

## Future Stressor #1: Land Disturbance During Construction

### Recommended Steps

Below are steps that the state or local governments could take to strengthen existing sedimentation and erosion control programs and encourage or require the additional protection practices.

- 1) Hold voluntary or mandatory Sedimentation and Erosion Control Workshops for contractors, engineers, and developers (State or Local Sponsorship/Action). Tetra Tech is conducting such workshops in communities in other states. See Draft Agenda in Attachment A.
- 2) Hold Soil Watch Workshops for local volunteers (State or Local Sponsorship). The purpose of Soil Watch workshops is to train volunteers to make sure sedimentation and erosion control practices are being properly employed. This is similar to the State of North Carolina's Stream Watch Program. Tetra Tech is conducting such training in Kentucky. See Draft Agenda in Attachment B.
- 3) Establish a sedimentation and erosion control certification program for contractors, engineers, and developers (Local Action). If #1, Sedimentation and Erosion Control Workshops, is mandatory then the workshops would be a primary requirement for certification. Rockdale County, GA has a very effective and popular certification program.
- 4) Require a certified responsible party on-site (State or Local Action). One of the most important keys to ensuring that BMPs are properly installed and maintained—and working properly—is having a certified, responsible party on-site. Local governments could require this on all construction sites with land disturbing activities above one acre or could use different criteria such as the size of the land disturbance (e.g., major subdivision or any development requiring a site plan), sensitivity of the area, proximity to streams, and existing water quality of the streams.

If state and local agencies wish to enhance sedimentation and erosion control through education and voluntary efforts only, then steps number 1 and 2, Sedimentation and Erosion Control Workshops and Soil Watch Workshops should be implemented. Steps number 1 through 4 take a stronger regulatory approach. Given their soils/topography, Tetra Tech recommends that the local governments, at minimum, strongly consider implementing Sedimentation and Erosion Control Workshops (#1) and a Certification Program (#3).

## Future Stressor #2: Post-Construction Impacts from Future Development

### Recommended Steps

Below are steps the state or local governments could take to encourage or require site design that mitigates post-construction impacts from stormwater runoff:

- 1) Provide checklist to use in conceptual design phase to encourage low impact design techniques above (local governments). See Attachment C as an example.
- 2) Use the checklist in Attachment C to do a comprehensive ordinance review to identify changes that would need to be made to encourage or allow low impact design techniques (local governments).
- 3) Hold Low Impact Design Workshops for Contractors, Architects, Engineers, Planners, and Policy Makers (sponsored by local or state governments). Tetra Tech has worked with communities to conduct such workshops. Also, the University of North Carolina and N.C. State University have assisted in sponsoring and conducting LID workshops in regions across the state. These workshops have been designed both at the introductory and the detailed “how to” levels.
- 4) Establish a stormwater volume performance standard for channel stability in the development ordinances and/or stormwater design manual. Use total volume control as the performance standard—it is more closely linked to channel stability. Tetra Tech has recommended a total volume control performance standard for both the 1-year 24-hour storm and the 2-year, 24-hour storm events. Since Phase II communities in that region are required to control and treat the additional runoff from the 1-year, 24-hour storm as a minimum state performance standard, Tetra Tech recommends using this performance standard for consistency and familiarity. To meet over bank flooding and other local stormwater management objectives, the local governments will likely have or need multiple design/performance standards (e.g., for peak discharge, TSS, and major flood events). The total volume performance standard will meet or help meet these other stormwater management objectives.

Developments with high levels of imperviousness will need to have a mix of retention and detention practices to meet bank stability and flooding objectives. In terms of activities that are applicable to this standard, Tetra Tech recommends that local ordinances be revised to state that any development of  $\geq 10$  percent imperviousness (or  $\geq 12$  percent if that is their current high density/low density threshold) AND any land disturbing activity greater than a certain number of sq. ft. (e.g., 20,000 or 40,000) should be required to meet post-construction Stormwater Management Performance Standards. This would mean that local governments would also need to delete the Water Supply Protection provision that 10 percent of the watershed can develop at up to 70 percent imperviousness without using stormwater controls. These areas, which are designated as Conditional Use Areas, should be required to meet stormwater management performance standards (local government actions).

