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16. Abstract

Achieving the maximum environmental benefits of an entire project's lifetime (planning and design phase, construction and maintenance) has become an important goal for the Texas Department of Transportation (TxDOT). With the implementation of the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) permitting requirements in 1992, an increased awareness and pro-active stormwater management program has been developed in TxDOT. During the past twenty years, there has been a proliferation of erosion and sediment control products and methods developed by the erosion industry. Industry standards have not kept up with the rapid changes; therefore, education, testing, and applications vary across the country. Designers need to have the appropriate guidance to be able to meet the demands placed on them today. The researchers evaluated the difficulties encountered during the design and selection process for developing stormwater pollution prevention plans (SW3P) and provided guidance in the following areas: erosion and sediment control functions, application areas, nomenclature, steps to select measures, erosion principles, and erosion prediction factors. Design aids developed include the following: PC-based computer program for SW3P reporting and selection procedures and a final report that includes a glossary for cross-referencing other publications and updated VM and K reference tables.

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TEMPORARY EROSION CONTROL SELECTION
TAMUBMP COMPUTER PROGRAM

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IMPLEMENTATION STATEMENT

The computer program developed from the research work conducted for study 0-1379 will have immediate application in the planning and design of stormwater management for construction (and maintenance) sites. Work accomplished by the researchers was utilized as a basis for this user-friendly PC-based computer program. The technical panel and research team intended this program to be used as a design aid or tool that would provide guidance to the designers in the districts. Selection of temporary erosion and sediment control measures is not an absolute science. Therefore, design guidelines and tools used to estimate, select, and specify these measures should be considered as an *acceptable* decision-making method that will require modifications to meet local, state, and federal regulations.

DISCLAIMER

AUTHOR'S DISCLAIMER

The contents of this document reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Texas Department of Transportation (TxDOT) or the Federal Highway Administration (FHWA). This report does not constitute a standard, specification, or regulation.

PATENT DISCLAIMER

There was no invention of discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine, manufacture, design or composition of matter, or any new useful improvement thereof, or any variety of plant, which is or may be patentable under the patent laws of the United States of America or any foreign country.

TABLE OF CONTENTS

SUMMARY xi

INTRODUCTION 1

SITE DEFINITION CRITERIA 5

CREATE APPLICATION 7

TEMPORARY EROSION OR SEDIMENT CONTROL MEASURE SELECTION 9

REPORT PREPARATION 11

SUMMARY

Land disturbing activities such as construction and maintenance operations within the highway rights-of-way are necessary to meet the demands for the traveling public and continuing movement of goods. Unfortunately, these activities are a major cause of erosion and resultant receiving waters' pollution. If not treated promptly and adequately, erosion-related impacts can include habitat changes, increased erosion and sediment losses, and increased pollutant loads.

Achieving the maximum environmental benefits of an entire project's lifetime (planning and design phase, construction, and maintenance) has become an important goal for the Texas Department of Transportation (TxDOT). With the implementation of the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permitting requirements in 1992, an increased awareness and pro-active stormwater management program has been developing in TxDOT. Guides have been developed to inform practitioners about recommended vegetation establishment and construction of temporary erosion and sediment control practices within the Department. An advisory team was formed to provide education and guidance on an as needed basis. These actions have positively impacted the Department; however, problems encountered in the field and on the design board warranted further efforts.

During the past twenty years, there has been a proliferation of erosion and sediment control products and methods developed by the erosion industry. Industry standards have not kept up with the rapid changes. Education, testing, and applications vary widely from one region to another. To meet the stringent environmental requirements placed on agencies today, designers need appropriate guidance on planning, designing, and selecting best management practices for construction (and maintenance) sites. This research study was initiated to develop design guidelines that would complement TxDOT's existing efforts and provide guidance for further erosion and sediment control research.

Researchers evaluated the difficulties experienced during the design and selection process and provided guidance on several issues. Temporary erosion and sediment control planning was defined by the development of functional and application areas. A working glossary of terms was created for cross-referencing other existing erosion manuals. A strategy for selecting measures by understanding basic erosion principles was developed. Erosion prediction factors, vegetative measures (VM) and soil erodibility (K), were consolidated from actual research data generated at the TxDOT/TTI Hydraulics and Erosion Control Laboratory as well as estimated values from existing literature. The most comprehensive tool developed was a PC-based computer program that helps the designer to select the appropriate best management practice, as recommended by TxDOT, and report generation capability for the stormwater pollution prevention plans (SW3P).

