EROSION PREVENTION AND SEDIMENT CONTROL IN GEORGIA

A Development Guide to Risk Management and Cost Control

Produced by
Erosion and Sedimentation Control Technical Study Committee (Dirt II Panel)[1]
Ben Dysart, Chair

Prepared with grant assistance from the Georgia Department of Natural Resources, Environmental Protection Division and administered through the Chattahoochee-Flint Regional Development Center.

[1]The Erosion and Sedimentation Control Technical Study Committee was authorized by S.R. 252 and the Senate Storm-Water Study Committee of the 1993 Georgia General Assembly. The members were appointed by Lt. Governor Pierre Howard.

TABLE OF CONTENTS

Executive Summary, Dirt II Panel

Part 1: Will There Be Water for Georgia in 10 Years _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ **4**
- What's All the Fuss About?
- Why is Erosion and Sediment Control Important?
- Georgia's Clay Soils Cause Problems
- Good Site Management Makes Good Business Sense

Part 2: Risk Management & Cost Control _ **7**
- Understanding Local, State, and Federal Laws
- Consider the Cost of Erosion Prevention and Sediment Control Before You Acquire or Develop a Site
- Can You Make an Acceptable Profit?
- Insist on a Plan that Works
- Set the Tone for Compliance

Part 3: Design & Planning _ **8**
- Assemble a Qualified Team of Professionals
- Design the Project to Reduce Risk
- Consider Seasons When Scheduling Development
- Require a Thorough and Realistic Erosion Prevention and Sediment Control Plan and Budget
- Invest in Training
- Plan to Be in Compliance

Part 4: Techniques to Improve Soil Erosion Management _ _ _ _ _ _ _ _ _ _ _ _ **10**
- Leave Stream Buffers and Other Undisturbed Vegetative Cover
- Minimize Disturbed Area and Reduce Amount of Time Land is Disturbed
- Install Perimeter Controls First
- Install Appropriate Controls Before Each Major Stage of Earthwork
- Re-Vegetate or Mulch Disturbed Soil Immediately
- Keep Clean Water Clean
- Slow Down the Water and Avoid Concentrated Water Flows
- Don't Let Soil Particles Get Into the Water
- Create a System of Controls That Function Together
- Use Passive De-Watering Systems
  - — Seep Berm
  - — Floating Siphon
  - — Sand Filter
- Design Controls That Will Provide Short-term Sediment Control during Construction and Long-term Storm Water Management Systems Once the Site is Occupied

Part 5: The Big Creek Elementary School Demonstration Site _ _ _ _ _ _ _ _ _ _ _ _ **15**

EXECUTIVE SUMMARY

Key development decision makers are involved in a critical series of choices that determine water quality in Georgia's streams and lakes. As awareness grows among citizens and business leaders about the importance of our limited water resources, there are increasing expectations of us all to protect these resources.

While we recognize the importance of the construction industry in the economic success of our state, the general crisis in water quality we now face as a result of sediment from construction sites pouring into the Chattahoochee basin puts the continuing economic health of our region at risk.

These common-sense guidelines — developed by professionals for professionals — are results-oriented and cost-effective. They identify current state-of-practice approaches. They aren't rocket science. When implemented and supported by all the parties, they can make possible a paradigm shift in the way disturbed sites are managed and in the water quality of our streams.

The broad membership of Dirt II reached an early consensus that no one affected by development — including developers, contractors, design professionals, government officials at all levels, public-interest advocates, and citizens at large — was well served by formerly-accepted approaches to sedimentation control.

Much too often, that approach meant accepting wasted on-site money and major off-site costs. Erosion prevention and sediment control plans didn't perform, waters of the state were degraded, business risks were not well-managed. Community as well as official expectations were unheeded, and there was much frustration in general for the public, regulators, design professionals and developers. All agreed that something very different was needed. And it was agreed that all the parties had a direct responsibility to make the shift to cost-effective protection of public waters a reality.

The changes outlined in this guide are relatively simple and inexpensive, but by adopting them you'll make a significant difference in Georgia's water quality.

Georgia has long recognized the need for a hard look at the soil erosion prevention and sediment control issue. This non-technical guide is the product of a broad-based technical study committee established by former Lt. Governor Pierre Howard at the request of a Georgia Senate committee on erosion and sedimentation.

It draws together the real-world experience of many leaders in the industry — developers, contractors, design professionals, site managers, government regulators, environmental experts and others. It is written in common-sense language and should save you months of delays, shutdowns, fines, embarrassment, and many dollars. We hope this guide will move you to make erosion prevention and sediment control the priority it should be early in the planning process in your future projects, and give you some common sense, cost-effective ways to go about it.

Ben Dysart, Chair, Dirt II Panel

PART 1: WILL THERE BE WATER FOR GEORGIA IN 10 YEARS?

WHAT'S ALL THE FUSS ABOUT?

Georgia's streams, rivers, lakes and wetlands are getting muddier and filling with dirt at an alarming rate. In the metro Atlanta region, most of this dirt is coming from land clearing and construction sites. As a result, Georgia's regulatory control of the development process has had to become a lot tougher.

Since 1975, state law has regulated construction projects over 1.1 acres. As of August 1, 2000, the state requires a National Pollutant Discharge Elimination System (NPDES) permit for all construction projects disturbing five acres or greater. This permit restricts the amount of dirt that can be discharged into local streams. The five-acre threshold drops to one acre in 2003.

Qualified erosion prevention and sediment control professionals know how to minimize soil erosion and protect public waters. But to provide effective site designs, they must have the support of the development community — site owners, the financial community, designers, architects, engineers, builders, contractors, subcontractors and vendors, as well as government agencies and elected officials. All these key figures must be in agreement that control of soil erosion and sediment is a real priority.

"Now everybody's on a level playing field. Whether you're a home builder, a commercial developer, apartment builder, everybody has to comply with the same laws. So there shouldn't be any complaints about, 'It costs too much.' Everybody has to do it. It's just like safety, you need to do it as job number one. Erosion control and the environment are important."

John Farmer
Senior Project Manager, Beck Company

WHY IS EROSION PREVENTION & SEDIMENT CONTROL IMPORTANT?

Muddy, clouded and turbid water are all forms of pollution. Sediment can contain bacteria, nutrients, chemicals and other pollutants that can poison people, aquatic life and animals. But that's just one serious outcome of uncontrolled or poorly controlled runoff in Georgia streams and lakes.

This runoff has economic impacts as well. Uncontrolled runoff damages downstream property owners and the public. And when sediment fills in our creeks and rivers, there is less room for water flow. The result — dangerous and expensive flooding.

If our waterways become contaminated, people will be unable to fish, swim and boat. Businesses built around these recreation industries — marinas, hotels, restaurants, store owners — will all lose money. And decreased property values hurt everyone who lives on degraded streams and lakes.