- 5) Although there are no good places in the watershed to target higher density development from a natural features perspective, the Detailed Assessment Report conceptually located some higher density areas around highway interchanges. For these higher intensity land uses, the jurisdictions could explore adding a “condition” to the conditional use permit which requires off-site mitigation in areas targeted as high priority for preservation (local actions). See also the section, Preserving Community Character and Open Space below.

Tetra Tech recommends that the local governments, at minimum, strongly consider implementing #4, Establishment of a Stormwater Volume Performance Standard, and then require the performance standard be met in all future developments with greater than 10 percent imperviousness.

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## Preserving Community Character and Open Space

### Potential Options

- (1) Encourage low-impact design, as discussed above, with special emphasis on conservation developments or subdivisions that dedicate at least 50% of the site in permanent open space, and that cluster the lots and houses to minimize land disturbance. (Portions of Orange County and Town of Huntersville).
- (2) Develop a conservation zoning district with strict on-site performance standards for new development that includes pollution runoff limits for TSS, TP, TN and strong stream buffer preservation requirements for intermittent and perennial streams. Upper Neuse Basin Association (Research Triangle Park Region, NC). There is no minimum lot requirement as long as the performance standards are met. In the conservation “zone” local governments have adopted buffer requirements range from 100 to 150 ft. on perennial streams to 50 to 100 feet on intermittent streams.
- (3) Develop conservation zone with large lot zoning requirement. Pursuant to drinking water supply protection and preservation of rural character, some communities have adopted large lot zoning such as 5 acre or greater minimum lot sizes. In North Carolina, Orange County has adopted a 5 acre minimum lot size for two of its drinking water supply watersheds. Counties in Virginia have adopted 10 and 20 acre lot size conservation zones pursuant to farmland preservation and drinking water supply protection.
- (4) If communities in the Troublesome and Little Troublesome Creek Watersheds upzone or target some higher density areas around highway interchanges, or these higher intensity land uses, the jurisdictions could explore adding a “condition” to the conditional use permit which requires off-site mitigation in areas targeted as high priority for preservation.
- (5) Develop new or strengthen existing stream buffer protection ordinances. To be most effective, buffers should be preserved on both intermittent and perennial streams. Communities that have implemented buffer requirements pursuant to local watershed studies and protection plans have generally adopted buffer requirements ranging from 75 ft. to 150 ft. on perennial streams and 50 ft. to 100 on intermittent streams.
- (6) Develop a land or conservation easement purchase program. From a water quality perspective, recent research has indicated that nutrient removal is most effective in land preserved along 1<sup>st</sup> order streams (those with a flow of less than 37 cfs) (McMahon, Journal of Water Resources Planning and Management, July/August 2003). Local jurisdictions might consider working with landowners or developers in these small watersheds to establish new or preserve existing area near or adjacent to streams.



## Attachments

- A. Sedimentation and Erosion Control Workshop – Draft Agenda
- B. Soil Watch Workshop – Draft Agenda
- C. Checklist: Opportunities for Low-Impact Development Design Techniques
- D. Example Programs to Control Sources of Fecal Coliform



## Attachment A

### SEDIMENTATION AND EROSION CONTROL WORKSHOP

#### EXAMPLE AGENDA

##### *Day 1*

8:00-8:30	Introductions
8:30-8:45	Pre-Test
8:45-9:00	Terminology
9:00-9:15	Break
9:15-9:45	Overview
9:45-10:00	Break
10:00-11:00	Opening Exercises (teams look at plans and determine where E&S measures should be installed)
11:00-11:30	Developing an E&SC Plan
11:30-12:45	Lunch
12:45-1:15	E&SC Regulations
1:15-1:45	E&SC Basics
1:45-2:00	Break
2:00-2:30	Hydrology and Hydraulics Basics
2:30-3:40	Erosion Control Practices and Measures
3:40-4:00	Review and Plan for the Next Day

