Repair or replace damaged trap components to restore the requirements of this Item. Redress and replace stone as needed to replenish depleted stone. Remove sediment deposit and restore traps to original dimensions when the sediment has accumulated to one-half the design depth of the trap or one foot, whichever is less.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4621 - PORTABLE SEDIMENT TANK

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control sediment tanks utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in Part 3.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct

all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install portable sediment tank at location specified on PLANS in accordance with enclosed drawing.
- B. Steel drums or other type of tanks may be used, providing that the volume requirements are met. If recycled steel drums are used, they must be free of chemical contamination.
- C. Inspection shall be made by the contractor after each pumping, and when one-third (1/3) of the portable sediment tank is filled with sediment, the contractor shall clean out the tank.
- D. Sediment collected in the tank shall be disposed of at an approved site in a manner that will not contribute to additional sedimentation.
- E. The portable sediment tank shall be removed when the construction is completed.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4631 - SEDIMENT SUMP PIT

PART 1 GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control sediment sump pit utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 PRODUCTS

2.01 Rock and Stone

Use open-graded rock with most of the fines removed. Rock shall be a 2 inches in diameter unless otherwise specified on PLANS and drawings in this Item. Use only clean, hard rocks free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

PART 3 EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.
- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.

- F. Unless otherwise indicated, compact embankments and sides and bottoms of excavations and trenches by mechanically blading, tamping, and rolling soil in a maximum of 8-inch layers. Compaction density shall be at a maximum of 90 percent of the Standard Proctor ASTM D 698 density. Make at least one test per 500 cubic yards of embankment.
- G. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.
- H. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install sediment sump pits at locations specified on PLANS in accordance with enclosed drawing.
- B. The dimensions of pit are optional.
- C. The standpipe should be constructed by perforating a 12"-24" diameter corrugated or PVC pipe.
- D. The standpipe should extend 12"-18" above the lip of the pit.
- E. Discharge of water pumped from the standpipe shall be conveyed to a sediment trapping device or to an area protected by any of these devices.
- F. The sites of sump pits shall be filled, compacted to the density of the surrounding soil and the surface stabilized when the construction is completed.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4641 - DEWATERING BAG

PART 1 - GENERAL

1.01 Description

This Item describes the installation of dewatering bags utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 SUBMITTALS

Manufacturers' catalogue sheets and other pertinent information on dewatering bags.

PART 2 – PRODUCTS

2.01 Filter Fabric Bag

Provide nonwoven geotextile filter fabric bag made of polypropylene material. Geotextile fabric shall have a minimum grab strength of 200 psi in any principal direction (ASTM D 4632); and the apparent opening size between 50 and 140 for soils with more than 15 percent by weight passing a No. 200 sieve and between 20 and 50 for soil with less than 15 percent by weight passing a No. 200 sieve; and permittivity of 0.05 sec^{-1} (ASTM D 4491). Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide an expected usable life comparable to the anticipated construction period. Ultraviolet stability shall exceed 70% after 500 hours of exposure (ASTM D 4355).

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. Inspect and repair or replace components of all dewatering and sedimentation control systems as specified for each type of system. Remove dewatering and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite or onsite as directed by the Owner.
- C. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, disposed of in accordance with existing federal, state and local regulations.
- D. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages

caused by construction traffic to erosion and sedimentation control system shall be repaired immediately.

- E. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Install dewatering bag at location specified on PLANS.
- B. Lifting straps shall be placed under the bag to facilitate removal after use.
- C. Strap the neck of the dewatering bag to the discharge hose and tightly secure to prevent water from flowing out of the unit without being filtered.
- D. To increase filtration efficiency, the unit shall be located on aggregate or haybale bed to maximize water flow through entire surface area of the bag.
- E. Inspect flow conditions, bag condition, bag capacity, and the secondary barrier. Replace the bag when sediment has reduced flow rate to impractical levels.
- F. Remove and dispose of the bag offsite or onsite as directed by the Owner. For offsite disposal, the bag shall be disposed in a manner that does not contribute to additional sedimentation. For onsite disposal, if not using a reusable bag, the bag shall be cut open to remove all visible fabric and the sediment seeded.
- G. The dewatering bag shall be removed when the construction is complete.

3.03 Measurement and Payment

Measurement and Payment requirements shall be developed as appropriate for each project.

ITEM NO. 4711 - STABILIZED CONSTRUCTION EXIT

PART 1 - GENERAL

1.01 Description

This Item describes the installation of erosion and sedimentation control stabilized construction exits utilized during construction and prior to the final development of the site.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

- A. Manufacturers' catalog sheets and other pertinent information on geotextile fabric.
- B. Sieve analysis of aggregates conforming to requirements of this Item.

PART 2 - PRODUCTS

2.01 Geotextile Fabric

Provide geotextile fabric made of either polypropylene or polyethylene material. Geotextile fabric shall have minimum grab strength of 270 psi in any principal direction (ASTM D 4632) and the apparent opening size. The geotextile shall be resistant to chemical attack, mildew and rot.

2.02 Coarse Aggregates

- A. Coarse aggregates shall consist of crushed stone, gravel, or combinations thereof. Particles shall compose of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

Coarse aggregates to consist of open graded rock 3" to 8" in size.

2.03 Materials for Alternative Construction Methods

Use materials specified in PART 3 - 3.02.J.

PART 3 - EXECUTION

3.01 General

- A. Provide erosion and sedimentation control systems at the locations shown on PLANS. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on PLANS and set out in this Item.
- B. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- C. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and discard the existing system.

- D. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials offsite.
- E. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- G. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site. Conduct all construction operation under this Contract in conformance with the erosion control practices described in that Item.

3.02 Construction Methods

- A. Provide stabilized access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes when shown on PLANS.
- B. Provide stabilized construction exits, and truck washing areas when approved by owner, of the sizes and locations shown on PLANS. Construction traffic shall not be allowed to leave construction site and move directly onto public roadway, alley, sidewalk, parking area, or other right-of-way in areas other than at locations of stabilized construction exits.
- C. Vehicles leaving construction areas shall have their tires cleaned to remove sediment prior to entrance onto public right-of-way. When washing is needed to remove sediment, Contractor shall construct a truck washing area. Truck washing shall be done on stabilized areas which drain into sediment traps.
- D. Detail for stabilized construction exit is shown in Drawing attached at the end of this Item. Use the same specifications for construction of all other stabilized areas. Roadway width shall be at least 14 feet for one-way traffic and 20 feet for two-way traffic and shall be sufficient for all ingress and egress. Furnish and place geotextile fabric as a permeable separator to prevent mixing of coarse aggregate with underlying soil. Exposure of geotextile fabric to the elements between laydown and cover shall be a maximum of fourteen days to minimize damage potential.
- E. Roads and parking areas shall be graded to provide sufficient drainage away from stabilized areas. Use sand bags, gravel, boards, or similar methods to prevent sediment from entering public right-of-way, storm drain, ditch, and watercourse.
- F. The stabilized areas shall be inspected and maintained daily. Provide periodic top dressing with additional coarse aggregates to maintain the required depth. Repair and

cleanout damaged measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto public right-of-way shall be removed immediately.