This is just one example of the economic impact of uncontrolled or poorly controlled run-off from construction sites. The sediment problem has become so great, so threatening, that it — along with other well-recognized environmental quality issues — is threatening the booming economy of our region as well as our citizens' quality of life.

As dirt fills reservoirs, there is less storage volume for water. So we have less water in reserve during dry seasons and droughts. And when sediment clogs the pipes and filters of drinking water treatment plants, it becomes much more expensive to produce clean water and harder to guarantee that our tap water is safe.

"The Dog River reservoir went into operation in 1991 and that is where Douglas County gets most of its drinking water. Unfortunately we've acquired so much silt since that time that we're having to haul about 80,000 cubic yards of silt out of our reservoir. That's about 100 truckloads a day evey working day for four months, paid for by taxpayers.

"It's the proverbial 'pay me now or pay me later.' The homeowner is going to pay for it one way or another — in the price of their house or when they get a water bill from us. I think that when you look at all the costs involved and all the issues, it's better to do it right the first time rather than correcting it at the end."

Pete Frost
Executive Director, Douglas County Water & Sewer Authority, Douglasville, Georgia

GEORGIA'S CLAY SOILS CAUSE PROBLEMS

The fine clay particles of Georgia soils are easy to erode, create muddy water and are the primary cause of damaging turbidity in our streams and lakes. Clay particles stay in the water and are carried downstream, while coarser soil particles like sand and silt will settle out quickly and are easier to retain on the job site with traditional methods.

Reducing the velocity or speed of the water results in less erosion, more soil retention on the job site and less muddy water.

GOOD SITE MANAGEMENT MAKES GOOD BUSINESS SENSE

While you are focusing on getting your project designed, financed and built, regulators, legislators and the community are focusing on the amount of water and the pollutants in it as the water comes off your site. If your run-off decreases the quality of the water in the streams of our state or alters the way that water impacts downstream property owners, you will be held accountable for those changes.

If designed and managed with water quality and erosion control as an afterthought, your project may take more time to complete and be less profitable. You can keep your project on track by following sound, state-of-practice soil erosion prevention and sediment control practices.

The bottom line:
Good site management makes good business sense.

Consequences of improperly designed and managed erosion and sediment control plans

Decreased Profits

- Job shutdowns or delayed completion dates
- Increased regulatory oversight by inspectors
- Expensive fines and penalties for violations of local, state and federal laws
- Lawsuits filed by regulatory agencies or citizen groups
- Loss or degradation of desirable and marketable site features
- Property damage payments
- Difficulty in marketing your firm for future jobs
- Increased insurance premiums due to additional damage claims by others
- Additional bonding costs
- Loss of public trust and community goodwill

Increased Construction Costs

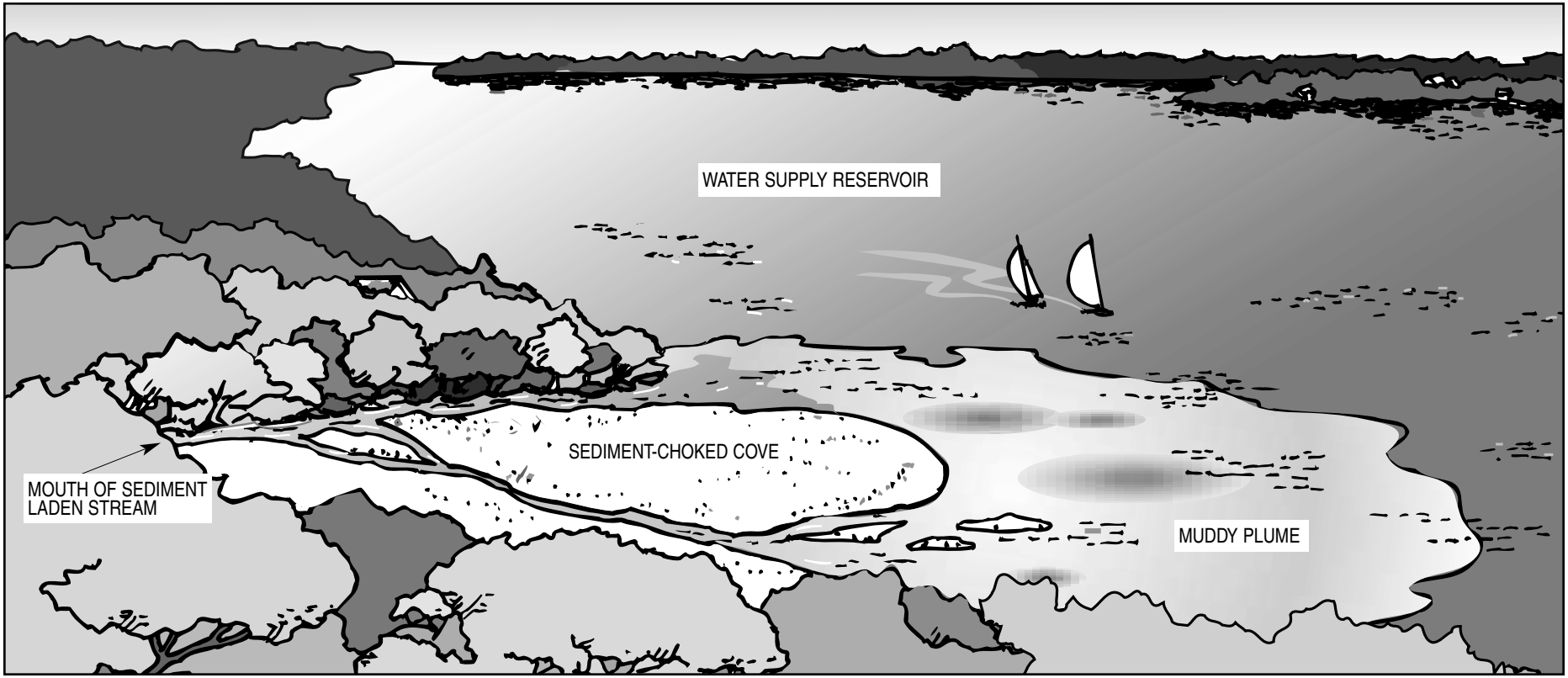
- Erosion of rough and finish grading
- Cleanup of site and adjacent properties impacted by uncontrolled flows
- Costs to repair washouts and re-install inadequate or improperly maintained devices
- Additional cleaning and maintenance of on-site and downstream drainage structures
- Loss of topsoil and higher landscaping costs
- Repair of completed construction work damaged by mud and water

"Lake Alatoona's half full of silt right now and that water supplies about 300,000 or 400,000 people. We're projecting that another million people will move to Georgia in the next 10 years, but we have lost the opportunity to provide the water they need because half of our reservoir is filled up with silt."

