

# **APPENDIX M**

## **CITY OF ATLANTA GREENWAY ACQUISITION PROJECT**

### **STANDARD OPERATING PROCEDURES FOR THE DESIGN, CONSTRUCTION, AND LAND RESTORATION OF NEW UTILITIES WITHIN THE GREENWAY SYSTEM**

**Prepared By:**



**USInfrastructure, Inc.**

**1000 Mansell Exchange West, Suite 220  
Alpharetta, GA 30022**

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## 1.0 INTRODUCTION

The following Standard Operating Procedures (SOPs) shall guide entities proposing to construct sewers and/or other utilities within the Greenway System. The purpose of these SOPs is to ensure that the design and construction of sewers and/or other utilities is consistent with the requirements of the Consent Decree and the Greenway Acquisition Plan.

This document presents SOPs for the following activities:

- A. Design and construction alternatives analysis process.
- B. Greenway System Encroachment permit.
- C. Design of new utilities.
- D. Construction of new utilities.
- E. Restoration of Greenway Properties disturbed during construction of new utilities.
- F. Training of personnel involved in construction of new utilities within the Greenway System.

These SOPs are designed to minimize erosion and sedimentation within Greenway Properties by:

- A. Focusing on design options that seek to prevent or minimize erosion and sedimentation.
- B. Minimizing the quantity and duration of soil exposure during construction of utilities.
- C. Protecting critical areas during construction by reducing the velocity of and/or redirecting runoff.
- D. Installing and maintaining erosion and sediment control measures during construction.
- E. Restoring disturbed properties by establishing vegetation immediately following completion of construction.
- F. Inspecting the utility rights-of-way and maintaining erosion and sediment control measures as necessary until disturbed properties are restored.

These SOPs do not replace existing utility-specific guidelines for design and construction of new utilities, or restoration of utility rights-of-way after construction, but do establish

minimum requirements for such activities on Greenway Properties. These SOPs do not limit the City, or other responsible local government or agency, from imposing additional or more stringent requirements to control erosion and/or sedimentation.

As stated in Section VIII.D.2.m of the Consent Decree, “Any infrastructure for human activity within the Greenway Properties shall be designed and constructed with prevention of non-point source pollution as the primary consideration”. This does not mean that prevention of non-point source pollution is the sole consideration. This means that cost or other factors will not outweigh non-point source pollution prevention as the primary concern. Only safety design consideration shall be as important as non-point source pollution prevention.

## **2.0 DESIGN AND CONSTRUCTION ALTERNATIVES ANALYSIS PROCESS**

All entities proposing to construct sewers and/or other utilities that infringe on the Greenway System must evaluate the following alternatives before any construction can begin. The evaluation of alternatives should demonstrate to the City, and other responsible local government or agency, that there is no feasible alternative to placing the utility in the Greenway System and that the requirements of the Consent Decree are met. Impacts to the Greenway System must be minimized to the maximum extent. The analysis shall include consideration of alternative routes, tunneling, and force mains (for sanitary sewers). The analysis shall also consider the sensitivity of the property being impacted such as, presence of wetlands, significant habitats, and Greenway acquisition priority.

The following alternatives are listed in order of priority:

1. Construction outside the Greenway System.
2. Tunneling under the Greenway System.
1. Construction in the Outer Zone (100'-greenway boundary) of the Greenway System.
4. Construction in the Middle Zone (50'-100') of the Greenway System.
5. Construction in the Inner Zone (0'-50') of the Greenway System.
6. Construction in the Stream Bed.

The alternative analysis process must implement the Consent Decree provision that the project will be designed with the prevention of non-point source pollution as the primary consideration. This does not mean that prevention of non-point source pollution is the sole consideration. This means that cost or other factors will not outweigh pollution prevention as the primary concern. Only safety design consideration shall be as important as non-point source pollution prevention. If sewers and/or other utilities must be

constructed within the Greenway System, approval must be given by the City and other responsible local government or agency.

If, after the design and construction alternatives have been evaluated, it is determined that there is no feasible alternative to constructing the utility within the Greenway System, an encroachment permit shall be submitted to the City and other responsible local government or agency for review.

### **3.0 GREENWAY SYSTEM ENCROACHMENT PERMIT**

In order to receive approval to construct utilities within the Greenway System, an “Encroachment” permit must be submitted to the City and other responsible local government or agency. The encroachment permit must be approved by the City with recommendations from other responsible local government or agency before any construction can begin. The permit application shall contain the information listed below:

- A. Name, address, and telephone number of the applicant.
- B. A description of the project and project location including stream segment, section, range, and township.
- C. A description of the methods which will be used for erosion and sediment control on the site.
- D. A description, including plans and specifications, of how the site will be restored after construction is completed.
- E. A description of how stormwater will be handled.
- F. A schedule of regular inspections and repair of erosion and sediment control structures.
- G. The Encroachment Permit must include a Land-Disturbing Activity Plan. This plan shall include a brief narrative description of the overall project, detailed maps, drawings and sketches, activity schedule for each phase of land-disturbing activity and supportive data. The Land-Disturbing Activity Plan must also describe the best management practices (BMPs) for erosion and sediment control for the project and demonstrate that the BMPs meet the minimum requirements of this section and the latest edition of the Manual for Erosion and Sediment Control in Georgia, and will be effective for the specific stream corridor conditions of the project. In addition, the Land-Disturbing Activity Plan must include the following:
  - 1. Required construction start and completion dates to minimize construction during the rainy season.

2. A plan for inspections to ensure BMPs are properly maintained and are effective throughout the project.
3. Installation techniques for BMPs such as silt fence, and requirements to remove any BMPs from the stream or Greenway properties that remain after project completion.

For complete requirements of a Land-Disturbing Activity Plan see the latest edition of the Manual for Erosion and Sediment Control in Georgia.

As part of the Encroachment Permit application process, the applicant must agree to notify the City and other responsible local government or agency before construction begins inside the Greenway System, so City and other responsible local government or agency can inspect the construction site to ensure that adequate erosion and sediment control measures are in place prior to construction and maintained until the project is completed and the site restored.

#### **4.0 DESIGN OF NEW UTILITIES**

The entity proposing to construct a new utility within the Greenway System shall be responsible for the design and preparation of construction contract documents (plans and specifications). All utilities shall be designed with prevention of non-point source pollution as the primary consideration. The construction contract documents shall include drawings and specifications describing erosion and sediment controls that shall be used during construction including best management practices (BMPs) to be implemented. BMPs shall meet the minimum requirements established in this document.

#### **5.0 CONSTRUCTION OF NEW UTILITIES**

##### **5.1 PERMITS, VARIANCES, AND PLANS**

It is the responsibility of the entity proposing to construct new utilities within the Greenway System to determine what permits, plans, or variances are required for construction activities. For example, the State of Georgia may have requirements under their General Storm Water Permit Program or Fulton County may require a Stream Buffer Variance and a Land Disturbance Activity Permit. Requirements may vary from one jurisdiction to another. Therefore, it is imperative that the entity proposing to construct new utilities has a clear understanding of local requirements.

##### **5.1.1 State of Georgia General Storm Water Permitting**

At the time of the writing of this document, construction projects that are five (5) acres or larger in size require coverage under the State of Georgia NPDES, General Permit GAR100000, for authorization to discharge storm water associated with construction activities. One of the construction activities this permit authorizes is the discharge of storm water associated with construction activities from linear construction that will

result in the disturbance of more than five (5) acres. As stated in the permit “‘Linear Construction’ or ‘Linear Construction Project’ means construction activities that are not part of a common development and where the length of the project is at least 25 times longer than the width of the project and the construction activity is being conducted by the Georgia Department of Transportation, by a local government, or by a utility company or utility contractor”. It is the responsibility of entity proposing to construct a new utility within the Greenway System to determine if they need to apply for coverage. Application is made by submittal of a Notice of Intent (NOI) and a permit fee to:

Northwest Georgia Regional Office  
Georgia Environmental Protection Division  
Suite 114  
4220 International Parkway, Suite 101  
Atlanta, GA 30354  
Telephone (404) 675-6240

The NPDES general construction permit requires the use of Best Management Practices (BMPs) to control stormwater runoff for all rainfall events up to and including a 25-year 24-hour rainfall event. BMPs used shall be consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the State Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is permitted. For some sites, additional BMPs beyond those identified in the Manual may be necessary for erosion and sediment control for all rainfall events up to, and including, a 25-year 24-hour rainfall events.