- G. The length of the stabilized area shall be as shown on PLANS, but not less than 50 feet. The thickness shall not be less than 8 inches. The width shall not be less than full width of all points of ingress or egress.
- H. Stabilization for other areas shall have the same course aggregate, thickness, and width requirements as the stabilized construction exit, except where shown otherwise on PLANS.
- I. Stabilized area may be widened or lengthened to accommodate truck washing area when authorized by Owner. Outlet Sediment Trap must be provided for truck washing area.
- J. Alternative methods of construction may be utilized when shown on PLANS, indicated on a special provision to this Item, or when approved by the Owner. These methods include the following.
 - 1. Cement Stabilized Soil - Compacted, cement stabilized soil, limestone aggregate or other fill material in an application thickness of at least 8 inches.
 - 2. Wood Mats/Mud Mats - Oak or other hardwood timbers placed edge to edge and across support wooden beams which are placed on top of existing soil in an application thickness of at least 6 inches.
 - 3. Steel Mats - Perforated mats placed across perpendicular support members.

3.03 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4721 - STREET CLEANING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Item describes the street cleaning needed to remove sediment tracked from the construction site onto private or public roadways.
- B. Street cleaning is to be used in conjunction with stabilized access road and parking areas when the construction site will disturb more than one acre at any one time or as directed by the Owner.

1.02 RELATED WORK

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Remove and dispose sediment deposits at the project spoil site. If a project spoil site is not designated on PLANS, dispose of sediment offsite at location not in or adjacent to stream or floodplain. Off-site disposal will be the responsibility of the Contractor. Sediment to be placed at the project site should be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it needs to be disposed of in accordance with existing federal, state and local regulations.
- B. Contractor shall prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction.
- C. Contractor shall employ other erosion and sediment control measures as determined by the erosion and sediment control inspector to minimize the amount of sediments tracking onto roadway. Conduct all construction operations under this Contract in conformance with the erosion control practices described in that Item. The Inspector's SWP3 inspection report shall include a certified report on erosion and sediment control measures required and/or used in conjunction with street cleaning.
- D. Contractor shall employ protective measures described in Item General Source Controls to avoid damage to existing trees to be retained on the project site.

3.02 CONSTRUCTION METHODS

- A. Provide street cleaning, such as sweeping or vacuuming, at locations around the project site where construction traffic has caused tracking of sediments onto roadways. Washing or flushing of sediments into adjacent drainage systems is prohibited.
- B. Mechanical sweepers shall be vacuum-type or regenerative sweepers. Sweeping speed not to exceed 6 mph. Two passes shall be made.

- C. Street must be cleaned daily before the end of the workday. If in the opinion of the Owner, excess sediments have tracked onto the streets or if rain is expected, clean the street as often as necessary to keep the street clean at all times or as directed by the Owner. Remove and dispose of sediments properly.
- D. Use other erosion and sediment control measures to prevent sediment runoff during period of rains and non-working hours and when storm discharges are expected.

3.03 MEASUREMENT AND PAYMENT

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4811 – GENERAL SOURCE CONTROLS

PART 1 - GENERAL

1.01 Description

This Item describes erosion and sedimentation control related practices which must be utilized during construction activities.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

PART 2 - PRODUCTS

Provide materials as specified in Part 3.

PART 3 - EXECUTION

3.01 General

- A. No clearing and grubbing or rough cutting, other than as specifically directed by the Owner to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.
- B. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.
- C. Contractor shall employ protective measures described in this Item to avoid damage to existing trees to be retained on the project site.
- D. Conduct all construction operations under this Contract in conformance with the erosion control practices described in this Item.

3.02 Topsoiling for Erosion and Sedimentation Control Systems

When topsoiling is called for as a component of another Item, conduct erosion control practices described in this Item during topsoiling operation.

1. When topsoiling, maintain erosion and sedimentation control systems, such as swales, grade stabilization structures, berms, dikes, waterways, and sediment basins.
2. Maintain grades which have been previously established on areas to be topsoiled.
3. After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or by scarifying to a depth of at least 2 inches to permit bonding of the topsoil to the subsoil. Compact by passing a bulldozer up and down the slope, tracking over the entire surface area of the slope to create horizontal erosion control slots.
4. No sod or seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials.

3.03 Protection of Trees in Construction Areas

- A. Heavy equipment, vehicular traffic, and stockpiles of construction materials, including topsoil, are not permitted within the dripline of any tree to be retained. Contractor shall avoid all contact with trees to be retained unless otherwise directed by the Owner or required by the work under this Contract.
- B. Specimen trees shown on the PLANS shall be boxed or fenced. When called for in the PLANS, tunnel under the root system for the installation of utility lines.
- C. Tree trunks, exposed roots, and limbs of the trees designated to be retained which are damaged during construction operations will be cared for as prescribed by a forester or licensed tree expert at the expense of the Contractor.

3.04 Dust Control

- A. Control dust blowing and movement on construction sites and roads to prevent exposure of soil surfaces, to reduce on and offsite damage, to prevent health hazards, and to improve traffic safety.
- B. Control dust blowing by utilizing one or more of the following methods.
 - 1. Mulches bound with chemical binders such as Curasol, Terratack, or equal.
 - 2. Temporary vegetative cover.
 - 3. Spray-on adhesive on mineral soils when not used by traffic.
 - 4. Tillage to roughen surface and bring clods to the surface.
 - 5. Irrigation by water sprinkling.
 - 6. Barriers using solid board fences, snow fences, burlap fences, crate walls, bales of hay or similar materials.
- C. Dust control methods shall be implemented immediately whenever dust can be observed blowing on the project site.

3.05 Equipment Maintenance and Repair

Maintenance and repair of construction machinery and equipment must be confined to areas specifically designated for that purpose. Such designated areas must be located and designed so that oils, gasoline, grease, solvents, and other potential pollutants cannot be washed directly into receiving streams or storm water conveyance systems. These areas must be provided with adequate waste disposal receptacles for liquid as well as solid waste. Maintenance areas should be inspected and cleaned daily.

On a construction site where designated equipment maintenance areas are not feasible, care must be taken during each individual repair or maintenance operation to prevent potential pollutants from becoming available to be washed into streams or conveyance systems. Temporary waste disposal receptacles must be provided.

3.06 Waste Collection and Disposal

A plan shall be formulated for the collection and disposal of waste materials on a construction site. Such a plan must designate locations for trash and waste receptacles and establish a special collection schedule. Methods for ultimate disposal of waste must be specified and carried out in accordance with applicable local, state and federal health

and safety regulations. Special provisions must be made for the collection and disposal of liquid wastes and toxic or hazardous materials.

Receptacles and other waste collection areas must be kept neat and orderly to the extent possible. Waste should not be allowed to overflow its container or accumulate for excessively long period of time. Trash collection points must be located where they will least likely be affected by concentrated storm water runoff.

3.07 Washing Areas

Vehicles such as cement or dump trucks and other construction equipment must not be washed at locations where the runoff will flow directly into a watercourse or storm water conveyance system. Special areas must be designated for washing vehicles. These areas should be located where the wash water will spread out and evaporate or infiltrate directly into the ground, or where the runoff can be collected in a temporary holding or seepage basin. Wash areas must have gravel or rock bases to minimize mud generation.