Keith Gilmer, Georgia Soil and Water Conservation Division

Regional Economic Impacts of Poor Erosion and Sediment Control on Construction Sites

- Moratoriums on new development until water quality and sewer capacity issues are resolved
- Lack of new investment in economic growth until environmental standards are met
- Increased taxes or user fees to pay for dredging reservoirs filled or impacted by sediment
- Higher water and sewer fees to pay for additional treatment facilities and more extensive treatment methods
- Polluted and undesirable streams, rivers, lakes and wetlands from muddy runoff
- Decreased fish population and loss of aquatic habitat
- Reduced recreational resources and opportunities
- Additional community and developer costs for watershed protection and restoration



CONSIDER THE COST OF EROSION PREVENTION AND SEDIMENT CONTROL BEFORE YOU ACQUIRE OR DEVELOP A SITE

Determine the cost of designing, implementing and maintaining an effective erosion prevention and sediment control system before you purchase a site. Qualified erosion control professionals can help you identify these costs.

Determine the impact of both on-site and off-site development costs:

— Steep slopes
— Highly erodible and fine-particle soil
— Stormwater runoff from an adjacent site or waterway that you will have to handle
— The requirement to "stabilize" the site, as defined by local, state and federal laws, during site development and project construction
— Any damage that may occur to a waterway or adjacent and downstream property owners and the general public
— The requirement to prepare effective erosion prevention and sediment control systems which comply with local, state, and federal laws

Understanding Local, State and Federal Laws

Land-Disturbance Permits

If more than 1.1 acre is to be developed or if you build inside a development that is larger than 1.1 acre, land-disturbance permits are issued by a local municipality or the state. Your project will be governed by the Georgia Erosion and Sedimentation Act of 1975 as amended and by any other relevant state laws or local ordinances.

National Pollutant Discharge Elimination System

If your site will disturb 5 or more acres, or if you build inside a development that is 5 or more acres, the Federal Clean Water Act requires you to also have a National Pollutant Discharge Elimination System (NPDES) permit. This permit regulates the discharge of silt, mud, sediment and other potential water pollutants from the project site.

CAN YOU MAKE AN ACCEPTABLE PROFIT?

An unsuitable development site can substantially increase your costs for effective erosion prevention and sediment control. A site may cost less on the front end, but is it worth the risk and costs it may expose you to and the problems you may encounter during the construction process itself? Can you still make the profit margin you want after you have factored in all the site development costs, including an effective erosion control system?

INSIST ON A PLAN THAT WORKS

Erosion and sediment plans must now perform to meet federal, state and local requirements. Submitting a set of plans for the sole purpose of getting a permit from the local jurisdiction will not protect you from state, federal or civil prosecution if your plan fails to control the sediment on your site. It is your responsibility to ensure that your design professional knows the law and designs a comprehensive system that provides you — and the waters of the state — with effective protection.

Because all sites are in constant change during the construction process, continue to implement your system as construction proceeds. Keep your design professional involved during and throughout the construction period. Your business risk and potential uncontrolled costs will be significantly reduced.

SET THE TONE FOR COMPLIANCE

The tone for compliance with laws and regulations and the expectation of professional performance is set from the top of your organization. If management takes the risks seriously and insists that they be properly managed, so will your project team, your consultants and your employees on the job site. State law allows the court to impose stiff civil penalties for non-compliance, and the individuals responsible can be prosecuted and fined. In addition, federal law affords citizens and public-interest groups the same recourse.

ASSEMBLE A QUALIFIED TEAM OF PROFESSIONALS

Assemble a team of planning and design professionals with professional qualifications commensurate with the environmental sensitivity and potential water quality impact of your project.

Mandate this team to select, evaluate, design and develop your property from a business risk reduction and cost control perspective using proper erosion prevention and sediment control designs, plans, systems, techniques and installation measures. The more qualified expertise you provide for the project, the less risk you have concerning erosion and water quality.

Select qualified professionals who are properly educated and whose experience demonstrates a record of successful performance. This is no different from procuring quality services for any other aspect of the project. Individuals who hold professional licenses, designations and credentials — such as civil and geotechnical engineers, architects, surveyors, landscape architects and land planners — need to have specialized, state-of-practice knowledge that is critical in developing projects. Include a professional on the team who specializes in effective erosion prevention and sediment control systems and who is available daily to respond to performance issues and compliance needs.

"The biggest thing is you've got to work with your partners, your developer, your engineers, early on in planning so that you get the proper erosion control structures designed into the project early."

John Farmer
Senior Project Manager, Beck Company

DESIGN THE PROJECT TO REDUCE RISK

Fit the project layout to the site's topography. Minimize mass grading. Buildings, parking lots, roads, walkways and other features should be sited to maximize the preservation of existing natural vegetation, reduce the risk of damage to adjacent waterways or property owners and avoid excessive costs for erosion prevention and sediment control measures.

The design should achieve good performance results under the most frequent occurrences of rainfall — those storms of two inches or less.

If the site plan is developed with erosion prevention and sediment control as a serious design consideration, and if a well-qualified professional is part of the team from the very beginning of the project design phase, your consultants will be able to create a design that is cost-effective, that performs, and that significantly reduces your business risk.

CONSIDER SEASONS WHEN SCHEDULING DEVELOPMENT

High-energy thunderstorms and short, intense periods of rainfall are common during warm weather. These storms erode land quickly. Disturbed land must be well protected during these times — with mulch, newly established vegetation or other appropriate measures.

You may want to schedule your major grading and earthwork during the drier months. Though rainfall is less intense in cool weather, it is more difficult to revegetate a freshly disturbed site. Make sure that plant materials specified as soil stabilizers are appropriate to the season they are being used.

By consulting your erosion prevention and sediment control professional and your landscape architect, you can determine the optimum times to develop your site.

"As soon as you get your contours ready, mulch it down heavily. 75% cover. Grass and seed as soon as possible. Vegetation is the most important thing of all. Don't wait six more months while you're doing everything else. Go ahead and mulch and vegetate and that will prevent run-off."

Keith Gilmer
Georgia Soil & Water Conservation Division

REQUIRE A THOROUGH AND REALISTIC PLAN & BUDGET

A thorough and realistic erosion prevention and sediment control plan is the basis for a cost-effective system that performs. This plan must address site protection before and during all land-disturbing activities. Detailed information and site data necessary to design an effective erosion and sediment plan include:

- — Soil characteristics before and during construction
- — Vegetation Survey
- — Detailed topographic mapping before and during construction
- — Identification of streams, lakes and wetlands on the site, in the vicinity and downstream of the site
- — Map of storm water entering the site
- — Characteristics of adjacent and downstream property

A well-designed plan requires implementation and active maintenance to be effective. This includes prompt revegetation and protection of disturbed sites. It also allows for timely changes and updates to the plan if there are significant weather events, changes in construction practices or modifications to the site plan itself.

Every project budget and schedule should include regular inspections by a qualified erosion prevention and sediment control professional. Project budgets should also include maintenance costs as well as a contingency factor that allows for plan changes, reinstallation of failed system components and additional costs for site or waterway cleanup.

INVEST IN TRAINING

At least one person with project management responsibility should participate in a certified erosion prevention and sediment control training program prior to design and construction of your development.