To ensure compliance with State water quality standards, the general permit requires inspections of the construction site as well as sampling and analysis of stormwater runoff from the site. The permit also requires daily recording of on-site precipitation. Detailed requirements for inspection and sampling are provided in the general permit. The guidelines set forth in this document and the latest edition of the Manual for Erosion and Sediment Control in Georgia will be used in conjunction with the State general permit to ensure that the best possible procedures are used for erosion and sediment control.

### **5.1.2 Stream Buffer Variance**

The State of Georgia Environmental Protection Division (EPD) enforces minimum stream buffer requirements. At the time of the writing of this document the EPD’s requirements prohibit construction activities within a 25-foot buffer along the banks of all state waters or within a 50-foot buffer along the banks of any state waters classified as ‘trout streams’ (the State of Georgia Department of Natural Resources maintains the most current stream classifications). The Director of the EPD may grant a variance that is at least as protective of natural resources and the environment as provisions described in Title 12-7-6 of the Official Code of Georgia Annotated. The Director of the EPD may also grant a variance where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion and sediment control measures are incorporated in the project plans and specifications and are implemented during

construction. The buffer distance is measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action. It is the responsibility of the entity proposing to construct a new utility within the Greenway System to determine if a variance is required from the State of Georgia, the City, or other responsible local government or agency.

### **5.1.3 Land Disturbance Activity Permits (LDP)**

It is the responsibility of the entity proposing to construct a new utility within the Greenway System to determine if a Land Disturbance Activity Permit is required from any authority having jurisdiction. A Land Disturbance Activity Permit may contain the following information:

- A. Name, address, and contact telephone number.
- B. Narrative description of the maintenance activities to be conducted.
- C. Description of BMPs to be used.
- D. A site map.
- E. An activity schedule.
- F. Supportive data.
- G. A plan and specifications for restoring the site to a natural state with permanent vegetation.

The entity proposing to construct a new utility within the Greenway System shall contact the City and other responsible local government or agency for specific Land Disturbance Activity Permit requirements.

## **5.2 SITE CLEARING**

The following SOPs shall be followed during the site clearing phase for construction of new utilities:

- A. All cut and fill activities occurring within the EPD's mandated 25-foot stream buffer (50-foot buffer for trout streams) shall be stabilized with appropriate erosion control matting and blankets.
- B. The area to be cleared shall be clearly delineated to ensure that no clearing occurs beyond the area identified. Except for perpendicular utility crossings, any open cut, grading, clearing, or installation of surface facilities shall be set back from the streambanks to the greatest distance feasible, with a minimum setback of fifty (50) feet. Except for manholes, portals, and the maintenance access to such

facilities, the Greenway System must remain in a natural state even where crossings are perpendicular to the stream. Where feasible utility projects are suggested to have no more than a thirty (30) foot construction width (for projects paralleling the stream) outside the fifty (50) foot buffer.

- C. Vegetation to be preserved shall be identified and clearly marked by flagging before clearing begins. Vegetation to be preserved shall include: vegetation vital to streambank stabilization; vegetation providing food and/or habitat to a federally listed endangered species, threatened species, or species of concern; vegetation that is a federally listed endangered species, threatened species, or species of concern; and vegetation that comprises a wetland ecosystem.
- D. Stemmed vegetation such as brush, shrubs, and trees shall be removed at or near the ground level, leaving the root systems intact.
- E. When pruning is necessary to clear the construction area, pruning cuts shall be made in accordance with the International Society of Arboriculture (ISA) Standards.
- F. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation to be preserved.
- G. Trees which have fallen into water bodies or beyond the construction area shall be removed immediately.

### **5.3 EROSION AND SEDIMENT CONTROL**

#### **5.3.1 Project Planning and Preliminary Grading**

Efforts shall be made during initial planning and whenever possible during construction phases to minimize the amount of area cleared and graded (exposed) as well as the total exposure time. Whenever feasible, preliminary grading operations shall be used to control the flow direction and velocity of runoff water and thereby dissipate energy. Where feasible, swales and diversion berms shall be used to direct runoff water to locations where treatment by sediment barriers can be performed. Where feasible, transverse diversion berms, installed perpendicular to the flow of water down slopes and in drainage channels, shall be used to reduce runoff water velocity. Cleared slopes shall be harrowed with construction equipment to create small diversion channels along the contours of the slope perpendicular to the direction of runoff flow. This action not only reduces flow velocities of runoff water traveling down the slopes, but also reduces flow quantities by increasing the area of exposed soil and thus enhancing percolation of runoff water.

Whenever feasible, small depressions shall be created in appropriate locations during site grading. Graded depressions can reduce flow velocities and can also provide clarification by allowing suspended particles to settle out. They also provide temporary storage of

runoff water, thereby reducing the rate at which water is discharged downgradient. Grading equipment shall cross flowing streams by the means of bridges or culverts, except when such methods are not feasible, provided in any case that such crossings shall be kept to a minimum.

Dust from the disturbed area shall be controlled. Temporary means for controlling dust shall include mulching or vegetative cover with temporary seeding (see the latest edition of the Manual for Erosion and Sediment Control in Georgia). Emergency means for controlling dust shall include tillage or irrigation.

### **5.3.2 Erosion and Sediment Control Practices**

Erosion and Sediment Control Practices must be implemented prior to any land disturbing activities within the Greenway System. Control of factors affecting erosion and sediment can be provided by a number of basic practices. The establishment of a dense strand of vegetation is probably the most effective means of controlling erosion and sediment; however, this control measure is often not practical until the completion of a project. Revegetation can require a substantial amount of time. Prior to and during the construction of utilities within the Greenway System, temporary erosion and sediment control measures shall be implemented and maintained until the construction area is restored as described later in this document.

Soft engineering techniques shall be used for erosion and sediment control. Hard engineering techniques shall only be used after soft techniques have failed and the failure is due to the inability of soft techniques to address the erosion problem. Improper choice of soft engineering techniques or improper design, implementation, and/or maintenance shall not be justification to turn to hard engineering techniques.

Article 8.0 of this appendix presents summaries of techniques, (including their applications) used to control erosion and sedimentation during the construction of utilities within the Greenway System. Erosion and sediment control measures shall be designed and implemented in accordance with the design standards established Article 8.0 and the latest edition of the Manual for Erosion and Sediment Control in Georgia. If a conflict occurs between the design and construction standards presented in Article 8.0 and those presented in the latest edition of the Manual for Erosion and Sediment Control in Georgia, the more stringent design and construction standards shall prevail. The selection of the most appropriate erosion and sediment control measure will be made by the entity proposing to construct a new utility within the Greenway System based on site specific conditions.

## **5.4 CONSTRUCTION METHODS**

After all appropriate erosion and sediment control measures have been installed, the designated construction work can proceed as approved by the City with recommendations from any other responsible local government or agency. All clearing work and construction operations shall be conducted in such a manner as to effectively control soil erosion and prevent non-point source pollution loads from entering streams, ponds,

and/or wetlands. At any time during the construction project, the City with recommendations from any other responsible local government or agency has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations and to direct the entity proposing to construct a new utility within the Greenway System to provide immediate permanent or temporary erosion and sediment control measures to prevent contamination of wetlands or water courses on the Greenway property.

Prohibited construction procedures include, but are not limited to, the following:

- A. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
- B. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters. During the design of sewers and/or other utilities likely to go through existing wetlands, the City, with recommendations from other responsible local government or agency, will explore other alternatives such as construction outside the wetland and/or tunneling. If other methods are feasible, the City or other utility provider will design and construct the sewer and/or other utilities using the method that avoids construction through the wetland.
- C. Pumping of silt-laden water from trenches or excavations into surface waters or wetlands.
- D. Damaging vegetation adjacent to or outside of the construction area limits.
- E. Disposal of trees, brush, debris, plants, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
- F. Alteration of the flow line of any stream, unless such work is of a temporary nature, has been specifically authorized, and is necessary to divert flow from excavation work so that debris and sediments are not released into streams. Various design and construction alternatives shall be investigated and the cost effective alternative that minimizes the deposition of debris, habitat degradation, and sediments will be utilized.
- G. Open burning of debris within Greenway properties.