3.08 Storage of Construction Materials, Chemicals, Etc.

Sites where chemicals, cements, solvents, paints, or other potential water pollutants are to be stored, must be isolated in areas where they will not cause runoff pollution.

Toxic chemicals and materials, such as pesticides, paints, and acids must be stored in accordance with manufacturers' guidelines. Groundwater resources must be protected from leaching by placing a plastic mat, packed clay, tarpaper, or other impervious materials on any areas where toxic liquids are to be opened or stored.

3.09 Demolition Areas

Demolition projects usually generate large amounts of dust with significant concentrations of heavy metals and other toxic pollutants. Dust control techniques shall be used to limit the transport of the airborne pollutants. However, water or slurry used to control dust must be retained on the site and not be allowed to run directly into watercourses or storm water conveyance systems.

3.10 Sanitary Facilities

All construction sites must be provided with adequate sanitary facilities for workers in accordance with applicable health regulations.

3.11 Pesticides

Pesticides used during construction should be stored and used in accordance with manufacturers' guidelines and with local, state and federal regulations. Overuse should be avoided and great care should be taken to prevent accidental spillage. Pesticide containers must **never** be washed in or near flowing streams or storm water conveyance systems.

3.12 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

ITEM NO. 4821 - TEMPORARY VEHICLE AND EQUIPMENT FUELING AREA

PART 1 - GENERAL

1.01 Description

Installation of erosion and sediment control for a temporary vehicle and equipment fueling area for aboveground fuel storage tank, which will be on site for more than 48 hours, or as directed or as directed by the Owner.

1.02 Related Work

Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 Submittals

- A. Submit manufacturer's catalog sheets and other product data on dispensing equipment, pump, and aboveground fuel storage tanks, indicating the capacity and dimensions of the tank.
- B. Submit drawings to show the location of tank protection area and driveway. Indicate the nearest inlet or channelized flow area. Clearly dimension all distances and measurements.
- C. Submit a list of spill containment equipment, and quantities thereof, located at the fueling area.

1.04 Quality Assurance

Person conducting visual examination for pollutant shall be fully knowledgeable about the NPDES Construction General Permit, detecting sources of storm water contaminants, inspection of aboveground storage tank and appurtenances for leakage, and the day-to-day operations that may cause unexpected pollutant releases.

PART 2 - PRODUCTS

2.01 Aboveground Storage Tank

- A. Tank Assembly: Must be listed with UL 1709 and UL 2085.
- B. Inner Steel Storage Tank: Follow UL 142, with minimum thickness of 1/8-inch all welded construction.
- C. Tank Encasement: Either concrete or steel to provide a minimum of 110 percent containment of the inner tank capacity. Provide 5-gallon overspill containment pan for tank refueling.
- D. Dispenser Pump: For submersible pump, UL listed emergency shut-off valve to be installed at each dispenser. For suction pump, UL listed vacuum-activated shut-off valve, with a shear section, is to be installed at each dispenser. Fuel may not be dispensed from a tank by gravity flow or by pressurization of the tank. Means must be provided to prevent release of fuel by siphon flow.

2.02 Concrete

Provide concrete with a minimum strength of 4,000 psi at 28 days.

2.03 Aggregates

- A. Coarse aggregate shall consist of crushed stone, gravel, crushed blast furnace slag, or a combination of these materials. Aggregate shall be composed of clean, hard, durable materials, free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.
- B. Coarse aggregate shall conform to the following graduation requirements.

Sieve Size (Square Mesh)	Percent Retained (By Weight)
2-1/2"	0
2"	0 - 20
1-1/2"	15 - 50
3/4"	60 - 80
No. 4	95 - 100

2.04 Geotextile Fabric

- A. Geotextile filter fabric made of either polypropylene or polyethylene material, in continuous rolls of longest practical length.
- B. Grab Strength: 270 psi in any principal direction (ASTM D 4632), and the apparent opening size 0.60 mm (U.S. Sieve No. 30) maximum per ASTM D 4751.
- C. Furnish ultraviolet inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.

PART 3 - EXECUTION

3.01 General

- A. Do not clear, grub, or rough cut until erosion and sedimentation control systems are in place, unless otherwise approved by Owner.
- B. Maintain existing erosion and sedimentation control systems located within the project site installed by others prior to start of construction under this contract until acceptance of the project or until directed by the Owner to remove and dispose the existing systems.
- C. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until acceptance of the project. Remove erosion and sedimentation control systems promptly when directed by the Owner and dispose of removal materials offsite.
- D. Remove and dispose of sediment deposits at the project spoil site. If a project spoil site is not designated on Drawings, dispose sediment at an offsite location. Contractor assumes responsibility for offsite disposal location. Sediment shall be disposed of at an offsite location not in or adjacent to a stream or floodplain. Spread, compact, and stabilize sediment placed at the project site in accordance with the directions of the Owner. Do not allow sediment to flush into a stream or drainage way. If sediment is contaminated, dispose of sediment in accordance with federal, state and local regulations.

- E. Do not maneuver equipment or vehicles on areas outside of dedicated rights-of-way and easements for construction. Immediately repair damages caused by construction traffic to erosion and sedimentation control systems.
- F. Employ protective measures to avoid damage to existing trees to be retained on the project site. Conduct all construction operations under this Contract in conformance with the erosion control practices described in Item 4811 - General Source Controls.
- G. Contractor to prepare spill response and containment procedures to be implemented in the event of a significant materials spill. Significant materials include but are not limited to: raw materials; fuels; materials such as solvent, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical required to be reported pursuant to Section 313 of Title III of SARA; fertilizers; pesticides, and waste products such as slag, ashes and sludge that have the potential to be released with storm water discharges. Spill containment procedures shall be kept on-site or in construction field office.
- H. Spill containment equipment appropriate to the size of operation is to be located in close proximity of the fueling area. Such equipment includes, but not limited to, suitable waste containers for significant materials, drip pans, booms, inlet covers, or absorbent.
- I. All significant materials or waste containers used for construction activities and stored on-site overnight are to be properly labeled.

3.02 Construction Methods

- A. Provide fuel tank protection area and driveway as shown on the Drawings.
- B. Do not locate fueling area in or near a channelized flow area or close to a storm sewer conveyance system. Sufficient space must be provided to allow installation of other erosion and sediment controls to protect those areas.
- C. Clear and grub the fueling area to remove unsuitable materials. Place geotextile fabric as permeable separator to prevent mixing of coarse aggregate with underlying soil. Overlap fabric a minimum of 6 inches. Place coarse aggregate on top of the geotextile fabric to minimum depth of 8 inches.
- D. Grade protection area and driveway to provide sufficient drainage away from stabilized areas. Use gravel, boards, or similar methods to prevent sediment from entering public right-of-way, receiving stream or storm water conveyance system. The driveway to the fuel tank area shall have a minimum width of 15 feet for one-way traffic and 30 feet for two-way traffic.
- E. Place the aboveground storage tank on top of the cast-in-place or pre-cast foundation. The size and thickness of the foundation shall be based on the size and weight of the tank to be used, with a minimum thickness of 6 inches. The concrete foundation shall be enclosed by a 5-inch by 5-inch concrete curb and shall extend a minimum of 1 foot beyond the tank and dispenser assemblies, so that leak and drip can be contained within the concrete foundation.