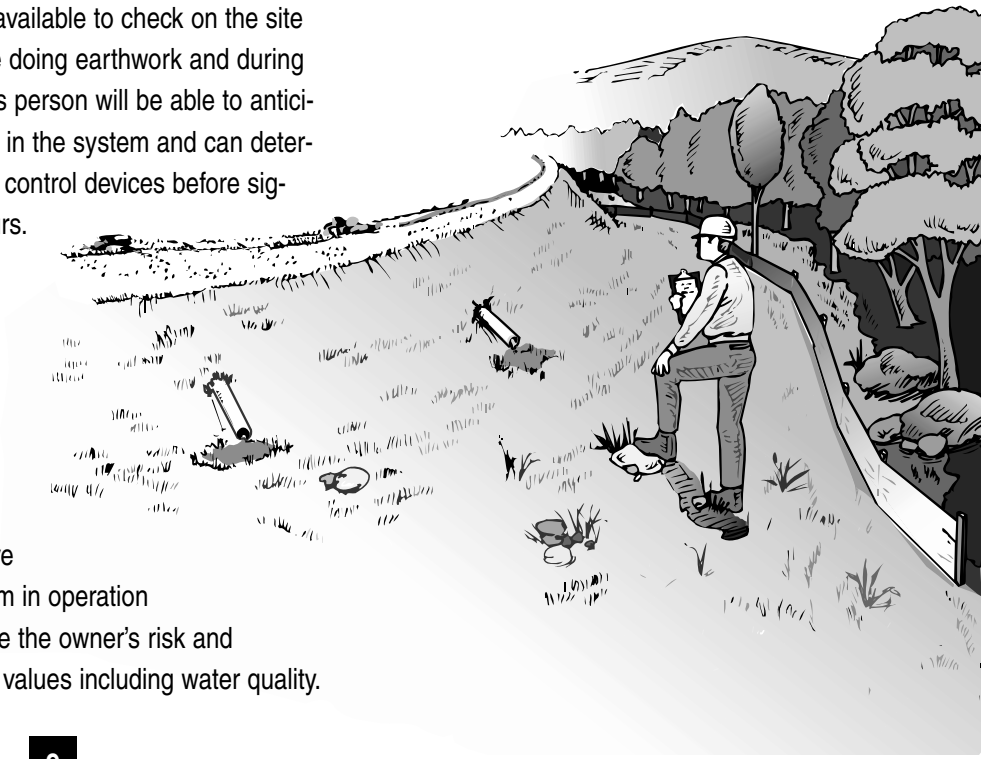
This individual, perhaps a superintendent or manager, should be available to check on the site daily, especially while doing earthwork and during the rainy season. This person will be able to anticipate possible failures in the system and can determine how to stabilize control devices before significant damage occurs.

Everyone on the job site needs to understand that this person has the authority and the responsibility for keeping the site stable and an effective erosion control system in operation at all times to manage the owner's risk and protect off-site public values including water quality.

PLAN TO BE IN COMPLIANCE

Compliance with local, state and federal regulations can also save you money in some phases of the construction project.

By minimizing site grading, preserving existing vegetation, siting buildings and features with consideration of the land's natural contours, and then implementing and maintaining an effective erosion prevention and sediment control system, you can save costs and plan to be in compliance with laws and regulations at all times.



"It's vital that everyone from the project sponsor to the motor grader operator be involved in managing the site and executing the plan."

Helen Tapp
Director of Planning, Jordan, Jones & Goulding

Water quality has reached a critical point in Georgia, and the common sense, cost effective erosion prevention and sediment control measures discussed in this booklet will help you meet regulatory requirements and community expectations throughout the development process.

Some of these techniques have been in use for years. Some are newer ideas. Others are "new" in our area but well accepted elsewhere. But they will only work when implemented according to a defined sequence, and when the proper devices themselves are properly maintained.

LEAVE STREAM BUFFERS AND OTHER UNDISTURBED VEGETATIVE COVER

Functional stream buffers provide valuable filtering and sheltering services. Leave the stream buffers undisturbed and, as long as possible, leave the rest of the site in undisturbed vegetative cover. The longer you keep water in contact with natural soil cover, the more muddy water is absorbed. As a result, less turbid water and soil reaches our streams.

MINIMIZE DISTURBED AREA AND REDUCE AMOUNT OF TIME LAND IS DISTURBED

The less disturbed area you have on a construction site, and the shorter the time the disturbed land surface is exposed, the lower the cost of the containment and other control system components you will need. Phase your work so you can maintain the original vegetative cover and disturb only that part of the site absolutely necessary at the time. Let the muddy water be soaked up by the soil as close to the source of the water and disturbed soil as possible. This is both cost-effective and smart business practice.

INSTALL PERIMETER CONTROLS FIRST

Have perimeter controls in place before land is disturbed. Don't grade the whole site at the start. Disturb land in phases, and re-vegetate and/or mulch immediately after each disturbance. Even large projects can be graded in phases with proper planning.

Old Paradigm:

- Maximize construction footprint while minimizing the buffers
- Clear entire site of all vegetation
- Direct all surface flows to one or two discharge points
- Develop EP&SC plans for permit approval with little implementation

Result:

- **Damage to waters of the State**

New Paradigm:

- Develop EP&SC plans that are expected to perform
- Phased clearing of development site
- Discharge water over wider areas through functioning stream buffers and numerous points
- Use greenspace buffers

Result:

- **Vast improvement to waters of the State**

INSTALL APPROPRIATE CONTROLS BEFORE STARTING EACH MAJOR STAGE OF EARTHWORK

Effective erosion prevention and sediment control devices should be in place before each stage of earthwork gets underway. These controls will protect off-site streams and lakes and also reduce the risk of damage to the site itself. Proper devices will protect topsoil as well as drainage structures and other construction work that is already in place.

REVEGETATE OR MULCH DISTURBED SOIL IMMEDIATELY

Disturbed soil without ground cover or mulch does not absorb water efficiently and can result in runoff more than 100 times greater than undisturbed, vegetated soil in buffers. Rainfall is best dealt with by allowing time for the soil to soak it up. Revegetating or mulching disturbed areas keeps the water in contact with the soil for a longer period and reduces the erosive power of raindrops on the soil. To cut business risk, absolutely minimize the time an area is left disturbed and unprotected.

Mulch and vegetation are the least expensive and most effective way to reduce runoff and erosion. Mulches, such as wood chips, straw and bark, are essential when seeding and planting because they protect the soil until new roots can be established. Geotextile and natural blankets or mats are also effective. Though more expensive, these may be required to adequately stabilize soil on slopes until vegetation is established.

"I think what's been most successful for us in terms of controlling silt and erosion has been the amount of greenspace that we have on our properties. We have 30-35% greenspace in all of our communities.

"Our first community that we developed with greenspace was the number-one selling community in Atlanta for three years in a row."