INTRODUCTION

This document contains user information for the PC-based computer program developed by the research team for temporary erosion (and sediment) control methods in 1993. Generally the program processes information given by the designer to choose recommended temporary erosion and sediment controls as approved by the Texas Department of Transportation (TxDOT). The program is intended for use as a design aid. The information contained in the program is based on the following resources: TxDOT Stormwater Management for Construction Sites Manual (1993), the U.S.D.A. Soil Conservation Service soil survey information, TxDOT Standard Specifications for the Construction of Highways, Streets and Bridges (1993), A Practical Guide to the Establishment of Vegetative Cover on Highway Rights-of-Way, TxDOT, (1993), and the many sources used in research study 1379 - Temporary Erosion Control Methods. Updates to the program will be necessary as additional information is obtained. The diagram below (Figure 1) illustrates the sequence of information necessary to run the computer program.

Temporary Erosion Control Computer Program

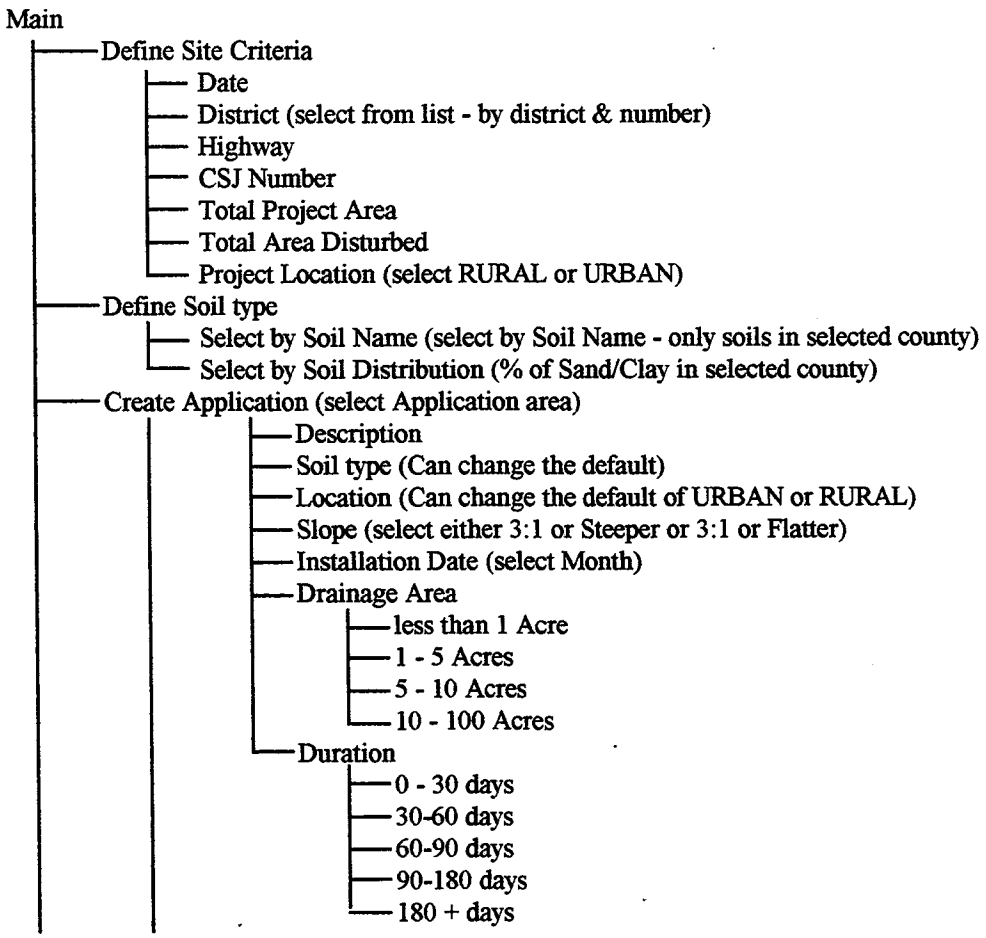
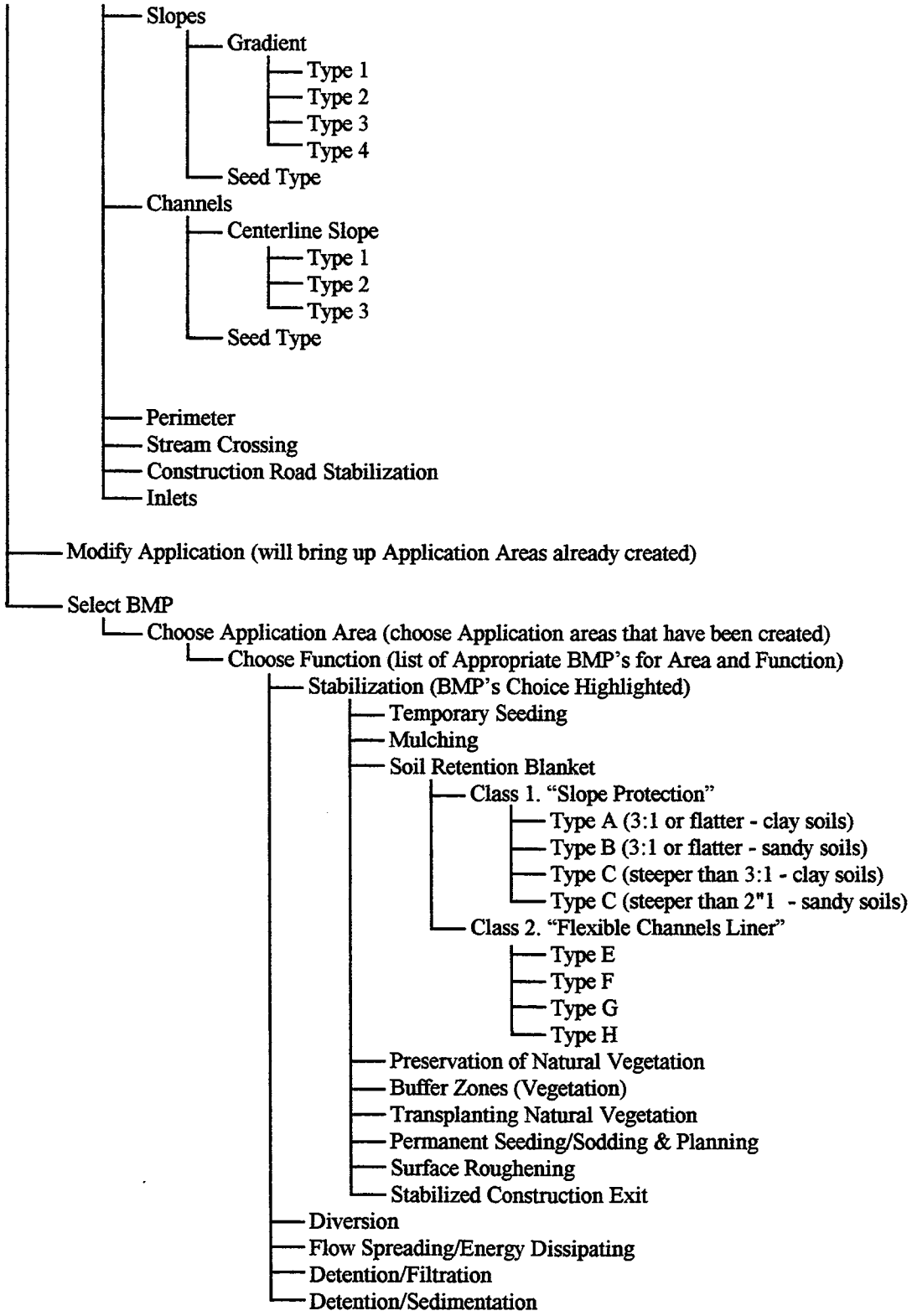