- F. Slope the concrete foundation a minimum of 1 percent toward a 6-inch wide by 12-inch long by 4-inch deep sump pit. Install a minimum of 2-inch pipe inside the sump pit with a valve on the outside of the curb to allow draining of the concrete foundation.
- G. Install a portable concrete barrier around the concrete foundation. Provide a minimum clearance of 2 feet from the edge of the foundation. In lieu of the concrete barrier, Contractor can install 4-inch diameter steel pipe bollards around the foundation. The bollards shall be buried a minimum of 3 feet deep, 3 feet aboveground, and 4 feet on center, encased in a 12-inch wide concrete foundation.

3.03 Maintenance

- A. Inspections shall be conducted by the designated health and safety officer qualified to conduct health and safety inspections.
- B. Inspect stabilized areas at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Provide periodic top dressing with additional coarse aggregate to maintain the required depth. Repair and clean out damaged control measures used to trap sediment.
- C. Inspect fuel tank foundation's bermed area at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater; or at a minimum of once every seven (7) calendar days. Visually examine storm water contained in the tank's bermed foundation area for oil sheen or other obvious indicators of storm water pollution. Properly dispose of the storm water when pollutant is present. Record visual examination of storm water discharge in a Report noting the date and time of examination, name of examiner, observations of water quality, and volume of storm water discharged from the bermed area. The Report shall be kept together with all other storm water pollution control inspection reports on the site, in a readily accessible location.

3.04 Temporary Fueling Area Closure

The temporary vehicle and equipment fueling area shall be disposed of by removal of all sediment and erosion controls properly offsite. Owner will inspect the top soils in the fueling area and immediate vicinity for evidence of fuel leaks. If the Owner determines that sufficient pollutants have been released, the soil shall be removed and properly disposed offsite. Other remediation method may be required.

3.05 Measurement and Payment

Measurement and payment requirements shall be developed as appropriate for each project.

APPENDIX D

USEFUL INFORMATION

TPDES CONSTRUCTION GENERAL PERMIT SUPPORT INFORMATION

PHONE NUMBERS:

Texas Commission On Environmental Quality (TCEQ) Storm Water Hotline	(512) 239-3700
City Engineer, City of Houston Storm Water Quality Section	(713) 225-8548
Program Manager, Harris County Storm Water Quality Section	(713) 956-3096

WEBSITE LINKS:

Storm Water Management Joint Task Force Website:

<http://www.cleanwaterclearchoice.org/>

Official Website for the City of Houston, Texas:

<http://www.houstontx.gov/>

Official Website for Harris County, Texas:

<http://www.co.harris.tx.us/>

Official Website for Harris County Flood Control District, Texas:

<http://www.hcfcd.org/>

Official Website for Harris County Permits Office, Texas:

<http://www.eng.hctx.net/permits/>

Link to SWP3 Plan Review Checklist, Harris County Engineering Permits:

http://www.eng.hctx.net/permits/swq/swq_pollution_prevent_checklist.pdf

Official Website for Texas Department of Transportation:

<http://www.dot.state.tx.us/>

EPA Storm Water Discharges from Construction Activities:

<http://cfpub.epa.gov/npdes/stormwater/const.cfm>

TCEQ TPDES Storm Water Permits

http://www.tceq.state.tx.us/nav/permits/sw_permits.html

U.S. Geological Survey

<http://www.usgs.gov>

Texas Structural Pest Control Board

<http://www.state.tx.us>

Texas Agricultural Extension Service

<http://www-aes.tamu.edu>

Texas Department of Agriculture

<http://www.agr.state.tx.us/index.htm>

FORMS:

TCEQ Notice of Intent (NOI)

TCEQ Construction Site Notices

TCEQ Notice of Termination (NOT)

Example Format for Notice of Change (NOC) Letter

**TCEQ Notice of Intent (NOI)
Form and Instructions**

C. APPLICATION CONTACT (If TCEQ needs additional information regarding this application, who should be contacted?)		
1. Name:	Title:	Company:
2. Phone No.: () -	Extension:	
3. FAX No.	E-mail Address:	
D. REGULATED ENTITY (RE) INFORMATION ON PROJECT OR SITE		
1. TCEQ Issued RE Reference Number (RN) (if available):		
2. Name of Project or Site:		
3. Physical Address of Project or Site: (enter in spaces below)		
Street Number:	Street Name:	
City (nearest to the site):	ZIP Code (nearest to the site):	County (Counties if >1):
4. If no physical address (Street Number & Street Name), provide a written location access description that can be used for locating the site: (Ex.: 2 miles west from intersection of Hwy 290 & IH35 on Hwy 290 South)		
5. Latitude:	N	Longitude: W
6. Standard Industrial Classification (SIC) code:		
7. Describe the activity related to the need for this authorization at this site (<i>do not repeat the SIC and NAICS code</i>):		
8. Is the project/site located on Indian Country Lands? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, you must obtain authorization through EPA, Region VI.		
E. SITE MAILING ADDRESS (address for receiving mail at the site)		
<input checked="" type="checkbox"/> Same As Operator (check if address is the same, then proceed with Section F.)		
Mailing Address:	Suite No./Bldg.No.:	
City:	State:	ZIP Code:
F. GENERAL CHARACTERISTICS		
1. Has a Pollution Prevention Plan been prepared as required in the general permit? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If No, coverage may be denied as the PPP is required at the time the NOI is submitted to TCEQ.		
2. Provide the estimated area of land disturbed (to the nearest acre): _____Acres		
3. Provide the name of the receiving water body (local stream, lake, drainage ditch), MS4 Operator (if applicable) and the segment number where storm water runoff will flow from the construction site. MS4 Operator: _____ Receiving Water Body: _____ Segment: _____		

G. CERTIFICATION

I, _____
Typed or printed name *Title (Required)*

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 gather and evaluate 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 there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signature: _____ Date: _____
(Use Blue Ink)

Did you complete everything? Use this checklist to be sure!

Are you ready to mail your form to TCEQ? Go to the General Information Section of the Instructions for mailing addresses.

Have you also mailed your check and Payment Submittal Form to the Cashier's office? Go to the end of this document for the Payment Submittal Form.