Steve Macauley
President, The Macauley Companies

No cover is as effective as adequate vegetation for long-term erosion prevention.

KEEP CLEAN WATER CLEAN

Don't encroach on waterways running through the site. Make sure water coming from upstream or up-slope does not go through areas that are or will be disturbed. Don't let clean water run in concentrated patterns across disturbed areas as it will dislodge soil and become muddy water.

SLOW DOWN THE WATER AND AVOID CONCENTRATED WATER FLOWS

The speed or velocity of water flow, and its erosive force, increases greatly on slopes greater than 5% and with longer flow paths. Reduce the velocity of water by diversion to gentler slopes, reducing the distance traveled, spreading the water into sheet flow or smaller channel flows. Use mulch, vegetative cover and suitable engineered structures such as baffles and basins.

Use dikes, swales, ditches, piping and other methods to intercept runoff. Break long slopes with diversions such as swales, ditches and terraces.

Slowing water movement reduces the forces which cause soil particles to be dislodged and moved down-slope to other areas. This reduces erosion of your site and sedimentation of downstream areas — as well as business risk.

DON'T LET SOIL PARTICLES GET INTO THE WATER

To the greatest extent possible, don't let soil particles get into the water. It takes weeks, months or much longer for fine soil particles like Georgia's clays to settle out of water. And this water cannot leave your site until it meets water quality standards for such discharges.

Total containment of large volumes of muddy water is very expensive and is unlikely to meet performance expectations. The clay particles that cause turbidity take an unfeasibly long time to settle out by themselves by conventional sedimentation. Or they require expensive chemical treatment for proper removal. The least expensive method, by far, is to focus on preventing soil from being dislodged and carried by the water. It is now well recognized in all areas of environmental protection that source reduction is much more technically effective and cost effective than "treating waste."

"The standard technique now is to take all the water, bring it to one point and basically fire it down the barrel at the stream. The seep berm is entirely different. You're coming up very close to the construction area; it's like a whole bunch of mini-sediment basins in a series. Instead of going out in one point, we're going out in many points and now we're re-charging the forested watershed."

Richard Warner
Surface Mining Institute
Erosion Prevention Advisor, Big Creek School

CREATE A SYSTEM OF CONTROLS THAT FUNCTION TOGETHER

Each erosion control device has two functions — to hold the existing soil in place and to keep the water draining off the site as clean as possible. Different terrains dictate which devices are effective and which you choose. By designing a comprehensive "system" of controls, each device or system component can be placed when and where it will work most effectively.

The "system" includes both hard and soft technology, some traditional engineered components as well as site selection, project management and scheduling aspects. Functioning stream buffers and maintenance of natural vegetation including trees, shrubs and ground cover is part of this. The "system" is not just a drawing of various familiar structures and practices shown for the completed project site.

A well-planned system will avoid concentrating large amounts of muddy stormwater and will successfully handle both large and small (but more frequent) rainstorms. The use of individual controls in sequence can greatly reduce the sediment load carried by the water. By combining different controls in sequence, one can retain existing soils in place and allow only clean water to flow off-site.

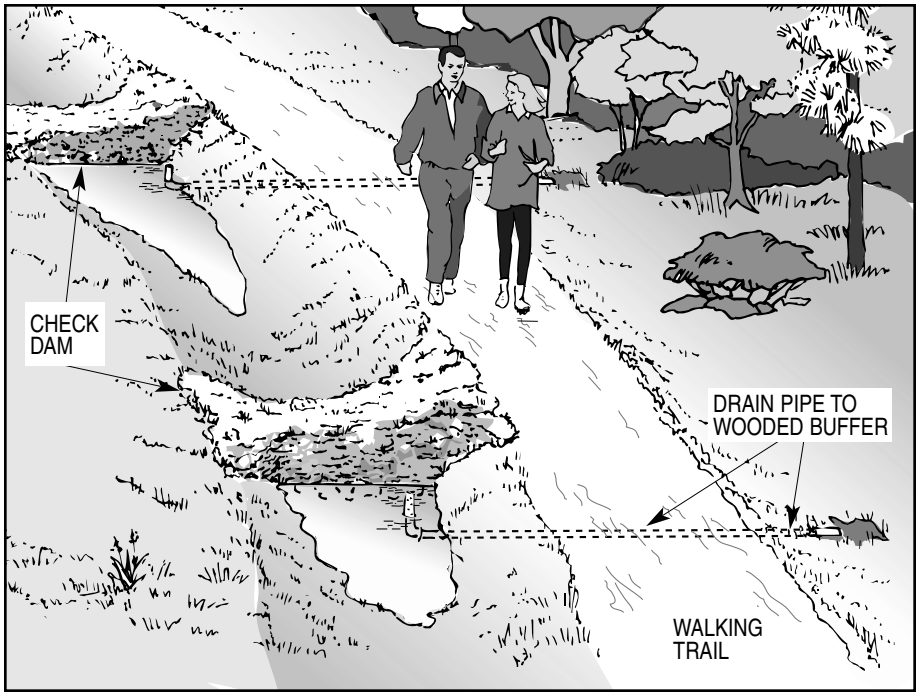
"We can no longer choose failing practices to try and solve our erosion and sediment problems. We must apply better techniques if we are to ensure protection of our rivers, streams, and lakes for future generations."

Alice Champagne
Water Protection Specialist
Upper Chattahoochee Riverkeeper

USE PASSIVE DEWATERING SYSTEMS

Silt fence material is too porous to effectively filter turbidity-causing clay particles and it cannot clean up muddy water. All site water should go through an appropriate system of controls and be discharged slowly only after it is clear and clean. These controls can be simple and relatively inexpensive to construct. Effective erosion prevention and sediment control, using site-appropriate components that perform, is not rocket science.

At the Big Creek Elementary School demonstration site, seep berms, a floating siphon and sand filters were integrated into a cost-effective system of controls that perform, using proven state-of-practice techniques.