All conveyance channels, drainage outlets, and erosion and sediment control measures must be constructed to withstand the expected velocity of flow from a five-year frequency storm without erosion.

## **6.0 RESTORATION OF GREENWAY PROPERTIES DISTURBED DURING CONSTRUCTION OF NEW UTILITIES**

Permanent soil stabilization measures shall be applied to disturbed areas within 30 days after all soil disturbing activities have been completed and the final grade has been reached on any portion of the construction project site. Permanent soil stabilization means that for unpaved areas and areas not covered by permanent structures, at least 70 percent of the soil surface is uniformly covered in permanent vegetation or equivalent permanent stabilization measures (such as the use of riprap, gabions, permanent mulches or geotextiles) have been employed. Until these conditions are satisfied and permanent control measures and facilities are operational, interim stabilization measures and temporary erosion and sediment control measures shall not be removed. Efforts shall be made to return the site to its natural condition. Native vegetation shall be used in such efforts. Acceptable plants and grasses are listed in Section 5.0 of this document and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Temporary soil stabilization measures shall be applied immediately to disturbed areas that are not at final grade but shall remain dormant for longer than 60 days. Areas that have been stabilized by temporary measures must be permanently stabilized once all soil disturbing activities are complete and the area is at final grade. Also, permanent stabilization measures shall be applied immediately to rough graded areas that will require erosion and sediment control for longer than six months.

### **6.1 PERMANENT VEGETATION**

Permanent vegetation is the planting of perennial vegetation such as trees, shrubs, vines, grasses, or legumes, on exposed areas for permanent soil stabilization. A crop of perennial vegetation appropriate for the region, which is capable of providing a 70 percent coverage within the growing season, shall be used to achieve permanent soil stabilization.

The purpose of establishing permanent vegetation in disturbed areas is to protect the soil surface from erosion, reduce damage from sediment, reduce runoff to downstream areas, improve wildlife habitat and visual resources, and improve aesthetics. Permanent soil stabilization applies to each phase of construction. For linear construction projects on land used for agricultural or silvicultural purposes, permanent stabilization may be accomplished by stabilizing the disturbed land for its agricultural or silvicultural use. For design and construction specifications for disturbed area stabilization with permanent vegetation see Article 8.0 and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Sod shall be used to establish a permanent vegetative cover on highly erodible or severely eroded lands. Sod establishes immediate ground cover and thereby reduces runoff, erosion, and dust, which results in improved aesthetics; higher land value; stabilized waterways and critical areas; less sediments, nutrients and bugs; less downstream complaints; reduced likelihood of legal action and work stoppage due to legal action; and increased “good neighbor” benefits.

Sod is appropriate for areas that require immediate vegetative covers such as drop inlets, grass swales, and waterways with intermittent flow. Sod can initially be more costly than seed, but the advantages justify the increased initial costs.

The advantages to sod include the following:

- A. Immediate erosion and sediment control, green surface, and quick use.
- B. Reduced failure as compared to seed.
- C. Lack of weeds.
- D. Can be established almost year-round.

Sod is preferable to seed in waterways and swales because of the immediate protection of the channel after application. Sod must be staked in concentrated flow areas. For design and construction specifications for disturbed area stabilization with permanent sod see Article 8.0 and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

## **6.2 EROSION CONTROL MATTING AND BLANKETS**

This stabilization technique provides a protective covering (blanket) or a soil stabilization mat to establish permanent vegetation on steep slopes, channels, or shorelines. The purpose of erosion control matting and blankets is to provide a microclimate that protects young vegetation and promotes its establishment and to reinforce the turf against forces of erosion during storm events.

Matting and blankets shall be applied on steep slopes where the hazard of erosion is high and planting is likely to be too slow in providing adequate protective cover. Concentrated flow areas, slopes steeper than 2.5:1 and with a height of ten feet or greater, and cuts and fills within the stream buffer, shall be stabilized with the appropriate erosion control matting or blanket. On streambanks where moving water is present, matting can be used to prevent new plantings from being washed away. For design and construction specifications for erosion control using matting and blankets see Article 8.0 of this section and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Benefits of using erosion control blankets include the following:

- A. Protection of seed and soil from raindrop impact and subsequent displacement.
- B. Thermal consistency and moisture retention for seedbed areas.
- C. Stronger and faster germination of grasses and legumes.
- D. Planing off excess stormwater runoff.

- E. Prevention of sloughing of topsoil added to steeper slopes.

Benefits of using erosion control matting include the following:

- A. All benefits gained from using erosion control blankets that are listed above.
- B. Collects soil out of stormwater which becomes the growth medium for the development of roots.
- C. Assists the vegetative root system in forming an erosion-resistant cover resistant to hydraulic lift and shear forces when embedded in the soil of stormwater channels.

## **7.0 TRAINING OF PERSONNEL INVOLVED IN CONSTRUCTION OF NEW UTILITIES WITHIN THE GREENWAY SYSTEM**

Key Personnel involved in construction of utilities within Greenway Properties shall be trained of the requirements of the Consent Decree, the Greenway Acquisition Plan, and these SOPs. The key personnel shall also be trained on the proper installation, implementation, and inspection of erosion and sediment control measures.

A “pre-construction” meeting shall be held between the City, other responsible local government or agency, and key personnel of the utility or construction agency following training in order to ensure that all parties have a common understanding as to how construction will be performed within the Greenway Properties.

## **8.0 TECHNIQUES FOR EROSION AND SEDIMENT CONTROL**

This section presents summaries of techniques, (including their applications) used to control erosion and sedimentation during the construction of utilities within the Greenway System. Erosion and sediment control measures shall be designed and implemented in accordance with the design standards established in this section and the latest edition of the Manual for Erosion and Sediment Control in Georgia. If a conflict occurs between the design and construction standards presented in this section and those presented in the latest edition of the Manual for Erosion and Sediment Control in Georgia, the more stringent design and construction standards shall prevail. The selection of the most appropriate erosion and sediment control measure will be made by the entity proposing to construct a new utility within the Greenway System based on site specific conditions.

### **8.1 CHECK DAM**

#### **8.1.1 Definition**

Small temporary barriers, grade control structures, or dams constructed across a swale, drainage ditch, or areas of concentrated flow.

### **8.1.2 Purpose**

To minimize erosion by reducing the velocity of storm water in areas of concentrated flow.

### **8.1.3 Conditions Where Practice Applies**

This measure is limited to use in small open channels and shall not be used in a live stream. Specific applications include:

- A. Temporary or permanent swales or ditches in need of protection during establishment of grass linings.
- B. Temporary or permanent swales or ditches which, because of their short length of service or other reason, cannot establish a non-erodible lining but still need some protection against erosion.
- C. Other locations where small localized erosion and resulting sedimentation problems exist.

### **8.1.4 Planning Consideration**

Check dams may be constructed of stone or hay bales. The drainage area for a stone check shall not exceed 2 acres. The drainage area for haybales shall not exceed one acre. Most check dams would be constructed of stone, however, stone may not be acceptable in some installations because of aesthetics and hay bales may need to be considered.

Stone checks dams (Figure M-2) are easier to install with backhoes or other suitable equipment. The stone is usually purchased. Stone shall be handled carefully in areas to be mowed. Some stone may be washed downstream and shall be removed before each mowing operation.

Check dams shall be planned to be compatible with the other features such as streets, walks, trails, sediment basins, and rights-of-way or property lines. Check dams may be constructed in series and the dams shall be located at a normal interval from other grade controls such as culverts or sediment basins.

Check dams constructed of hay bales (Figure M-3) have the shortest life of the materials discussed. The maximum design life for hay bale structures is 3 months. Haybale check dams shall not be used where permanent watercourse protection is needed.

### **8.1.5 Design Criteria for Check Dams**

Formal design is not required. The following limiting factors shall be adhered to when designing check dams.