##### *Day 2*

8:00-10:45	Erosion Control Practices and Measures
10:45-11:30	Sediment Control Practices and Measures
11:30-12:45	Lunch
12:45-1:45	Sediment Control Practices and Measures
1:45-2:00	Summary of Control Practices
2:00-2:15	Break
2:15-2:45	Stormwater BMPs and Post-Construction
2:45-3:30	Review of Example
3:30-4:00	Summary, Conclusions, Post-Test



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## Attachment B

### Citizen Soil Watch Workshop

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**Training Course:** How to Select, Install and Inspect Construction Site Erosion and Sediment Control Best Management Practices for NPDES Stormwater Permit Compliance

**Technical Level of Course Materials:** Beginner

**Learning Objectives:**

- Learn the regulatory basis for erosion and sediment control, including the requirements for a comprehensive Stormwater Pollution Prevention Plan (SWPPP).
- Master a systems approach to erosion and sediment control planning, implementation and operation.
- Discover a 10-step process for designing an effective erosion and sediment control plan.
- Learn the proper procedures for obtaining coverage under an NPDES construction permit.
- Walk away with the current menu of best management practices (BMPs). Learn where to use them and how they work.
- Get information on the typical costs for materials, methods, installation and maintenance of current BMPs.
- Discover a method for selecting which BMP, or system of BMPs, is appropriate for your site conditions.
- Incorporate operation and maintenance of all BMPs as part of your erosion and sediment control planning and implementation.
- Learn what to look for as an inspector, in both planning documents and field implementation of erosion and sediment control plans.
- Find where to go for additional and more detailed information, such as plant materials, soil testing, etc.

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**Course Outline:****I. Introduction – 8:00 - 8:10 a.m.**

- A. Instructor Introductions
- B. Course Organization and Schedule

**II. Rules and Regulations – 8:10 - 9:10 a.m.**

- A. Why is Erosion a Problem?
- B. Federal Regulations
  - Clean Water Act (Sections 401, 402, 404)
  - NPDES Program (Phase I and II)
  - Definitions (stormwater, waters of the U.S., beneficial uses, etc)
  - CZARA
  - TMDL Program (water quality standards, beneficial uses, 303(d) lists, TMDL process, waste load allocations)
- C. State Regulations
  - Types of Stormwater Permits (individual and general)
  - Types of Permitting Authority
  - Permit Application Requirements
  - State-specific Requirements
- D. Permit Application Requirements for Construction Sites
  - What is a SWPPP?
  - Construction Permit Applications
  - NOIs
  - Deadlines
  - Certification and Notification
  - Enforcement and Penalties (administrative orders, civil actions, criminal prosecutions, citizen suits)
- E. Local Regulations (municipal SWMP, ordinances)

**III. Site Planning and Management 9:10 - 9:40 a.m.**

- A. Erosion and Sediment Hazards in Urban Development
- B. Factors that Influence Erosion
- C. The Planning Process
- D. Considerations in Construction Sequencing
- E. Erosion and Sediment Control Plan Checklist

**Break 9:40 - 9:55 a.m.****IV. Runoff Control 9:55 - 10:40 a.m.**

- A. Hydrologic Cycle and Site Drainage Patterns
- B. Runoff Considerations
- C. Surface Runoff Predictions
- D. Factors Affecting Runoff
- E. Runoff Management Practices

**V. Erosion Control – 10:40 - 11:40 a.m.**

- A. Definition of Erosion Control
- B. Slopes - Strengthen Subsurface Structural (retaining walls, land grading, surface roughening, etc) Biotechnical (wattling, matting, brush layering, etc)
- C. Graded Areas - Protect Surface Vegetative Measures (seeding, topsoiling, sodding, protecting vegetation, vegetative buffers, etc) Non-Vegetative Measures (wood chips, mulching, rolled erosion control products, bonded fiber matrices, soil stabilizers, rip-rap, etc)
- D. Proper Installation
- E. Proper Maintenance