Customer GP TXR150000 Notice of Intent Checklist	
<input checked="" type="checkbox"/>	This checklist is for use by the operator to ensure a complete application. Missing information may result in denial of coverage under the general permit. (See NOI Process description in the Instructions)
<input type="checkbox"/>	Application Fee was sent to TCEQ's Financial Administration and the check information is listed.
<input type="checkbox"/>	<p>OPERATOR INFORMATION - Confirm each item is complete:</p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/> Customer Number issued by TCEQ Central Registry (if you have it)</p> <p><input type="checkbox"/> Legal Name as filed to do business in Texas (Call TX SOS 512/463-5555)</p> <p><input type="checkbox"/> Operator Mailing Address is complete & verifiable with USPS. www.usps.com</p> <p><input type="checkbox"/> Phone Numbers/E-mail</p> <p><input type="checkbox"/> Type of Operator (Entity Type)</p> <p><input type="checkbox"/> Independent Operator</p> <p><input type="checkbox"/> Number of Employees</p> <p><input type="checkbox"/> For Corporations or Limited Partnerships - Tax and Filing numbers</p>
<input type="checkbox"/>	Billing Address is complete & verifiable with USPS. www.usps.com
<input type="checkbox"/>	Application Contact - a contact person for TCEQ to call is listed
<input type="checkbox"/>	<p>REGULATED ENTITY (RE) INFORMATION - Confirm each item is complete:</p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/> Regulated Entity Reference Number (RN) (if you have it)</p> <p><input type="checkbox"/> Site/Project Name/Regulated Entity</p> <p><input type="checkbox"/> Site/Project (RE) Physical Address Please do not use a rural route or post office box for a site location</p> <p><input type="checkbox"/> Latitude and Longitude http://www.tnrcc.state.tx.us/gis/drgview.html or www.terraserver.microsoft.com/advfind.aspx</p> <p><input type="checkbox"/> Standard Industrial Classification (SIC) code http://www.osha.gov/oshstats/sicser.html and business description</p> <p><input type="checkbox"/> Indian Country Lands - your answer was NO</p> <p><input type="checkbox"/> Site Mailing Address (checked same as operator or gave a complete & verifiable with USPS. www.usps.com)</p>
<input type="checkbox"/>	<p>GENERAL CHARACTERISTICS - Confirm each item is complete:</p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/> Pollution Prevention Plan (PPP) must be "Yes"</p> <p><input type="checkbox"/> Area of Land Disturbed (nearest acre)</p> <p><input type="checkbox"/> MS4 Operator, Receiving Water Body or Segment</p>
<input type="checkbox"/>	<p>CERTIFICATION</p> <p>Signature meets 30 Texas Administrative Code (TAC) §305.44 and is original.</p>



Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES General Permit (TXR150000)

General Information and Instructions

GENERAL

INFORMATION

Where to Send the Notice of Intent (NOI):

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Storm Water & Pretreatment Team; MC-228
P.O. Box 13087
Austin, Texas 78711-3087

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Storm Water & Pretreatment Team; MC-228
12100 Park 35 Circle
Austin, TX 78753

It is recommended that the NOI be mailed using a method that documents the date mailed.

TCEQ Contact list:

Application Processing Questions relating to the status and form requirements:	512/239-3700 & E-mail at "swpermit@tceq.state.tx.us"
Technical Questions relating to the general permit:	512/239-4671
Environmental Law Division:	512/239-0600
Central Records for obtaining copies of forms submitted to TCEQ:	512/239-0900
Information Services for obtaining reports from program data bases(as available):	512/239-DATA (3282)
Financial Administration's Cashier's office for receipt of payment:	512/239- 0357 or 512/239-0187

Notice of Intent Process:

When your NOI is received by the program, the form will be processed as follows:

1. Administrative Review: Each item on the form will be reviewed for a complete response. In addition, the operator's legal number must be verified with Texas Secretary of State as valid and active (when applicable). The address on the form must be verified with the US Postal service as an address receiving regular mail delivery (never give an overnight/express mailing address).
 2. Notice of Deficiency: If an item is incomplete or not verifiable as indicated above, a notice of deficiency (NOD) will be mailed to the operator. The operator will have 30 days to respond to the NOD. The response will be reviewed for completeness; and if complete,
 3. Acknowledge Coverage: We will mail an Acknowledgment Certificate to the operator. This certificate acknowledges coverage under the general permit.
- or-
- Denial of Coverage: If the operator fails to respond to the NOD, we may deny coverage under the general permit. If coverage is denied, we will notify the operator.

General Permit (Your Permit)

Provisional coverage under the general permit begins two days following the date that the NOI was postmarked. You should have a copy of the general permit when submitting your application. You may view and print the general permit for which you are seeking coverage on the TCEQ web site www.tceq.state.tx.us.

General Permit Forms

The Notice of Intent and Notice of Termination forms (with instructions) are available in Adobe Acrobat PDF format on the TCEQ web site www.tceq.state.tx.us.

Change in Operator

An authorization under the general permit is not transferable. If the operator of the regulated entity changes, the present permittee must submit a Notice of Termination and the new operator must submit a Notice of Intent. The NOT and NOI must be submitted not later than 10 days prior to the change in operator status.

Notice of Change

A Notice of Change letter must be submitted with supplemental or corrected information within 14 days following the time when the operator becomes aware that it failed to submit any relevant facts or incorrect information in the NOI; or the time when relevant facts in the NOI change (i.e. addresses, or phone numbers).

Notice of Termination

A permittee shall terminate coverage under this general permit through the submittal of a NOT when the operator or owner of the facility changes, the discharge becomes authorized under an individual permit, or the use of the property changes and is no longer subject to regulation under this general permit.

TCEQ Central Registry Core Data Form

The Core Data Form has been incorporated into this form. Do not complete and attach a core data form when submitting this application. After final acknowledgment of coverage under the general permit, the program will transfer the core data to the agency Central Registry for assignment of a Customer Number and Regulated Entity Number. You can find this information on our web site at www.tceq.state.tx.us, where you can query the Central Registry under the regulated entity number, or by your permit number under the search field labeled "Additional ID".

Fees are associated with a General Permit

The general permit refers to two different fees that apply to operators required to submit a Notice of Intent (NOI). Payment of the fees may be made by check or money order, payable to TCEQ.

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, TX 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, TX 78753

Application Fee: This is a fee that is required to be paid at the time the NOI is submitted. Failure to submit the payment at the time the application is filed will cause delays in acknowledging coverage or denial of cover under the general permit. This payment must be submitted separately using the Payment Submittal Form. If submitting one check or money order for multiple NOI's, list each site name and location exactly as provided on the NOI.

Annual Water Quality Fee: This is a fee that is assessed to operators with an active authorization under the general permit on September 1 of each year. The operator will receive an invoice for payment of the annual fee in November of each year. The payment will be due 30 days from the invoice date. A 5% penalty will be assessed if the payment is received by TCEQ after the due date. Annual fee assessments cannot be waived as long as the authorization under the general permit is active on September 1. It's important for the operator to submit a Notice of Termination (NOT) when coverage under the general permit is no longer required. A NOT is effective on the postmarked date of mailing the form to TCEQ. It is recommended that the NOT be mailed using a method that documents the date mailed.

INSTRUCTIONS FOR FILLING OUT THE FORM**A. OPERATOR** (As defined in the general permit.)**1. TCEQ Issued Customer Number (CN)**

TCEQ's Central Registry will assign each customer a number that begins with "CN," followed by nine digits. **This is not a permit number, registration number, or license number.**

- If this customer has not been assigned a Customer Reference Number, leave the space for the Customer Reference Number blank.
- If this customer has already been assigned this number, enter the operator's Customer Reference Number in the space provided.

2. Legal Name

Provide the legal name of the facility operator, as authorized to do business in Texas. The name must be provided exactly as filed with the Texas Secretary of State(SOS), or on other legal document forming the entity that is filed in the county where doing business. You may contact the SOS at 512/463-5555, for more information related to filing in Texas. If filed in the county where doing business, provide a copy of the legal documents showing the legal name.