- A. Drainage Area: Stone -2 acres or less  
Haybale – 1 acre or less.
- B. Maximum Height: 2 feet when measured to center of check dam.
- C. Side Slopes: 2:1 or flatter.
- D. Max. Spacing Between Dams: Elevation of toe of upstream dam is at or below elevation of crest of downstream dam (see Figure M-1).
- E. Geotextiles: Suitable geotextiles shall be placed between the stone and its soil base and abutments.

Top of dam, perpendicular to flow, shall be parabolic. The center of the dam must be at least 9 inches lower than the outer edges (see Figures M-2 and M-3).

### **8.1.6 Construction Specifications for Check Dams**

Check dams shall be constructed to be stable throughout their planned life. The dam shall be constructed well into the abutment so that water cannot run around the dam.

- A. Stone check dams shall be constructed of size 2-10 inch stone. Mechanical or hand placement shall be required to insure complete coverage of the entire width of ditch or swale and that the center of the dam is a minimum of 9 inches lower than the outer edges.
- B. Haybale check dams may be used as temporary check dams in concentrated flow areas while vegetation is becoming established. Haybale check dams shall not be used where the drainage area exceeds 1 acre. The haybales shall be embedded a minimum of 4 inches on its upslope side.

### **8.1.7 Maintenance**

Periodic inspection of check dams is necessary. Repair shall be made as soon as possible to minimize damage and expense of repair. Sediment shall be removed when it reaches a depth of one-half the original dam height.

Once areas that require mowing are at final grade and have been permanently stabilization the check dams shall be removed. Otherwise, check dams may remain in place permanently.

Whenever check dams are removed, care shall be taken to minimize disturbance to the remainder of the watercourse. The area where the check dam was removed shall be immediately shaped and smoothed to watercourse dimensions, seeded and mulched. If the area is to be mowed where stone check dams have been used, care shall be taken to remove all stone.

## **8.2 STREAM DIVERSION CHANNEL**

### **8.2.1 Definition**

Stream diversion channels are temporary channels constructed to convey flow around a construction site while a permanent structure is being constructed in the stream channel.

### **8.2.2 Purpose**

The purpose of a stream diversion channel is to protect the streambed from erosion and allow work “in the dry”.

### **8.2.3 Conditions Where Practice Applies**

Temporary stream diversion channels shall be used only on flowing streams with a contributing drainage area less than one square mile. For streams with larger contributing drainage areas, structures or methodology shall be designed by methods which more accurately define the actual hydrologic and hydraulic parameters which will affect the functioning of the structure.

### **8.2.4 Planning Consideration**

In cases where in-stream work is unavoidable, the amount of encroachment and time spent working in the channel shall be minimized. If construction in the streambed will take an extended period of time, substantial in-stream controls or stream diversion channel shall be considered to prevent excessive damage due to sedimentation. To limit land-disturbance, overland pumping of the stream shall be considered in low-flow conditions. Clearing of the streambed and banks shall be kept to a minimum. Refer to Figures M-14a and M-14b for typical stream diversion channel details.

### **8.2.5 Design Criteria for Stream Diversion Channels**

- A. Contributing drainage Area: Temporary stream diversion channels shall not be used on streams with a contributing drainage area greater than one square mile (640 acres).
- B. Size: The bottom width of the stream diversion shall be a minimum of six feet or equal to the bottom width of the existing streambed, whichever is greater.
- C. Side Slopes: Side slopes of the stream diversion channel shall be no steeper than 2:1.
- D. Depth and Grade: The depth and grade may be variable, dependent on site conditions, but shall be sufficient to ensure continuous flow of water in the diversion.

- E. Channel Lining: A stream diversion channel shall be lined to prevent erosion of the channel and sedimentation in the stream. The lining is selected based upon the expected velocity of bankfull flow. Refer to Table M-1 for selection of channel lining material and see the latest edition of the Manual for Erosion and Sediment Control in Georgia for specifications.

<b>Lining Materials</b>	<b>Code</b>	<b>Acceptable Velocity Range</b>
Geotextile, polyethylene film, or sod	Dc-A	0 – 2.5 fps
Geotextile alone	Dc-B	2.5 – 9.0 fps
Class I riprap and geotextile	Dc-C	9.0 – 13.0 fps

Source: the Manual for Erosion and Sediment Control in Georgia, 2000, Georgia Soil and Water Conservation Commission.

- F. Geotextile: Geotextiles shall be used as a protective cover for soil, or if the channel is to be lined with riprap, as a separator between graded stone and the soil base. The geotextile will prevent erosion of the channel and the migration of soil particles from the subgrade into the graded stone. The geotextile shall be specified in accordance with AASHTO M288-96 Section 7.5, *Permanent Erosion Control Recommendations*. The geotextile shall be placed immediately adjacent to the subgrade without any voids.

**8.2.6 Construction Specifications for Stream Diversion Channels**

- A. The channel shall be excavated, constructing plugs at both ends. Plugs can be constructed of compacted soil, riprap, sandbags or sheet plastic.
- B. A Silt fence or berm shall be placed along the sides of the channel to prevent unfiltered runoff from entering the stream. The berm can be constructed using the material excavated for the stream diversion.
- C. The channel surface shall be smooth (to prevent tearing of the liner) and lined with the material specified in the plans. The outer edges of the geotextile shall be secured at the top of the channel with compacted soil.
- D. The plugs shall be removed when the liner installation is complete, removing the downstream plug first.
- E. As soon as construction in the streambed is complete, diversions shall be replugged and backfilled. The liner shall be inspected for damage and salvaged if possible.

- F. Upon removal of the lining, the stream shall immediately be restored and properly stabilized.

### **8.2.7 Maintenance**

To ensure that the work area stays dry and that no construction materials float downstream, the stream diversion channel shall be inspected at the end of each day to make sure that the construction materials are positioned securely. All repairs shall be made immediately.

## **8.3 DIVERSION**

### **8.3.1 Definition**

A ridge of compacted soil, constructed above, across or below a slope.

### **8.3.2 Purpose**

To reduce the erosion of steep, or otherwise highly erodible areas by reducing slope lengths, intercepting stormwater runoff and safely diverting it to stabilized outlets at non-erosive velocities.

### **8.3.3 Conditions Where Practice Applies**

- A. Where runoff from higher areas may damage property, cause erosion, contribute to pollution, flooding, or interfere with the establishment of vegetation on lower areas.
- B. Where surface and/or shallow subsurface flow is damaging sloping upland, manmade improvements, or unstabilized areas.
- C. Where the slope length needs to be reduced to minimize soil loss.

### **8.3.4 Planning Considerations**

Diversions can be a useful tool for managing surface water flows and preventing soil erosion. On moderately sloping areas, they may be placed at intervals to trap and divert sheet flow before it has a chance to concentrate and cause rill and gully erosion.

Diversions may be placed at the top of cut or fill slopes to keep runoff from upland drainage areas off the slope. Diversions are also typically built at the base of steeper slopes to protect flatter developed areas, which cannot withstand runoff water from outside areas. They can also be used to protect structures, parking lots, adjacent properties, and other special areas from flooding.

Diversions are preferable to other types of man-made stormwater conveyance systems because they more closely simulate natural flow patterns and characteristics. Flow velocities are generally kept to a minimum. When properly coordinated into the landscape design of a site, diversions can be visually pleasing as well as functional.

As with any earthen structure, it is very important to establish adequate vegetation as soon as possible after installation. It is usually important to stabilize the drainage area above the diversion so that sediment will not enter and accumulate in the diversion channel.

### **8.3.5 Design Criteria**

- A. Location: Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, seepage (where seepage is a problem), and the development layout. Outlets must be stable after diversions empties stormwater flow into them, therefore, care shall be exercised in the location selection of the diversion and its outlet.
  
- B. Ridge Design: The supporting ridge cross-section shall meet the following criteria.
  - 1. The compacted ridge shall be designed to have stable side slopes, which shall be no steeper than 2:1.
  - 2. The width of the ridge at the design water elevation shall be a minimum of 4 feet.
  - 3. The minimum freeboard shall be 0.3 foot.
  - 4. The design shall include a 10 percent settlement factor.
  