**Questions and Answers – 11:40 - 11:55 a.m.****Lunch – 11:55 - 12:55 p.m.****VI. Sediment Control 12:55 - 1:55 p.m.**

- A. Definition of Sediment Control
- B. Sediment Control Measures (sediment traps and basins, barriers, stabilized construction entrances, inlet filters, slope interrupter devices, turbidity curtains, cofferdams, etc)
- C. Proper Installation
- D. Proper Maintenance

**VII. Erosion Control Planning Process 1:55 - 2:45 p.m.**

- A. 10-Step Planning Process
  - Step 1. Identify Issues and Concerns
  - Step 2. Develop Goals and Objectives
  - Step 3. Collect and Analyze Data
  - Step 4. Develop Best Management Practice Selection Criteria
  - Step 5. Nominate Candidate Best Management Practices
  - Step 6. Screen and Select Best Management Practices
  - Step 7. Develop Erosion Control Plan
  - Step 8. Implement the Erosion Control Plan
  - Step 9. Operate, Monitor, and Maintain the System
  - Step 10. Update the Plan
- B. Common Installation Mistakes
- C. Inspection Tips

**Break – 2:45 - 3:00 p.m.****VIII. Class Exercise/Sample Problems – 3:00 - 3:30 p.m.****IX. Why We Care – 3:30 - 3:45 p.m.**

- A. Economic Advantages of Compliance B. Environmental Advantages of Compliance

**Questions and Answers – 3:45 - 4:00 p.m.**



## Attachment C

### Checklist: Opportunities for Low-Impact Development Design Techniques\*

#### *Clearing and Grading*

- ◆ Is disturbance of vegetated areas and riparian areas minimized?
- ◆ Do the building envelopes avoid sensitive environmental areas such as riparian areas, wetlands, high infiltration soils, steep slopes, etc.?
- ◆ Is total site disturbance minimized?

#### *Minimizing Impervious or Built Upon Area*

##### Streets

- ◆ If this is a residential development, are the street pavement widths between 18 to 22 feet?
- ◆ Does the design promote the most efficient street layout to reduce overall street length?
- ◆ If there are cul-de-sacs, is the radius 35 feet or less?
- ◆ If there are cul-de-sacs, is there a landscaped island or bioretention island?
- ◆ Are grass swales or bioretention swales used instead of curb and gutter where slopes allow?

##### Parking/Driveways/Sidewalks

- ◆ If this is an office building, is the parking ratio 3.0 spaces per 1000 sq.ft. of gross floor area or less?
- ◆ If this is a commercial center, is the parking ratio 2 to 4.5 spaces per 1,000 sq.ft. of gross floor area or less?
- ◆ Is a mass transit stop provided or nearby (if applicable)?
- ◆ Does the proposed development take advantage of opportunities for shared parking?
- ◆ Is the minimum stall width for a standard parking space 9 feet or less?
- ◆ Do the parking medians (if required) have bioretention cells where feasible?
- ◆ Are driveways 9 feet or less in width?
- ◆ Are shared driveways used?
- ◆ Is on-street parking considered and imperviousness minimized (no on-street or single-side parking where allowed)?
- ◆ Are sidewalks (if required) designed to the narrowest allowable width?
- ◆ Are sidewalks on one side of street only?

#### *Clustering Development*

- ◆ To encourage clustering and open space design, are setbacks minimized (e.g., for residential lots that are ½ acre or less in size is the front set back 20 feet or less, the rear setback 25 feet or less, and the side setback 8 feet or less)
- ◆ Does the design focus development on areas of lesser slopes and farther from watercourses?

#### *Preserving Sensitive Areas*

##### Wetlands

- ◆ Are existing wetlands preserved?
- ◆ Will the site design minimize hydrologic alteration to existing wetlands?