3. Operator Mailing Address

Provide a complete mailing address for this customer to receive mail from the TCEQ. The address must be verifiable with the US Postal Service at www.usps.com for regular mail delivery (not overnight express mail). If you find that the address is not verifiable using the USPS web search, please indicate the address is used by the USPS for regular mail delivery.

If this is a street address, please follow US Postal Service standards. In brief, these standards require this information in this order:

- # the "house" number—for example, the 1401 in
1401 Main St
- # if there is a direction before the street name, the one- or two-letter abbreviation of that direction (N, S, E, W, NE, SE, SW, or NW)
- # the street name (if a numbered street, do not spell out the number—for example, 6th St, not Sixth St)
- # an appropriate abbreviation of the type of street—for example, St, Ave, Blvd, Fwy, Exwy, Hwy, Cr, Ct, Ln
- # if there is a direction after the street name, the one- or two-letter abbreviation of that direction (N, S, E, W, NE, SE, SW, or NW)
- # if there is a room number, suite number, or company mail code

City, State, and ZIP Code

Enter the name of the city, the two-letter USPS abbreviation for the state (for example, TX), and the ZIP Code. (Enter the full ZIP+4 if you know it.)

Country Mailing Information

If this address is *outside* the United States, enter the territory name, country code, and any non-ZIP mailing codes or other non-U.S. Postal Service features here. If this address is *inside* the United States, leave these spaces blank.

Operator Electronic Communications

4. Phone Number

This number should correspond to this customer's mailing address given earlier. Enter the area code and phone number here. Leave "Extension" blank if this customer's phone system lacks this feature.

5. Fax Number and E-mail Address

This number and E-mail address should correspond to operator's mailing address given earlier. (Optional Information)

6. Type of Operator

Check only one box that identifies the type of entity. Use the descriptions below to identify the appropriate entity type:

Individual	is a person and has not established a business to do whatever causes them to be regulated by us.
Sole Proprietorship— D.B.A.	is a business that is owned by only one person and has not been incorporated. This business may: <ul style="list-style-type: none"> • be under the person's name • have its own name ("doing business as," or d.b.a.) • have any number of employees
Partnership	is a business that is established as a partnership as defined by the Texas Secretary of State's Office.
Corporation	meets all of these conditions: <ul style="list-style-type: none"> • is a legally incorporated entity under the laws of any state or country • is recognized as a corporation by the Texas Secretary of State • has proper operating authority to operate in Texas.
Federal, state, county, or city government (as appropriate)	is either an agency of one of these levels of government or the governmental body itself.
Other	fits none of the above descriptions. Enter a short description of the type of customer in the blank provided.

7. Independent Operator

Check "No" if this customer is a subsidiary, part of a larger company, or is a governmental entity. Otherwise, check "Yes."

8. Number of Employees

Check one box to show the number of employees for this customer's entire company, at all locations. This is not necessarily the number of employees at the site named in this NOI.

9. State Franchise Tax ID Number	Corporations and limited liability companies that operate in Texas are issued a franchise tax identification number. If this customer is a corporation or limited liability company, enter this number here.
Federal Tax ID	All businesses, except for some small sole proprietors, should have a federal taxpayer identification number (TIN). Enter this number here. Use no prefixes, dashes, or hyphens. Individuals and sole proprietors do not need to provide a federal tax ID.
TX SOS Charter (filing) Number	Corporations and Limited Partnerships required to register with the Texas Secretary of State are issued a charter or filing number. You may obtain further information by calling SOS at 512/463-5555 or www.sos.state.tx.us
DUNS Number	Most businesses have a DUNS (Data Universal Numbering System) number issued by Dun and Bradstreet Corp. If this customer has one, enter it here.
B. BILLING ADDRESS	
An annual fee is assessed to an operator holding an active authorization under the general permit September 1 of each year. Provide the complete mailing address where the annual fee invoice should be mailed. Verify the address with the USPS ensuring it to be an address for delivery of regular mail (not overnight express mail). Also, provide a phone number of the office responsible for payment of the invoice. The operator is the responsible billing client for payment of annual fee.	
C. APPLICATION CONTACT	
Provide the name, title and communication information of the person that TCEQ can contact for additional information regarding this application.	
D. REGULATED ENTITY (RE) INFORMATION ON PROJECT OR SITE	
1. Regulated Entity Reference Number (RN)	This is a number issued by TCEQ's Central Registry to sites regulated by TCEQ (a location where a regulated activity occurs). This is not a permit number, registration number, or license number.
	<ul style="list-style-type: none"> If this Regulated Entity has not been assigned a Regulated Entity Number, leave the space for the Regulated Entity Number blank. If this customer has already been assigned this number, enter the operator's Regulated Entity Number.
2. Site/Project Name/Regulated Entity	Provide the name of the site as known by the public in the area where the site is located. The name you provide on this application will be used in the TCEQ Central Registry as the Regulated Entity. A regulated entity number will be assigned by Central Registry, if this is a new site (not currently regulated by TCEQ).
3. Site/Project (RE) Physical Address	Enter the complete address of where the site is located. This address must be validated through US Postal Service or your local police (911 service) as a valid address. Please confirm this to be a complete and valid address. In some rural areas, new addresses are being assigned to replace rural route addresses. Please do not use a rural route or post office box for a site location.
	Provide the county, city and ZIP code of the area where the project/site is located. This information is required to complete the processing of your form.
4. No Physical Address	If a site does not have an actual physical address that includes a street (or house) number and street name, enter NO ADDRESS for the street name. Then provide a complete written location access description. <i>For example:</i> "The site is located 2 miles west from intersection of Hwy 290 & IH35, locate on the southwest corner of the Hwy 290 South bound lane."
	For projects/sites that includes a large project area, describe the project. <i>For example:</i> "State Highway 45 road project between Highway 620 and IH 35."

5. Latitude and Longitude

Enter the latitude and longitude of the site in either degrees, minutes, and seconds or decimal form. For help obtaining the latitude and longitude, go to: <http://www.tnrcc.state.tx.us/gis/drgview.html> or www.teraserver.microsoft.com/advfind.aspx.

6. Standard Industrial Classification (SIC) code

Provide the SIC code that best describes the activity being conducted at the site. Common SIC Codes related to construction activities include: 1521 Construction of Single Family Homes; 1522 Construction of Residential Bldgs. Other than Single Family Homes; 1541 Construction of Industrial Bldgs. and Warehouses; 1542 Construction of Non-residential Bldgs. other than Industrial Bldgs. and Warehouses; 1611 Highway & Street Construction, except Highway Construction; 1622 Bridge, Tunnel, & Elevated Highway Construction; 1623 Water, Sewer, Pipeline & Communications, and Power Line Construction. For help with SIC codes, go to: <http://www.osha.gov/oshstats/sicser.html>

7. Description of Activity Regulated

Provide a description of the activity being conducted at the site. This must be a description specific to what you are doing that requires this authorization. (Do not repeat the SIC Code)

8. Indian Country Lands

If your site is located on Indian Country Lands, the TCEQ does not have authority to process your application. You must obtain authorization through EPA, Region VI, Dallas. **Do not submit this form to TCEQ.**

E. SITE MAILING ADDRESS

Provide a complete mailing address to be used by TCEQ for receiving mail at the site. In most cases, the address is the same as the operator. If so, simply place a check mark in the box. If you provide a different address, please verify the address with USPS as noted above for the operator address.