- C. Channel Design: Diversions shall be tailored to fit the conditions of a particular site and local soil type(s). Land slope must be taken into consideration when choosing channel dimensions. Narrow and deep channels may be required on steeper slopes, while broad, shallow channels usually are more appropriate on gentle slopes. The wide, shallow section will be easier to maintain. Since sediment deposition is often a problem in diversions, the designed flow velocity shall be kept as high as the channel lining will permit.

Table M-2 shall be used to select the storm frequency required for the design of the diversion and to determine the required channel capacity, Q (peak rate of runoff).

<b>Table M-2 Diversion Design Criteria</b>				
<b>Diversion Type</b>	<b>Land or Improvement Protected</b>	<b>24-hour Storm Frequency</b>	<b>Freeboard (feet)</b>	<b>Minimum Top Width (feet)</b>
Temporary	Construction areas Building Sites	10 years <sup>1</sup>	0.3	4
Permanent	Landscaped, recreation and similar areas	25 years	0.3	4
	Dwellings, schools, commercial buildings, and similar installation	50 years	0.5	4

<sup>1</sup> Use 10 year or the storm frequency specified in Title 12 of the Official Code of Georgia Annotated.  
Source: the Manual for Erosion and Sediment Control in Georgia, 2000, Georgia Soil and Water Conservation Commission.

The channel portion of the diversion shall be designed according to specifications outlined in the latest edition of the Manual for Erosion and Sediment Control in Georgia.

- D. Outlet: Each diversion shall have an adequate outlet, which will discharge concentrated runoff without erosion. The outlet may be a constructed or natural waterway, a stabilized vegetated area or a stabilized open channel. Protected outlets shall be constructed and stabilized prior to construction of the diversion.
- E. Road and Utility Rights-of-Way: Diversions installed to divert water off a road or right-of-way shall consist of a series of compacted ridges of soil running diagonally across the road at a 30° angle. Ridges are constructed by excavating a channel upstream for this type of diversion (see Figure M-5). Stable outlets shall be provided for each diversion.

A detailed design is not required for this type of diversion. The compacted ridge height shall be 8-12 inches above the original road surface; the channel depth shall be 8-12 inches below the original road surface. Channel bottoms and ridge tops shall be smooth enough to be crossed by vehicular traffic. The maximum spacing between diversions shall be as follows:

<b>Road Grade (%)</b>	<b>Distance Between Diversions (feet)</b>
1	400
2	250
5	125
10	80
15	60
20	50

### **8.3.6 Construction Specifications**

- A. All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the diversion.
- B. The diversion shall be excavated or shaped to line, grade, and cross-section as required to meet the criteria specified herein and free of irregularities which will impede normal flow.
- C. All fills shall be machine compacted as needed to prevent unequal settlement that would cause damage in the completed diversion.
- D. All earth removed and not needed in construction shall be spread or disposed of so that it will not interfere with the functioning of the diversion.
- E. Diversion channels shall be stabilized in accordance with Channel Stabilization specifications in the latest edition of the Manual for Erosion and Sediment Control in Georgia.

### **8.3.7 Maintenance**

Before the construction site is restored, the diversion shall be inspected after every rainfall. Sediment and debris shall be removed from the ditch line and repairs made as necessary. Seeded areas that fail to establish a vegetative cover shall be reseeded as necessary.

After stabilization, the diversion shall be inspected for erosion following each significant flow. Damaged areas shall be patched with compacted soil and re-vegetated to prevent further erosion. The vegetation shall be fertilized on an annual basis to keep the grass vigorous and protective. The vegetation shall be re-established whenever it does not cover the ground and does not provide protection against erosion damage.

## **8.4 TEMPORARY DOWNDRAIN STRUCTURE**

### **8.4.1 Definition**

A temporary downdrain structure is a pipe used to temporary convey a concentration of storm water down the face of cut or fill slopes without causing slope erosion.

### **8.4.2 Purpose**

The purpose of a temporary downdrain is to safely move storm runoff from one elevation to another without causing slope erosion and allowing the establishment of vegetation on the slope. Refer to Figure M-6 for typical temporary downdrain structure details.

### 8.4.3 Conditions Where Practice Applies

Temporary downdrains shall be used on slopes where concentrated storm water could cause erosion damage. Once a permanent water disposal system has been installed these structures shall be removed.

### 8.4.4 Design Criteria

Formal design shall not be required. A temporary downdrain structure shall be placed on undisturbed soil or well-compacted fill. The pipe diameter shall have sufficient capacity to convey the maximum runoff expected during the life of the drain. Refer to Table M-3 for selecting pipe sizes.

<b>Maximum Drainage Area per Pipe (acre)</b>	<b>Pipe Diameter (inches)</b>
0.3	10
0.5	12
1.0	18

Source: Manual for Erosion and Sediment Control in Georgia, 2000, Georgia Soil and Water Conservation Commission.

The pipe material shall be heavy-duty, flexible material such as non-perforated, corrugated plastic pipe or specially designed flexible tubing. The pipe shall be anchored with hold-down grommets or stakes at intervals not to exceed 10 feet. The outlet of the pipe shall be securely anchored in place. The pipe shall extend beyond the toe of the slope.

Diversions shall be used to route runoff to the downdrain's Tee or "L" inlet at the top of the slope. The entrance shall be sloped ½ inch per foot toward the outlet. To prevent the pipe from being washed out by seepage or piping, the soil around the inlet shall be thoroughly compacted. A stone filter ring or check dam may be placed at the inlet for added sediment filtering capacity.

Riprap shall be placed at the outlet for energy dissipation. For additional protection at the outlet a flared end section, Tee outlet, or other suitable device shall be used in conjunction with the riprap.

### 8.4.5 Construction Specifications

Slope drains often fail due to water saturating the soil and seeping along the pipe. Firm contact between the pipe and the soil at all points will help to eliminate this type of failure. To ensure proper pipe-soil contact, back-filling around and under the pipe shall be performed with stable soil material, hand compacting in 6-inch lifts.

- A. Slope drains shall be placed on undisturbed soil or well-compacted fill as indicated on the plans.
- B. The section of pipe under the dike toward the outlet shall be slightly sloped.
- C. The soil under and around the entrance section shall be hand tamped in lifts not to exceed 6 inches.
- D. The fill over the drain at the top of the slope shall have minimum dimensions of 1.5-foot depth, 4 feet top width and 3:1 side slopes.
- E. All slope drain connections shall be watertight.
- F. All fill material shall be well-compacted and the exposed sections of the drain shall be securely fasten with grommets or stakes spaced no more than 10 feet apart.
- G. The drain shall be placed slightly diagonally across the slope and extend beyond the toe of the slope. The outlet shall be curved uphill and adequately protected from erosion.
- H. If the drain is conveying sediment-laden runoff, the flow shall be directed into a sediment trap or sediment basin.
- I. The settled, compacted dike ridge shall be no less than 1 foot above the top of the pipe at every point.
- J. All disturbed areas shall be stabilized immediately following construction.

#### **8.4.6 Maintenance**

The slope drain and supporting diversions shall be inspected after every rainfall. Any necessary repairs shall be made promptly. Once the disturbed area has been permanently stabilized the slope drains shall be removed. The slope drain material shall be disposed of properly and all disturbed areas shall be stabilized appropriately.

### **8.5 ROCK FILTER DAM**

#### **8.5.1 Definition**

A rock filter dam is a permanent or temporary stone filter dam installed across a small stream or draingeway.

#### **8.5.2 Purpose**

This structure serves as a sediment filtering device in drainageways and in come cases, it may also reduce the velocity of stormwater flow through a channel. A rock filter dam is

not intended to substantially impound water. All appropriate agencies and local officials shall be contacted before installing any structure in a flowing stream.

### **8.5.3 Conditions Where Practice Applies**

When used in conjunction with other appropriate sediment control measures, rock filter dams may reduce the amount of sediment reaching a water body. A rock filter dam may be used in small channels that drain 50 acres or less.

Rock filter dams shall be used as an additional sediment control measure below construction projects such as culvert installations, dam construction, or any project that may involve grading activity directly in a stream. Rock filter dams may also be used at the upstream end of ponds or lakes to trap incoming sediment loads.