Figure 1. TAMUBMP Computer Program Diagram

Figure 1. TAMUBMP Computer Program Diagram (continued)



Before loading the Temporary Erosion Control computer program, create a directory or subdirectory where the program will reside. Once this is done, switch to this directory and insert the program disk into the computer floppy drive. Copy the program files from the floppy disk to the directory. Now the program is present on the user's hard-drive. To start the program, type *TAMUBMP* at the directory prompt. This will start the program and place you in the main program directory.

SITE DEFINITION CRITERIA

First, the user will need to complete the site definition criteria. This information will provide valuable background information for control selection. Specific information requested includes the following.

- **Today's date**: The current date is filled by default but may be modified by the user if necessary.

- **District**: Upon entering this field, a selection window will pop-up containing all of the Texas districts. The user may select a district with the arrow keys and press *return* to accept or *escape* to ignore. This value must be entered because it relates the standard seeding mixtures.

- **County**: Upon entering this field, a selection window will pop-up containing all counties in the above referred district. The same controls for selection apply as those for district selection. This value must be entered.

- **Highway**: An optional highway field may be entered. This information may be helpful for the designer who chooses to use this program for report generation.

- **CSJ Number**: An optional CSJ number may be entered. This information may be helpful for the designer who chooses to use this program for report generation.