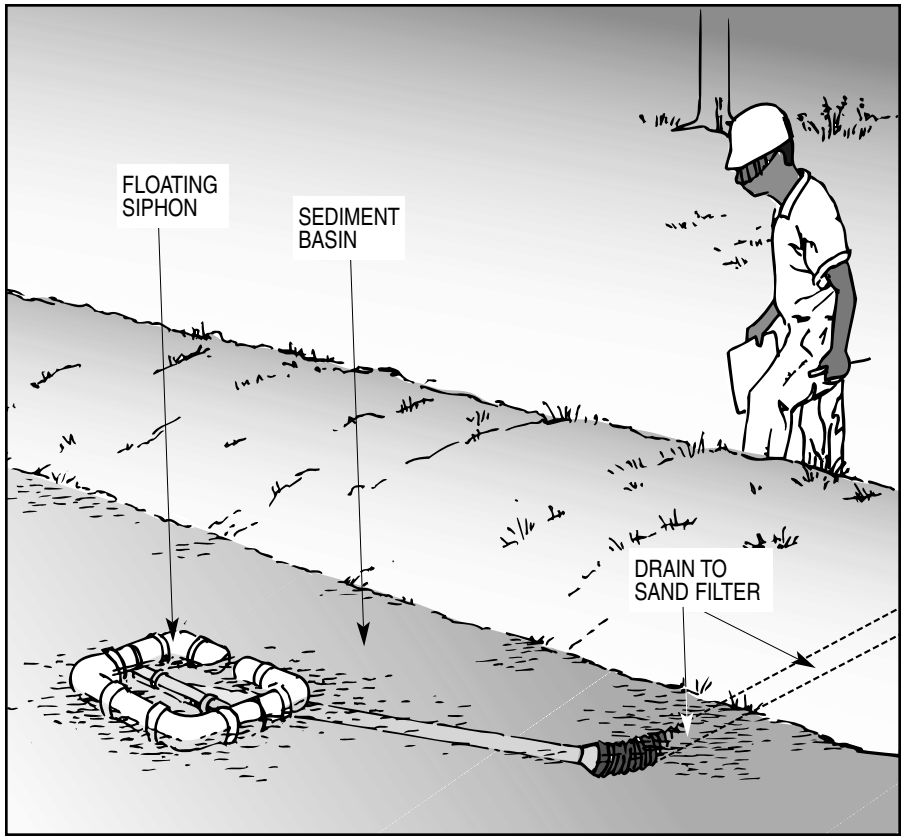


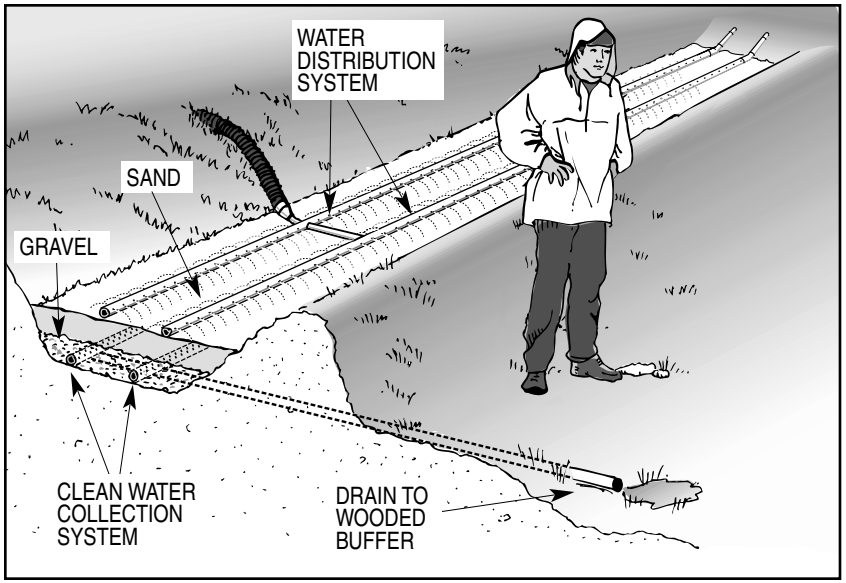
Seep Berm

A "seep berm" is simply a diversion ditch or channel. Check dams, which may be wood chips or other materials cleared from the site, slow stormwater along the channel. Then the water is slowly and passively released to vegetated buffer areas through dewatering controls made from drilled PVC or other devices that have been installed along the length of the berm.

Floating Siphon

For larger storms, stormwater flows into a plunge pool and then into a sediment basin with a "floating siphon" — again, a low-tech, low-cost passive de-watering device. The floating siphon operates mechanically, without pumping or electrical requirements. As coarser soil particles settle to the bottom of the basin, the upper, less muddy level of water reaches the floating siphon and is released from the basin to the next system component.





Sand Filter

A "sand filter" requires a truckload of sand, a truckload of gravel, some drilled PVC pipes, and a garden rake for maintenance. The top pipes receive water from a sediment basin, floating siphon or seep berm and distribute the water over the sand.

The water filters through the sand which traps most of the remaining eroded soil particles, before seeping into the gravel below. Then collection pipes embedded in the gravel collect the filtered water and discharge it, where possible, into vegetated areas such as functional stream buffers. Muddy, turbid, silt-laden water need not be discharged from a site construction into the waters of the state.

A sand filter is a simplified version of the process used by many municipal water treatment plants.

"We've found that saving a natural buffer is the best way for us to do erosion control. Locate the streams and stream buffers accurately with field run topography and then set aside those areas that your surveyors and engineers tell you are important. The more trees you take out, the more run-off you have from an area. Maintaining natural stream buffers is your best line of defense."

Bill Mallery
Manager, Construction & Development,
Sugarloaf Country Club

DESIGN CONTROLS THAT WILL PROVIDE SHORT-TERM SEDIMENT CONTROL DURING CONSTRUCTION AND LONG-TERM STORM WATER MANAGEMENT SYSTEMS ONCE THE SITE IS OCCUPIED

An example of appropriate controls can be found at the Big Creek Elementary School demonstration site. Some of the controls used there during construction will become permanent elements of the landscape design and continue to function as part of the permanent stormwater control system.

For example, the seep berm will become a walking trail around the site perimeter once construction is complete. One of the sediment ponds can continue as a stormwater retention device, and the greenspace around it will become an outdoor laboratory for nature study, as well as a buffer for adjacent, possibly non-compatible land use.

Residential developers retain greenspace as buffers and cost-effective natural sediment filters during construction. Later, they become natural common recreation areas for homeowners that add to the quality of these developments and attract buyers.

PART 5: THE BIG CREEK ELEMENTARY SCHOOL DEMONSTRATION SITE

Located in western Alpharetta, the Big Creek Elementary School construction site is a demonstration project for state-of-practice erosion prevention and sediment control measures in Georgia. The Fulton County School Board, with their design and construction team, developed this site to illustrate state-of-practice erosion prevention and sediment control systems in a demanding full-scale, real-world situation. Their objective was a system — designed, installed and maintained — which was cost-effective and performed reliably to protect the waters of the state.

This demonstration illustrates the "new paradigm" that the diverse members of Dirt II have been working hard to present to policy-level decision makers in the public and private sectors for several years.

The site was designed by the landscape architects. Working with members of the Dirt II panel and an erosion-control focus group, the landscape architect and his team developed a comprehensive and coherent erosion prevention and sediment control system for the site. Some of the features and system components demonstrated here are making their debut in Georgia, while the system modeling approach has been used by design professionals across the U.S. for several years.

The major components of the Big Creek system include passive-dewatering sediment basins, seep berms, temporary berms, sand filters, coir logs, and silt fences. The site contains four sediment basins, three of which are temporary.

"This is a demonstration site for us, not only for our on-going school construction projects, but also for other developers of large sites…We wanted to disturb the land as little as possible. And we wanted, in the most cost-effective way, to eliminate erosion and completely prevent sedimentation flow from the project."