### **8.5.4 Design Criteria**

Although formal design is not required, a qualified engineer shall be consulted before a structure of any kind is installed in a flowing stream.

- A. Drainage Area - The drainage area contributing to a rock filter dam shall not exceed 50 acres
- B. Height - The height of a rock filter dam shall not be higher than the channel banks or exceed the elevation of the upstream property line. The center of the dam shall be at least 6 inches lower than the outer edge of the dam (see Figure M-7).
- C. Side slopes - Side slopes shall be 2:1 or flatter.
- D. Location - A rock filter dam shall be located as close to the source of sediment as possible and so that it will not cause water to back up on upstream adjacent property.
- E. Stone Size - The stone size for a rock filter dam shall be determined by the design criteria set forth in the latest edition of the Manual for Erosion and Sediment Control in Georgia. For additional filtering effect, the dam shall be faced with the smaller stones on the upstream side. However, this may make the dam more prone to clogging.
- F. Top Width - The top of a rock filter dam shall be no less than 6 feet wide.
- G. Geotextile – To prevent the migration of soil particles from the subgrade into the graded stone, geotextiles shall be used as a separator between the graded stone, the soil base, and the abutments. The geotextile shall be specified in accordance with AASHTO M288-96 Section 7.5, *Permanent Erosion Control Recommendations*. The geotextile shall be placed immediately adjacent to the subgrade without any voids. To prevent scour the geotextile shall extend five feet beyond the downstream toe of the dam.

### **8.5.5 Construction Specifications**

The rock filter dam shall extend completely across the channel and securely ties into both channel banks. Rocks shall be placed by mechanical methods or by hand placement. The center of the dam shall be at least 6 inches lower than the outer edge of the dam (see Figure M-7). Gabions that have been sized and installed according to specification outlined in the latest edition of the Manual for Erosion and Sediment Control in Georgia may serve as a rock filter dam.

### **8.5.6 Maintenance**

Periodic inspection and required maintenance shall be provided. Sediment shall be removed when it reaches a depth of one-half of the original height of the dam. Rock filter dams shall be removed once the disturbed areas have been stabilized.

## **8.6 SEDIMENT BARRIER/FENCE**

### **8.6.1 Definition**

A sediment barrier/fence is a temporary structure typically constructed of a silt fabric supported by steel or wooden posts. Other barrier materials may include sandbags, straw bales, brush piles, or other filtering mediums.

### **8.6.2 Purpose**

To prevent sediment carried by sheet flow from leaving the site and entering natural drainage ways or storm drainage systems by slowing storm water runoff and causing the deposition of sediment at the structure.

### **8.6.3 Conditions Where Practice Applies**

Sediment barriers shall be installed where runoff can be stored behind the barrier without damaging the fence or the submerged area behind the fence. Silt fence shall not be installed across streams, ditches, waterways, or other concentrated flow area.

### **8.6.4 Planning Consideration**

Silt fences are usually preferable to hay bales because silt fences can trap a much higher percentage of suspended solids. The success of silt fences depends on a proper installation so as to develop maximum efficiency of trapping. Silt fences as well as hay bales shall be carefully installed to meet the intended purpose

Sediment barriers shall be used on all construction development sites. They shall be installed on the contour so that flow will not concentrate and cause bypassing, overtopping and/or failure. Sediment barriers shall remain in plane and maintained until the disturbed areas have been permanently stabilized.

The primary sediment barrier is a silt fence. A silt fence is specifically designed to allow water to pass through while retaining sediment on the site. Silt fences shall be installed to be stable under the flows expected from the site. Silt fences are composed of woven filter fabric supported between steel or wooden posts. Silt fences are commercially available with geotextile attached to the post and can be rolled out and installed by driving the post into the ground. This type of silt fence is simple to install, but more expensive than some other installations. Silt fences must be trenched in at the bottom to prevent rills from developing under the fence (see Figures M-8a and M-8b).

Hay bale barriers are the next most common sediment barrier. Hay bales are laid end to end along the contour and anchored in place by driving wooden stakes through the bales into the soil. To prevent water from going under the barrier, the bales shall be embedded into the soil four inches (see Figure M-9). Sediment barriers shall be of sufficient length to eliminate end flow whenever it is constructed across a swale or ditch line. The plan configuration shall resemble an arc or horseshoe with ends oriented upstream (see Figure M-3).

### 8.6.5 Design Criteria

- A. Silt fences may be premanufactured or built on site with post, wire and fabric. Silt fence fabric shall be selected from the approved fabrics listed in the Georgia Department of Transportation Qualified Products List #36 (QPL-36).
- B. Where all runoff is to be stored behind the fence (where no stormwater disposal system is present), the maximum slope length behind a silt fence shall not exceed those shown in Table M-4 and the latest edition of the Manual for Erosion and Sediment Control in Georgia. The drainage area shall not exceed 1/4 acre for every 100 feet of silt fence.

<b>Table M-4 Criteria for Silt Fence Placement</b>	
<b>Land Slope (%)</b>	<b>Maximum Slope Length Above Fence (feet)</b>
<2	100
2 to 5	75
5 to 10	50
10 to 20	25
>20*	15

\*In areas where the slope is greater than 20%, a flat area length of 10 feet between the toe of the slope to the fence shall be provided.

Source: Manual for Erosion and Sediment Control in Georgia, 2000, Georgia Soil and Water Conservation Commission.

- C. Types of Silt Fence
  - 1. Type A silt fence has filter fabric that is 36 inches wide. A type A silt fence shall be used on developments where the life of the project is expected to be greater than or equal to six months.

2. Type B silt fence has filter fabric that is 22 inches wide. Type B silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six months.
  3. Type C silt fence has wire reinforced filter fabric that is 36 inches wide. This type fabric allows almost three times the flow rate as Type A silt fence. Type C silt fence shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10 feet.
- D. A riprap splash pad or other outlet protection device shall be provided for any point where the flow may top the sediment fence, such as natural depressions or swales. At protected reinforced outlets the maximum height of the fence shall not exceed 1 foot and the fence support post spacing shall not exceed 4 feet.

### **8.6.6 Construction Specifications**

- A. Sandbags: Shall be approved by local issuing authorities. Sandbags shall be installed such that flow under and between the bags is minimal. If the structure height exceeds two bags, it shall be anchored in place with steel rods.
- B. Hay or Straw Bales: Shall be approved by local issuing authorities. Bales shall be placed lengthwise on the contour in a single row and embedded in the soil a minimum depth of 4 inches. Bales shall be securely anchored in place by stakes, bars or other acceptable means (see Figure M-9). Stakes for hay bale barriers shall be nominal 2 inch by 2 inch wood. The wood shall be sound with a minimum length shall be 3 feet. The stakes shall be driven into the ground 18 to 24 inches. Equivalent metal rods or steel bars may be used.
- C. Brush Barrier: Shall be used only during timber clearing operations. Brush obtained from clearing and grubbing operation may be piled in a row along the perimeter of disturbance. Brush barriers shall not be used in developed areas or where aesthetics are a concern.

Brush shall be wind-rowed on the contour as nearly as possible. If compaction is necessary, construction equipment may be used for compaction operations. The brush barrier shall have a base width between 5 and 10 feet, and a height between 3 and 5 feet. To achieve greater filtering capacity, filter fabric shall be placed on the side of the brush barrier receiving sediment-laden runoff. The lower edge of the fabric shall be buried in a 6-inch deep trench immediately uphill from the barrier. The upper edge of the fabric shall be stapled, tied or otherwise fastened to the brush barrier. Edges of adjacent fabric pieces shall overlap each other.