- **Total Project Area**: A value representing the total project area is entered here. This value must be entered.

- **Total Area Disturbed**: A value representing the total area disturbed is entered here. This value must be entered.

- **Project Location**: This field may be toggled between rural and urban. This value must be entered as it relates to selecting the appropriate seeding mixture.

- **Select Soil Type**: This section allows the user to select the default soil type. The program allows flexibility in selecting the soil type by either of the following methods.

  Select by Soil Distribution: The percentages of sand and clay soils for the current district and county will be displayed in a selection window. The user can use the arrow keys to select either clay or sand, pressing *return* to accept and *escape* to ignore.

Select by Soil Name: All soils present in the current district and county are displayed by symbol, common name and type. The user may select an entry in the list in the same manner as above.

CREATE APPLICATION

This section allows the user to define multiple applications for their project to meet site specific needs.

- **Description**: A text string used to describe the application may be entered here.

- **Soil Type**: This value defaults to the value selected above in *Select Soil Type*, but may be changed for this particular application.

- **Location**: This value defaults to the value selected above in *Define Site Criteria,* but may be changed for this application.

- **Slope**: This field may be toggled between *3:1 or Steeper* or *3:1 or Flatter*.

- **Installation Date**: This relates the time of year to the appropriate seeding mixture used and must be entered. The user may select any of the 12 months of the year.

- **Drainage Area**: This field may be toggled between: *less than 1 acre, 1 - 5 acres, 5 - 10 acres,* or *10 - 100 acres*. (Metric equivalents were not used in this version. A soft conversion would equate to the following: less than 0.405 hectares, 0.405 - 2.025 hectares, 2.025 - 4.05 hectares, and 4.05 - 40.5 hectares, respectively.)

- **Duration**: Duration refers to the length of time that the temporary erosion or sediment control measure will be necessary for a particular application area. The designer's best estimate of this time should correspond to the amount of working days allotted for project phases. This field may be toggled between: *0 - 30 days, 30 - 60 days, 60 - 90 days, 90 - 180 days,* or *180+ days.*

- **Type**: This field describes the type of application to be protected: *Slope, Channel, Perimeter, Stream Crossing, Construction Road Stabilization,* or *Inlet.* Additional reference information may be found in the research report 0-1379, *Temporary Erosion Control Measures Design Guidelines for TxDOT* (1994) or *TxDOT's Stormwater Management Guidelines for Construction Activities* (1993).

- **Modify Application**: This section allows the user to modify a previously created application. It functions the same as *Create Application* does.

TEMPORARY EROSION OR SEDIMENT CONTROL MEASURE SELECTION

This section allows the user to choose a temporary erosion or sediment control based upon the background information entered in an interactive mode. For each application area, the user picks *select BMP* (best management practices) which causes the list of user-created applications to appear. The user then selects one of the application areas, which causes a "window" to appear onscreen. The window prompt waits for the user to select a function that in turn causes a list of temporary erosion or sediment controls or BMPs to appear onscreen. The user may select any of the BMPs that appear on the list. This list reflects the currently approved temporary erosion or sediment controls as recommended by TxDOT.

The designer has flexibility to select from the list to meet specific needs. Consideration for associated factors in temporary erosion and sediment control selection such as labor requirements, cost-effectiveness (using locally available materials or fluctuating market costs), and previous experience should be included in the final selection of any measure. The program was designed as a guidance tool for plan preparation and report preparation and should not be thought of as an absolute answer for all situations.

REPORT PREPARATION

This section allows the user to create a report of his work that details the site definition criteria, created applications, and selected BMPs. The following output options are available: onscreen report viewing, writing to a disk drive, or sending to a printer. To begin the report generation process, the user must select *Create Report* from the main menu. The user will be prompted to enter an output option as listed below.

- **Report to Screen**: Creates the report and displays it in a window on the screen. The user may scroll through the report with the arrow keys.

- **Report to Disk**: Creates the report and prompts the user for a filename in which to save the report (as a text file).

- **Report to Printer**: Creates the report and prompts the user for a communications port in which to send the report.

Once the report has been generated, the *Options* section allows the user to save and load data and also to reset the program. By selecting one of these options, the following tasks will be initiated.

- **Load Data**: Displays a list of the current directory. The user can navigate the list with the arrow keys to select the appropriate file for loading.

- **Save Data**: Prompts the user for a filename in which to save the current data. It is recommended that the user save the created file for reference, future modifications, or project data storage.

- **Program Reset**: Resets all values to their initial state.