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### Steep Slopes

- ◆ Is building footprint concentrated on slopes 10 percent or less?
- ◆ Is disturbance minimized on slopes 15 percent to 25 percent and revegetation proposed where disturbance occurs?
- ◆ Are areas with 25 percent or greater slope preserved?

### Soils

- ◆ Do the building footprints avoid highly erodible soils?
- ◆ Do the building footprints avoid soils with high permeability (e.g., Hydrologic Soil Group A and B)?

### Stream Buffer

- ◆ Is a 50 to 75 foot stream buffer provided?
- ◆ Will the stream buffer remain in a natural state?

### ***Managing Stormwater***

- ◆ Are efforts made to retain/infiltrate stormwater on-site (through bioretention, natural areas, and swale infiltration)?
- ◆ Are stormwater management practices designed and sized correctly to provide sufficient storage volume?
- ◆ Are outfalls stabilized to reduce erosion?
- ◆ Has a BMP maintenance plan been submitted?

### ***Managing Open Space***

- ◆ Is open space available for preservation?
- ◆ Will the preserved open space be managed in a natural condition?
- ◆ Will there be a Homeowners Association or other association that can effectively manage the open space?

*\* Adapted from Low-Impact Development Design Strategies, Prince George's County MD. 1999; Better Site Design: A Handbook for Changing Development Rules in Your Community, Center for Watershed Protection, 1998; State of North Carolina Model Ordinance for Water Supply Watershed Protection.*

## Attachment D

### Example Programs for Controlling Sources of Fecal Coliform

#### Programs Recommended for Consideration by County Jurisdictions

**Requirements for Individual Septic Systems:** Adopt some or all of the following recommendations:

1. Establish an inspections and maintenance program. Three alternatives are offered:
  - a) Inspect septic systems every five years to ensure that they are functioning properly. On average, this would mean inspecting 20 percent of all septic systems in the county annually. Require that homeowners repair or replace failing systems. (Local Health Code may need to be revised to require this inspection and maintenance program).
  - b) Alternatively, use the results of Wake County's pilot onsite wastewater conditions assessment to develop risk-based management strategies for septic systems. Risk-based strategies could be based on any of the following: system type, system location, system age, or system maintenance history.
  - c) Alternatively, inspect septic systems at the time of new home sale or home resale (new system inspections could be delayed by 6-9 months).
2. Implement a GIS database of existing septic tank and well owners.
3. Develop a certification program for people who install and inspect septic systems, and require that a licensed person install all septic systems. (Note: the General Assembly is now considering the adoption of a state-wide certification program.)
4. Provide operation and maintenance information packages to all homeowners who have septic systems by mail or at time of property purchase.

#### Programs Recommended for Consideration by Municipal Jurisdictions

**Point Source Controls:** Where practical, eliminate old WWTPs and consolidate capacity of the older plants into regional WWTPs.

**Sanitary Sewer Overflow Inspections:** Inspect sewage conveyance systems (e.g., pipes, pump stations, manholes, etc.) to ensure their proper functioning. When sanitary sewer systems overflow, untreated or partially treated sewage may flow into streams, rivers and lakes within the watershed. Repairs to overflowing systems may include detecting and disconnecting storm drain connections, replacing conveyance pipes to allow larger volumes of flow or to replace older pipes, and upgrading or repairing pump stations, including installation of automatically-actuated standby power generators.

**Inspection and Maintenance Program for Leaking Sewer Pipes and Illegal Connections to Storm Drainage System:** Inspect sewage conveyance systems to detect and repair leaks of untreated sewage. When sanitary sewer systems leak, untreated or partially treated sewage may flow into streams, rivers and lakes in the watershed. Also, when water that should be conveyed through the sanitary sewer system to the treatment plant is instead connected to the stormwater drainage system, untreated sewage may flow into rivers and lakes. It is important to detect and remove these illegal connections.

#### Citizen Education Program for Pet Waste Control