#### D. Silt Fence

1. The filter fabric shall have an approved color mark yarn woven into the fabric or the manufacturer label and fabric name printed on the fabric every 100 feet.
2. The temporary silt fence shall be installed according to these specifications, as shown on construction plans or as directed by an engineer. For fabric installation specifications see Figures M-8a and M-8b and the latest edition of the Manual for Erosion and Sediment Control in Georgia.
3. Post installation shall start at the center of the low-point (if applicable) with the remaining posts spaced 6 feet apart for Type A and B silt fences and 4 feet apart for Type C silt fence. Wood and steel post may be used with Type A and Type B silt fences. Only steel post shall be used with Type C silt fence. For post size requirement see Figures M-8a and M-8b and the latest edition of the Manual for Erosion and Sediment Control in Georgia.
4. The filter fabric shall be securely fastened to the fencing with staples or nails or other fasteners made for this purpose (see Figure M-8a for fastener specifications). The bottom of the filter fabric shall be installed in a trench. The trench shall then be filled with the soil and compacted.
5. Along stream buffers and other sensitive areas, two rows of Type C silt fence or one row of Type C silt fence backed by haybales shall be used.

#### 8.6.7 Maintenance

Sediment barriers shall be inspected immediately after each rainfall and at least weekly during normal construction activities and daily during prolonged rainfall. Any needed repairs shall be made immediately. Fabric shall be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months).

Sediment deposits shall be removed when the deposits reach one-half the original height of the barrier. Any sediment deposits remaining after the sediment barrier is no longer required shall be smoothed to conform to the natural topography and the area restored as described earlier in Article 6.0.

### 8.7 INLET SEDIMENT TRAP

#### 8.7.1 Definition

An inlet sediment trap is a temporary protective device formed around a storm drain drop inlet to trap sediment.

### **8.7.2 Purpose**

Inlet sediment traps shall be used until the disturbed areas are permanently stabilized to prevent sediment from leaving the site, or from entering storm drainage systems.

### **8.7.3 Conditions Where Practice Applies**

Inlet sediment traps shall be installed at or around all storm drain drop inlets that receive runoff from disturbed areas.

### **8.7.4 Design Criteria**

The drainage area contributing to an inlet sediment trap shall be no greater than one acre. A variety of sediment filtering devices that can serve as temporary sediment traps are shown in Figures M-10a through M-10e. Sediment traps shall be self-draining unless they are otherwise protected in an approved manner that will not present a safety hazard.

A temporary dike shall be constructed on the down slope side of a sediment trap where runoff may bypass the protected inlet. Stone filter rings may be used on the up slope side of the inlet to slow runoff and filter larger soil particles. Refer to the latest edition of the Manual for Erosion and Sediment Control in Georgia for stone filter ring specifications.

Where additional sediment storage is required, an excavation shall be created around the inlet sediment trap. The excavated area shall be sized to provide a minimum storage capacity calculated at 67 cubic yards per acre of drainage area. All excavated sediment traps shall provide a minimum of 1.5 feet of sediment storage and shall not have side slopes steeper than 2:1.

### **8.7.5 Construction Specifications**

Sediment traps shall be constructed on natural ground surface, on an excavated surface, or on machine compacted fill provided they have a non-erodible outlet.

- A. Fabric Frame Inlet Sediment Traps: Filter fabric fitted around a supporting frame shall be used for inlet protection where the inlet drains a relatively flat area (slope no greater than 5 percent) and the inlets do not receive concentrated flows. The frame shall be constructed from Type C filter fabric supported by steel posts (see Figure M-10a). Stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3 feet apart and securely driven into the ground approximately 18 inches deep. The fabric shall be entrenched 12 inches and backfilled with crushed stone or compacted soil. Fabric shall be securely fastened to the posts, and fabric ends shall be overlapped a minimum of 18 inches or wrapped together around a post.
- B. Baffle Box: A baffle box inlet sediment trap shall be used for inlets receiving runoff with a higher volume or velocity. The baffle box shall be constructed of 2”

x 4" boards spaced a maximum of 1 inch apart or of plywood with weep holes. The weep holes shall be 2 inches in diameter spaced approximately 6 inches on center vertically and horizontally. The entire box shall be wrapped in Type C filter fabric. The filter fabric shall be entrenched 12 inches and backfilled. Gravel shall be placed outside the box, all around the inlet, to a depth of 2 to 4 inches (see Figure M-10b).

- C. Block and Gravel Drop Inlet Sediment Traps: Block and gravel drop inlets shall be used where heavy flows are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure. On each side of the structure one block, in the bottom row, shall be placed on its side to allow the pool to drain (see Figure M-10c). The foundation shall be excavated at least 2 inches below the crest of the storm drain. The bottom row of blocks shall be placed against the edge of the storm drain for lateral support and to avoid washouts when overflow occurs. When needed, lateral support shall be provided to subsequent rows by placing 2" x 4" wood studs through the block openings. To hold gravel in place, hardware cloth or comparable wire mesh with ½ inch openings shall be carefully fitted over all block openings. Clean gravel shall be placed to a height of 2 inches below the top of the block on a 2:1 slope or flatter and smoothed to an even grade. Georgia DOT #57 washed stone is recommended.
- D. Gravel Drop Inlet Sediment Traps: Gravel drop inlet protection shall be used where heavy concentrated flows are expected. The slope toward the inlet shall be no steeper than 3:1. To prevent gravel from entering the inlet, an area of level stone, that is a minimum of 1 foot wide, shall be placed between the structure and around the inlet. Stone that is 3 inches or larger in diameter shall be used on the slope toward the inlet. On the slope away from the inlet, #57 (½" to ¾" diameter) washed stone shall be placed in a layer at least one foot (1') thick (see Figure M-10d).
- E. Sod Inlet Protection: Sod inlet protection shall be used at the time of permanent seeding to protect inlets from sediment and mulch material until the permanent vegetation becomes established. The sod shall be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure. Sod strips shall be staggered so that adjacent strip ends are not aligned. Refer to Figure M-10e for sod inlet protection details.

### **8.7.6 Maintenance**

Sediment traps shall be inspected daily and after each rain. Repairs shall be made as needed. Sediment shall be removed when the sediment has accumulated to one-half the height of the trap. For excavated inlet sediment traps, sediment shall be removed when one-half the storage capacity has been lost due to sediment accumulation. Sediment that is removed from sediment traps shall be properly disposed of and stabilized so that it will not enter the inlet or any waters bodies. Sediment shall not be washed into the inlet. Sod inlet protection shall be maintained as specified in the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Sediment traps shall be removed when the contributing drainage area has been adequately stabilized. All materials and any unstable soil shall be salvaged or properly disposed of. The disturbed area shall be brought back to proper grade then smoothed and compacted. All bare areas around the inlet shall be permanently stabilized.

## **8.8 TEMPORARY SEDIMENT BASIN**

### **8.8.1 Definition**

A temporary sediment basin is created by the construction of a barrier or dam across a concentrated flow area, by excavating a basin, or by a combination of both. Temporary sediment basins usually consist of a dam, a pipe outlet, and an emergency spillway. The size of the structure depends on the location, size of contributing drainage area, soil type, and rainfall pattern.

### **8.8.2 Purpose**

The purpose of a temporary sediment basin is to protect properties and drainage ways from damage caused by excessive sedimentation and debris from erodible areas. The water is temporarily stored and the bulk of the sediment carried by the water drops out and is retained in the basin before the water is automatically released.

### **8.8.3 Conditions Where Practice Applies**

This practice applies to critical areas where physical site conditions, construction schedules, or other restrictions preclude the installation or establishment of erosion and sediment control practices to satisfactorily reduce runoff, erosion, and sedimentation. The structure may be used in combination with other practices and shall remain in effect until the sediment-producing area is permanently stabilized.

This standard applies to the installation of temporary (to be removed within 18 months) sediment basins on sites where: (1) failure of the structure would not result in loss of life or interruption of use or service of public utilities, and (2) the contributing drainage area does not exceed 150 acres.

### **8.8.4 Design Criteria**

- A. Compliance with Laws and Regulations: Design and construction shall comply with federal, state, and local laws, ordinances, rules and regulations.
- B. Location: The sediment basin shall be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It shall also be located to minimize interference with construction activities and construction of utilities. Sediment basins shall be located so that storm drains discharge into the basin. They shall never be placed in live streams.