F. GENERAL CHARACTERISTICS

1. Pollution Prevention Plan (PPP)

This plan identifies the areas and activities that could produce contaminated runoff at your site and then tells how you will ensure that this contamination is mitigated. For example, in describing your mitigation measures, your site’s plan might identify the devices that collect and filter storm water, tell how those devices are to be maintained, and tell how frequently that maintenance is to be carried out. **You must develop this plan in accordance with the TCEQ general permit requirements. This plan must be developed and implemented before you complete this NOI.** This plan must be available for a TCEQ investigator to review on request.

2. Estimated Area of Land Disturbed

Provide the approximate number of acres that the construction site will disturb. Construction activities that disturb less than one acre, unless they are part of a larger common plan that disturbs more than one acre, do not require permit coverage. Construction activities that disturb between one and five acres, unless they are part of a common plan that disturbs more than five acres, do not require submission of an NOI. Therefore, the estimated area of land disturbed should not be less than five, unless the project is part of a larger common plan that disturbs five or more acres. If the acreage is less than 1, enter 1. “Disturb” means any clearing, grading, excavating, or other similar activities. If you have any questions about this item, please call the storm water technical staff at (512)239-4671.

3. Receiving Water Body

The storm water from your site eventually reaches a receiving water body such as a local stream or lake, possibly via a drainage ditch. The discharge may initially be into a municipal separate storm sewer system (MS4). If applicable, provide the name of the entity that operates the MS4 where the storm water discharges. An MS4 operator is often a city, town, or utility district, but possibly another form of government.

You must provide the name of the water body that receives the discharge from the construction site (a local stream or lake). Storm water may be discharged directly to a receiving stream or through a MS4. If known, please include the segment number if the discharge is to a classified water body.

G. OPERATOR CERTIFICATION

The certification must bear an original signature of a person meeting the signatory requirements specified in under 30 Texas Administrative Code (TAC) §305.44. The printed name and title of the person signing the form must be provided. NOI forms with stamped or copied signatures will not be processed.

IF YOU ARE A CORPORATION:

The regulation that controls who may sign an NOI or similar form is 30 Texas Administrative Code §305.44(a)(1) (see below). According to this code provision, any corporate representative may sign an NOI or similar form so long as the authority to sign such a document has been delegated to that person in accordance with corporate procedures. By signing the NOI or similar form, you are certifying that such authority has been delegated to you. The TCEQ may request documentation evidencing such authority.

IF YOU ARE A MUNICIPALITY OR OTHER GOVERNMENT ENTITY:

The regulation that controls who may sign an NOI or similar form is 30 Texas Administrative Code §305.44(a)(3) (see below). According to this code provision, only a ranking elected official or principal executive officer may sign an NOI or similar form. Persons such as the City Mayor or County Commissioner will be considered ranking elected officials. In order to identify the principal executive officer of your government entity, it may be beneficial to consult your city charter, county or city ordinances, or the Texas statute(s) under which your government entity was formed. An NOI or similar document that is signed by a government official who is not a ranking elected official or principal executive officer does not conform to §305.44(a)(3). The signatory requirement may not be delegated to a government representative other than those identified in the regulation. By signing the NOI or similar form, you are certifying that you are either a ranking elected official or principal executive officer as required by the administrative code. Documentation demonstrating your position as a ranking elected official or principal executive officer may be requested by the TCEQ.

If you have any questions or need additional information concerning the signatory requirements discussed above, please contact the Texas Commission on Environmental Quality's Environmental Law Division at 512/239-0600.

30 Texas Administrative Code

§305.44. Signatories to Applications.

(a) All applications shall be signed as follows.

(1) For a corporation, the application shall be signed by a responsible corporate officer. For purposes of this paragraph, a responsible corporate officer means a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. Corporate procedures governing authority to sign permit or post-closure order applications may provide for assignment or delegation to applicable corporate positions rather than to specific individuals.

(2) For a partnership or sole proprietorship, the application shall be signed by a general partner or the proprietor, respectively.

(3) For a municipality, state, federal, or other public agency, the application shall be signed by either a principal executive officer or a ranking elected official. For purposes of this paragraph, a principal executive officer of a federal agency includes the chief executive officer of the agency, or a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., regional administrator of the EPA).

**Texas Commission on Environmental Quality
General Permit Payment Submittal Form**

Use this form to submit your Application Fee.

- Complete items 1 through 4 below:
- Staple your check in the space provided at the bottom of this document.
- Do not mail this form with your NOI form.
- Do not mail this form to the same address as your NOI. Instead, mail this form and your check to:

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, TX 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, TX 78753

To confirm receipt of payment, call the Cashier's office at 512/239- 0357 or 239-0187.

Fee Code: **GPA**

General Permit: **TXR150000**

1. Check / Money Order No:

2. Amount of Check/Money Order:

3. Date of Check or Money Order:

4. Name on Check or Money Order:

5. NOI INFORMATION

If the check is for more than one NOI, list each Project/Site (RE) Name and Physical Address exactly as provided on the NOI. **DO NOT SUBMIT A COPY OF THE NOI WITH THIS FORM AS IT COULD CAUSE DUPLICATE PERMIT ENTRIES.**

See Attached List of Sites *(If more space is needed, you may attach a list.)*

Project/Site (RE) Name:

Project/Site (RE) Physical Address:

Staple Check In This Space

TCEQ Construction Site Notice Forms

Note: Construction Site Notice For Small Construction Sites (1 to less than 5 acres).



CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program
TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: (Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	
Location of Storm Water Pollution Prevention Plan :	

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

Signature and Title

Date

Note: Construction Site Notice For Large Construction Sites (5 acres or more). Use of this form is optional for large sites; however, the information must be posted in addition to the NOI.



CONSTRUCTION SITE NOTICE

FOR THE

Texas Commission on Environmental Quality (TCEQ)

Storm Water Program

TPDES GENERAL PERMIT TXR150000

This notice applies to construction sites operating under Part II.D.3. of the TPDES General Permit Number TXR150000 for discharges of storm water runoff from construction sites equal to or greater than five acres, including the larger common plan of development. This is an optional notice which contains information required in Part III.D.2. of the general permit. This information should be posted along with a signed copy of the Notice of Intent. Additional information regarding the TCEQ storm water permit program may be found on the internet at:

www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

TPDES Permit Number:	
Contact Name and Phone Number:	
Project Description: <i>Physical address or description of the site's location, and Estimated start date and projected end date, or date that disturbed soils will be stabilized.</i>	
Location of Storm Water Pollution Prevention Plan (SWP3):	

**TCEQ Notice of Termination (NOT)
Form and Instructions**



Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20023-Instructions).