Marcus Ray
Executive Director, Capital Programs
Fulton County Public Schools

Basin B1 is an 1,800-cubic yard basin that drains the northeastern section of the site. This basin contains a perforated riser that feeds runoff into an external sand filtration system before the runoff is released. This basin also contains an emergency overflow pipe and an emergency spillway to safely handle heavy rains.

Basin B2, the largest and most extensive, will remain a permanent feature of the site. The majority of the southern and western portion of the site drain into basin B2. The **seep berms** (a 1,275-foot-long drainage channel encircling the western quarter of the site) also feed into basin B2. The basin consists of a riprap plunge pool and drainage channel, a 950-cubic yard sediment basin, a large dike with a french drain, riprap overflow areas, a 7,800-cubic yard basin, a **floating siphon**, a riprap emergency spillway and berm, and a **sand filtration** system. This basin is designed to handle a 100-year flood event.

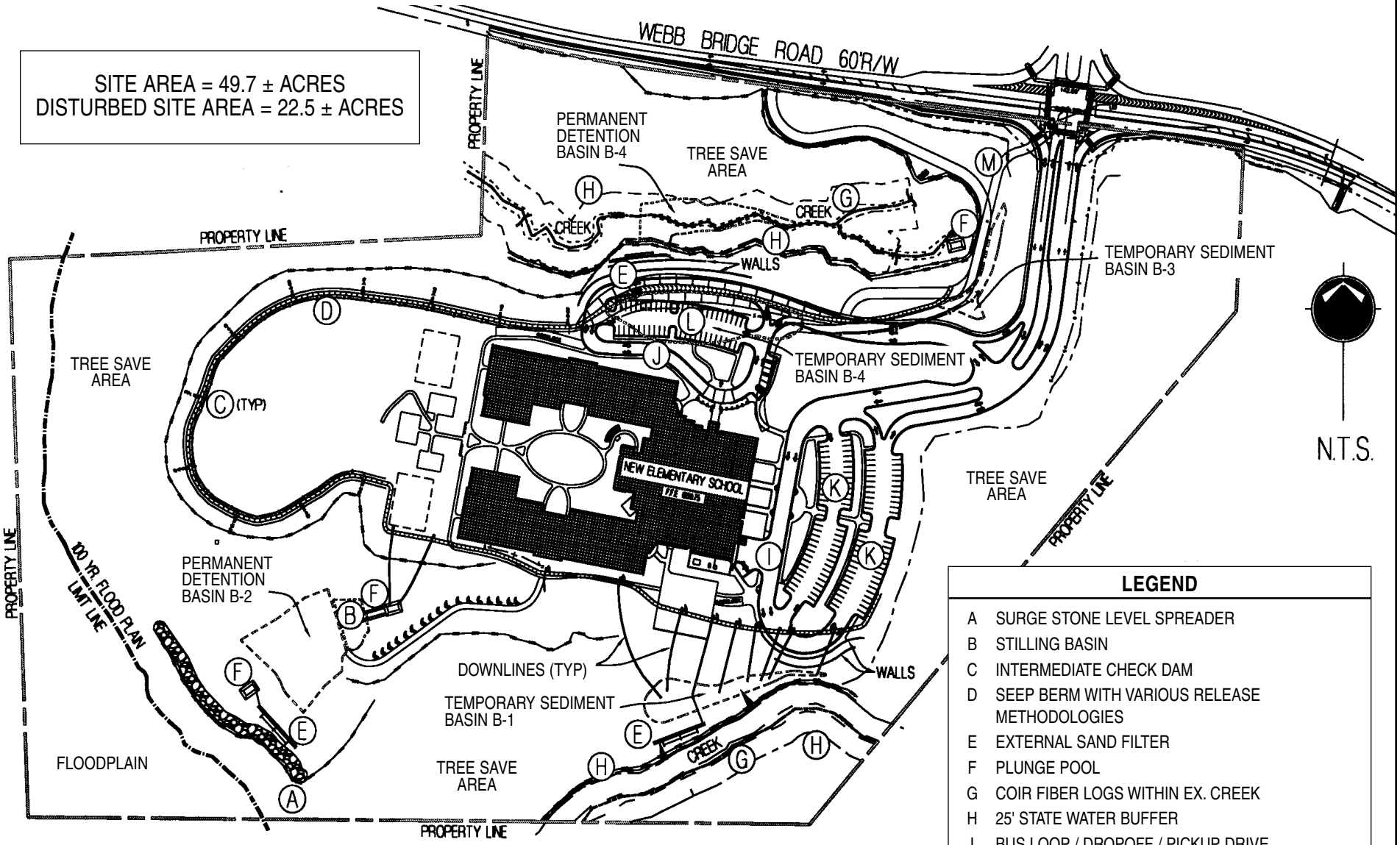
Basin B3 is a small, temporary basin that services the northern section of the site. Basin B3 measures 400 cubic yards and contains a riprap plunge pool and a perforated riser.

Draining the northwestern section of the site, **Basin B4** contains a 650-cubic yard temporary basin which is slowly eliminated as the area is brought up to grade. An external sand filtration system services this basin. An active creek runs along the base of basin B4.

The creek was routed several yards through concrete pipe and an earth dam was constructed over the pipe. A storm drain outlet protection section was constructed at the outflow to prevent erosion. Although the B4 sediment basin and sand filtration system are temporary, the modifications to the creek are permanent.

Another permanent erosion control feature is the **seep berms**. They are designed to illustrate four methods of erosion control. Divided into eight sections, the berms extend 1,275 feet alongside an earthen channel. Each section is separated by a check dam, consisting of an earth dam over a

BIG CREEK ELEMENTARY SCHOOL SITE PLAN



LEGEND

A	SURGE STONE LEVEL SPREADER
B	STILLING BASIN
C	INTERMEDIATE CHECK DAM
D	SEEP BERM WITH VARIOUS RELEASE METHODOLOGIES
E	EXTERNAL SAND FILTER
F	PLUNGE POOL
G	COIR FIBER LOGS WITHIN EX. CREEK
H	25' STATE WATER BUFFER
I	BUS LOOP / DROPOFF / PICKUP DRIVE
J	PARENT DROPOFF / PICKUP DRIVE
K	STAFF PARKING
L	VISITOR PARKING
M	ENTRANCE / EXIT CONSTRUCTION DRIVE (875 LF±)

6-inch french drain. The first two sections use fixed siphon pipes. The second set use perforated risers with filter fabric and #57-stone. The third set use perforated risers with filter fabric alone, and the last two sections use a sand filtration system.

The seep berms slope around the southwestern portion of the site, along its natural contours, to allow larger flow events to empty into the plunge pool at basin B2. The more frequent minor rain events are released from each section of the seep berm through its own set of controls. In this way the rainfall is distributed into the surrounding undisturbed woodland buffer in a pattern reminiscent of the sheet flows that occurred in the site's pre-development state.

As construction progressed, temporary berms were maintained to ensure that runoff was properly diverted into the basins as the grades changed. Before every rain event, the site was thoroughly inspected to ensure all areas were safe. Additional silt fence was added when necessary to protect areas exposed to erosion. This process of inspecting the site for erosion control represented a new way of thinking for the construction manager's team. Once the team adjusted to this new way of looking at the site, they realized that using the temporary berms and basins to divert runoff was neither difficult nor time consuming.

In addition to the seep berms and sediment basins, silt fence and coir logs were used to help combat erosion. In critical areas near the site's two active creeks, double layers of silt fence were installed for added protection. Though it was not anticipated that muddy water or mud flows would reach the silt fences, they were installed to provide an additional layer of protection to satisfy the owner's sensitivity to the importance of off-site water quality and community values.

Along the banks of the creeks, coir logs were installed by hand before any machinery was allowed on-site. Twelve inches in diameter and made from the fibers of coconut husks, the coir logs protected the creek banks from natural erosion. The coir logs are a permanent feature of the creek and can be germinated to promote re-growth of vegetation.

According to the construction manager, erosion control at Big Creek accounted for roughly $265,000 of the $3,015,000 sitework package. That is about 8.5% of the sitework costs. Compared to the average 3-5% spent on traditional erosion control, this represents a cost increase. But the costs must be measured against having a successfully functioning erosion prevention and sediment control system in place that deals effectively with a real business risk. The Big Creek Elementary School remains a very high-profile project. Both the Owner and a host of active stakeholders insisted that the waters of the state be protected and that community values be respected.

"Properly design your erosion and sediment control system. Properly install your devices. Be vigilant about inspecting them, and be even more vigilant about repairing them when they aren't working properly."

Pamela Burnett
Senior Water Resources Specialist
Jordan, Jones & Goulding

If one eliminates those control items associated with the owner's environmental education agenda, then the total erosion control cost is estimated at under $175,000, representing 5.8% of the sitework construction cost. A further consideration is that a portion of the costs charged to erosion control resulted from the integration of grading activity with the erosion control system.

The Owner accepted this cost increase rather than using traditional erosion control approaches, which almost surely would have been less effective in allowing the project to proceed on schedule and without difficulties.

The erosion control approach was also reflected in the sitework schedule. Initially, the target completion time for erosion control for this project, using customary practices, was five weeks. The actual construction time was closer to 12 weeks. However, the overall project schedule was not affected since

"The research at Big Creek conclusively demonstrated that the total amount of rainfall is not the big player in generating sediment loads. The intensity of even a one-inch rainfall event can generate a very high inflow of sediment into the control system.

System performance was monitored during several rainfall events, nine of one-inch or greater, including two in excess of two inches. Using the state-of-practice techniques described above, sediment loads in the range of 25,000-160,000 mg/liter were reduced by control systems using passive de-watering to the 50-300 mg/liter range. And turbidities were reduced to the 100-600 NTU range before treated water was spread into the surrounding vegetated buffer areas. And this was the first try."

Richard Warner
Surface Mining Institute,
Erosion Prevention Advisor, Big Creek School

the installation of erosion control features often coincided with the progress of the grading operation.

In order to evaluate the performance of these erosion controls, a small team of researchers, including two university interns, monitored the outflow points. They determined the amount of turbidity and sediment in the water leaving the site and evaluated the overall erosion control system as well as the individual components of the system. Extensive water-quality sampling during a number of storm events, as well as visual inspection around the site and in the streams, demonstrated that the water quality control measures — designed, installed, and maintained as an integral part of the construction project — performed effectively.

The information collected at Big Creek enabled the Owner to establish the performance of the methods demonstrated there. With the cost information provided by the construction manager, the performance of each method can then be compared to the costs associated with its construction and maintenance. In this manner one can derive a measure of effectiveness from the standpoint of both performance and cost.

Throughout construction the Owner, contractors and landscape architect learned the best ways to approach, construct, and maintain these newer, state-of-practice techniques. The construction management team and their earthwork subcontractor learned to look at the sitework process in a new way. As can be expected when applying new approaches, mistakes were made along the way. Subsequent use of these approaches can be expected to yield reduced time delays and costs.

The techniques used here may be new for Georgia, but they are also practical. Working with the erosion control system designers and research team, the construction management team came to understand and appreciate the value of reducing erosion and protecting water quality in a cost-effective, performance-oriented manner with state-of-practice components and systems. The waters of the state were protected and risk was effectively managed for the developer.

Key participants in the Big Creek Elementary School demonstration project

Fulton County Public Schools/Fulton County Board of Education:

Project owner/developer

Dr. Stephen Dolinger, Superintendent
Mike Vanairsdale, Assistant Superintendent
Marcus Ray, Executive Director of Capital Programs

Collins Cooper Carusi, Architects

Project architects

Mike Collins, AIA, President
Eric Richardson, AIA, Project Architect
Scott Southerland, AIA, Project Manager

Beers Construction Company:

Construction manager

Rob Tharpe, Senior Project Manager
Chris Johnston, Project Superintendent
Karen Dunsmore, Project Engineer
Bill Stinnett, Grading Superintendent

VECO, Inc.

Erosion control installation subcontractor

Rob Spiller, Project Manager

Breedlove Land Planning, Inc.

Landscape architect, site designer, erosion and sediment control system designer

Mike Breedlove, RLA, FASLA
Chip Brown, RLA, ASLA, Project Manager
Jason Houston, PE, Project Engineer

Surface Mining Institute

Contractor to Dirt II, advisor on erosion control system modeling and performance

Dr. Richard Warner, Director

Dr. Terry Sturm, School of Civil and Environmental Engineering, Georgia Institute of Technology

Advisor on erosion control system methodology, modeling, design, and performance evaluation

Diana Weber and Mindy Hoepner, Georgia Tech interns assisting in performance sampling and evaluation

Dirt II Panel

Gene Barber*
Mike Breedlove*
Ben Dysart*
Phil Freshley*
Larry Hedges*
Vince Howard*
Terry Hughey*
Earl Jenkins*
Bill Jorden*
Charles Kastner*
James Magnus*
Karim Shahlaee*
Tom Sills*
Robin Snell*
Terry Sturm*
Helen Tapp*
Wayne Woodall*
Wesley Woolf*
Sally Bethea
Alice Champagne
Dana Heil
Dennis Billew
James E. Dean
John Godbee
Frank Green
John McEvoy
Bill Segars

This booklet was produced for the Chattahoochee-Flint Regional Development Center

Project Administrator

Tom W. Sills, AICP

Producer

Burst Video/Film, Inc.
Fran Burst-Terranella
Catherine Burst

Writer

Maggie Anderson, Maggie Anderson Writing and Creative Communications, Inc.

Graphic Design

Linda Rye, RyeType Design & Typography

Illustrations

Henry Bryant, Bryant Art Direction

Special thanks to the Georgia Chapter, American Society of Landscape Architects represented by Mike Breedlove.

** Project Management Advisory Committee membership*