TCEQ Office Use Only

TPDES Permit Number: TXR15__ __ __ __ __ __ __ __ __ __ NO
GIN Number: __ __ __ __ __ __ __ __ __ __

A. TPDES Permit Number: TXR15_____

B. Construction Site Operator Customer Reference Number: CN _____
Name: _____
Mailing Address: _____
City: _____ State: -- _____ Zip Code: _____
Country Mailing Information (if outside USA) Territory: _____ Country Code: _____ Postal Code: _____
Phone Number: _____ Extension: _____ Fax Number: _____
E-mail Address: _____

C. Project / Site Information Regulated Entity Reference Number: RN _____
Name: _____
Physical Address: _____
Location Access Description: _____
City: _____ County: -- _____ Zip Code: _____

D. Contact - If the TCEQ needs additional information regarding this termination, who should be contacted?
Name: _____ Title: _____
Phone Number: _____ Extension: _____ Fax Number: _____
E-mail Address: _____

E. Certification
I certify under penalty of law that authorization under the TPDES Construction General Permit (TXR150000) is no longer necessary based on the provisions of the general permit. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with construction activity under the general permit TXR150000, and that discharging pollutants in storm water associated with construction activity to waters of the U.S. is unlawful under the Clean Water Act where the discharge is not authorized by a TPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Construction Site Operator Representative:

Prefix: _____ First: _____ Middle: _____
Last: _____ Suffix: _____
Title: _____
Signature: _____ Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671. Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOT must be mailed to the following address:

**Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087**

Completing the Notice of Termination for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

Who May File a Notice of Termination (NOT) Form

Permittees disturbing 5 acres or more (or part of a larger common plan of development or sale disturbing 5 acres or more) who are presently covered under the Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit must submit a Notice of Termination (NOT) when final stabilization has been achieved on all portions of the site that is the responsibility of the permittee; or another permitted operator has assumed control over all areas of the site that have not been finally stabilized and all silt fences and other temporary erosion controls have either been removed, scheduled for removal as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage. Erosion controls that are designed to remain in place for an indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal.

Final Stabilization occurs when either of the following conditions are met:

- (a) All soil disturbing activities at the site have been completed and a uniform (e.g. evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.
- (b) For individual lots in a residential construction site by either:
 - (1) the homebuilder completing final stabilization as specified in condition (a) above; or
 - (2) the homebuilder establishing temporary stabilization for an individual lot prior to the time of transfer of the ownership of the home to the buyer and after informing the homeowner of the need for, and benefits of, final stabilization.
- (c) For construction activities on land used for agricultural purposes (e.g. pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to a surface water and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization conditions of condition (a) above.

A. TPDES Permit Number

Provide the TPDES permit number assigned to the operator of the construction site.

B. Construction Site Operator Information

Customer Reference Number

This number designates the operator's status as a TCEQ "customer"—in other words, an individual or business that is involved in an activity that we regulate. We assign each customer a number that begins with "CN," followed by nine digits. **This is not a permit number, registration number, or license number.** In the remainder of this section, we will use "this customer" to mean the operator for Part B of the form.

- If this customer has not been assigned a Customer Reference Number, leave the space for the Customer Reference Number blank.
- If this customer has already been assigned this number, enter the operator's Customer Reference Number.
- **Do not enter a permit number, registration number, or license number in place of the Customer Reference Number.**

Name

Enter the legal name of this customer as authorized to do business in Texas. Include any abbreviations (LLC, Inc., etc.).

Mailing Address

Enter a central and general mailing address for this customer to receive mail from the TCEQ. For example, if this customer is a large company, this address might be the corporate or regional headquarters. On the other hand, for a smaller business, this address could be the same as the site address.

If this is a street address, please follow US Postal Service standards. In brief, these standards require this information in this order:

- the "house" number—for example, the 1401 in 1401 Main St
- if there is a direction before the street name, the one- or two-letter abbreviation of that direction (N, S, E, W, NE, SE, SW, or NW)
- the street name (if a numbered street, do not spell out the number—for example, 6th St, not Sixth St)
- an appropriate abbreviation of the type of street—for example, St, Ave, Blvd, Fwy, Exwy, Hwy, Cr, Ct, Ln
- if there is a direction after the street name, the one- or two-letter abbreviation of that direction (N, S, E, W, NE, SE, SW, or NW)
- if there is a room number, suite number, or company mail code

City, State, and ZIP Code

Enter the name of the city, the two-letter USPS abbreviation for the state (for example, TX), and the ZIP Code. (Enter the full ZIP+4 if you know it.)

Country Mailing Information

If this address is **outside** the United States, enter the territory name, country code, and any non-ZIP mailing codes or other non-U.S. Postal Service features here. If this address is **inside** the United States, leave these spaces blank.

Phone Number and Extension

This number should correspond to this customer's mailing address given earlier. Enter the area code and phone number here. Leave "Extension" blank if this customer's phone system lacks this feature.

Fax Number

This number should correspond to this customer's mailing address given earlier. Enter the area code and fax number here.

E-mail Address

As with the mailing address, this should be a general address that is appropriate for e-mail to this customer's central or regional headquarters, if applicable.

C. Project / Site Information

Regulated Entity Reference Number

This number designates this site's status as a TCEQ "regulated entity"—in other words, a location where an activity that we regulate occurs. We assign each regulated entity a number that begins with "RN," followed by nine digits. ***This is not a permit number, registration number, or license number.***

- If this site has not been assigned a Regulated Entity Reference Number, leave the space for the Regulated Entity Reference Number blank.
- If this site has already been assigned this number, enter the Regulated Entity Reference Number.
- ***Do not enter a permit number, registration number, or license number in place of the Regulated Entity Reference Number.***

Name

Enter the name by which you want this site to be known to the TCEQ.

Physical Address

Enter the physical address of the site itself. TCEQ staff should be able to use this address to find the site.

Location Description

Enter a physical description of the location of the site based on highway intersections and/or permanent landmarks.

City, County, and ZIP Code

Enter the name of the city, the county, and the ZIP Code. (Enter the full ZIP+4 if you know it.)

D. Contact

Give all the relevant information for the person whom TCEQ can contact if there are questions about any of the information on this form—perhaps the same person who completed the form.

E. Certification

The operator must sign and date this statement to validate this NOI. Be sure to enter the full legal name of the person signing the form and the relevant title—for example, "Operator," "Operator's attorney," or "Senior Site Manager." Use the "Prefix" blank for such titles as Dr., Mr., or Ms., as desired. Use the "Suffix" blank for such designations as Ph.D., Jr., Sr., III, or J.D., if applicable.

For a corporation, the application shall be signed by a responsible corporate officer. A responsible corporate officer means a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. Corporate procedures governing authority to sign permit applications may provide for assignment or delegation to applicable corporate positions rather than to specific individuals.

For a partnership or sole proprietorship, the application shall be signed by a general partner or the proprietor, respectively.

For a municipality, state, federal, or other public agency, the application shall be signed by either a principal executive officer or a ranking elected official. For purposes of this application, a principal executive officer of a federal agency includes the chief executive officer of the agency, or a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. regional administrator of the United States Environmental Protection Agency).

Questions?

If you have questions about any of the information on this form, contact our Storm Water Program at 512/239-4671 or look for "Storm Water" on our Web site:

www.tceq.state.tx.us

**Example Format for
Notice of Change (NOC) Letter**

Notice of Change Letter

(Note: This example includes the information identified in the Construction General Permit for a Notice of Change letter.)

This letter is to inform you that there has been a change in information for the following Construction Site Operator:

Customer Reference Number: CN_____

ORIGINAL INFORMATION

Construction Site Operator

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

INFORMATION CHANGED

Construction Site Operator

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

APPENDIX E

REFERENCES

REFERENCES

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