- C. Volume of Basin: The sediment storage volume of the basin, as measured to the crest elevation of the principal spillway, shall be at least 67 cubic yards per acre of disturbed area draining to the basin (67 cubic yards is equivalent to ½ inch of sediment per acre of drainage area). The entire contributing drainage area shall be used for this computation, rather than the disturbed area alone. The sediment shall be removed once approximately one-third of the storage volume of the basin has been lost to sediment accumulation
- D. Surface Area: Studies (Barfield and Clar, 1985) indicate that the following relationship between surface area and peak inflow rate gives a trapping efficiency from greater than 75 percent for clay loam to 96 percent for loamy sandy soils.

$$A = 0.01q$$

where A is the basin surface area in acres and q is the peak inflow rate in cfs. The area is measured at the crest of the principal spillway riser. The minimum peak inflow rate shall be determined from a 2-year, 24-hour storm.

- E. Shape of the Basin: To maximize detention time within the basin the designer shall incorporate features as listed below:
1. The length to width ratio shall be greater than 2:1 where length is the distance between the inlet and the outlet. Computation methods are described in the *Procedure for Determining or Altering Sediment Basin Shape* in the latest edition of the Manual for Erosion and Sediment Control in Georgia.
  2. A wedge shaped basin with the inlet located at the narrow end.
  3. Baffles or diversions.
- F. Spillways: Runoff shall be computed by the method outlined in the latest edition of the Manual for Erosion and Sediment Control in Georgia. Other approved equivalent methods may also be used. Runoff computations shall be based upon the worst soil-cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of the structure. The combined capacities of the principal and emergency spillway shall be sufficient to pass the peak rate of runoff from a 25-year, 24-hour frequency storm. An emergency spillway shall be included in the design, even if the principal spillway is designed to convey the peak rate of runoff from a 25-year, 24-hour storm,
1. Principal Spillway: A spillway consisting of a vertical pipe or box type riser joined (watertight connection) to a pipe that extends through the embankment and outlet beyond the downstream toe of the fill shall be provided. The metal gauge thickness of the principal spillway shall comply with Georgia DOT or NRCS specification. The discharge shall be

based on a 2-year, 24-hour storm for the total drainage area without causing flow through the emergency spillway. The appropriate disturbed soil cover condition shall be used. The minimum pipe size shall be 8 inches in diameter. Refer to the *Pipe Flow Chart for Corrugated Metal Pipe Drop Inlet Principal Spillway Conduit* table and the *Weir Flow (Q) Over Riser Crest for Circular Risers with Trash Rack* table, in the latest edition of the Manual for Erosion and Sediment Control in Georgia, to determine the proper sizing of the principal spillway, the riser, and the trash rack.

- a. Crest Elevation: The crest elevation of the riser shall be a minimum of one foot below the elevation of the control section of the emergency spillway (see Figure M-11a).
- b. Watertight barrel assembly: The riser and all pipe connections shall be completely watertight except for the inlet opening at the top or dewatering openings, and shall not have any other holes, leaks, rips or perforations.
- c. Dewatering the basin: Retention time within the basin is an important factor in effective sedimentation retention. The method used to dewater the sediment basin shall be selected from the following;
  1. Perforated Riser Pipe: The lower half of the riser shall be perforated with ½ inch holes spaced approximately 3 inches apart. The riser pipe shall then be covered with two feet of 3 to 4 inch stone (see Figure M-11a).
  2. Skimmer Outlet: The skimmer-type dewatering device operates at the surface of the ponded water and will not withdraw sediment from the submerged volume of the basin. Skimmers discharge 45 percent less sediment mass than conventional perforated risers. However, skimmers are mechanically more complex and shall require frequent inspection and maintenance in order to operate as designed.
- d. Trash rack and anti-vortex device: A trash rack and anti-vortex device shall be securely installed on top of the riser as detailed in the latest edition of Manual for Erosion and Sediment Control in Georgia.
- e. Base: The riser shall have a base attached with a watertight connection and shall have sufficient weight to prevent flotation of the riser. A concrete base 18” thick with the riser embedded 9” in the base is recommended. The minimum factor of safety shall be

1.20 (downward forces = 1.20 x upward forces). Refer to Table M-5 for volume of concrete required for risers and Figure M-11b for concrete riser base details.

<b>Table M-5 Concrete Volume Required to Prevent Flotation of Riser</b>		
<b>Riser Pipe Diameter (inches)</b>	<b>Buoyant Force (lbs./Vertical Foot of Riser Height)<sup>1</sup></b>	<b>Volume of concrete per Vertical Foot of Riser Height (c.f./V.F.) Needed to Prevent Flotation<sup>2</sup></b>
12	49.0	0.69
18	110.3	1.54
21	150.1	2.10
24	196.0	2.75
30	306.3	4.29
36	441.1	6.18
48	784.1	10.98
54	992.4	13.90
60	1225.2	17.16

<sup>1</sup>The weight of the riser pipe is negligible.

<sup>2</sup> Includes a factor of safety of 1.2.

Source: *Manual for Erosion and Sediment Control in Georgia*, 2000, Georgia Soil and Water Conservation Commission.

- f. Anti-Seep Collars: One anti-seep collar shall be installed around the pipe, near the center of the dam, when any of the following conditions exist:
1. The settled height of the dam is greater than 15 feet.
  2. The conduit is smooth pipe larger than 8” in diameter.
  3. The conduit is corrugated metal pipe larger than 12” in diameter.

Use an anti-seep collar with an 18-inch projection for heads (H) less than or equal to 10 feet and a 24-inch projection for heads (H) greater than 10 feet. The anti-seep collar and its connection shall be watertight.

- g. Outlet: An outlet shall be provided, including a means of conveying the discharge in an erosion-free manner to an existing stable area. Where discharge occurs at the property line, drainage

easements shall be obtained in accordance with local ordinances. Adequate notes and references shall be shown on the erosion and sediment control plan. Protection against scour at the discharge end of the pipe spillway shall be provided. Measures may include excavated plunge pools, riprap, impact basins, revetments, or other approved methods. For storm drain outlet protection specifications refer to the latest edition of the Manual of Erosion and Sediment Control in Georgia.

2. Emergency Spillway: The entire flow area of the emergency spillway shall be constructed in undisturbed ground (not fill). The emergency spillway cross-section shall be trapezoidal with a minimum bottom width of eight feet. This spillway channel shall have a straight control section of at least 20 feet in length and a straight outlet section for a minimum distance equal to 25 feet.
  - a. Capacity: The minimum capacity of the emergency spillway shall be that required to pass the peak rate of runoff from the 25-year, 24-hour frequency storm, less any reduction due to flow in the principal spillway. The appropriate disturbed soil cover condition shall be used. Emergency spillway dimensions shall be determined by using the method described in the latest edition of the Manual for Erosion and Sediment Control in Georgia.
  - b. Velocities: The velocity of flow in the exit channel shall not exceed 5 feet per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be within the non-erosive range for the type of protection used. Vegetation, riprap or concrete shall be provided to prevent erosion. For channel stabilization specifications refer to the latest edition of the Manual for Erosion and Sediment Control in Georgia.
  - c. Freeboard: Freeboard is the difference between the design high water elevation in the emergency spillway and the top of the settled embankment. The freeboard shall be at least one foot.
- G. Entrance of Runoff Into the Basin: The points of entrance of surface runoff into excavated sediment basins shall be protected to prevent erosion and sediment generation (for specifications refer to the latest edition of the Manual for Erosion and Sediment Control in Georgia). Dikes, swales or other water control devices shall be installed as necessary to direct runoff into the basin. To maximize travel time, the points of runoff entry shall be located as far away from the riser as possible.

### 8.8.5 Construction Specifications

- A. Site Preparation: The areas under the embankment and under structural works shall be cleared, grubbed, and stripped of topsoil. All trees, vegetation, roots and other objectionable material shall be removed and disposed of by approved methods. In order to facilitate clean-out or restoration, the pool area (measured at the top of the pipe spillway) shall be cleared of all brush and trees.
- B. Cut-off Trench: A cut-off trench shall be excavated along the centerline of earth fill embankments. The minimum depth shall be 2 feet. The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be 4 feet, but wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be drained during the backfilling and compaction operations.
- C. Embankment: The fill material shall be taken from approved areas shown on the plans. It shall be clean mineral soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material. Relatively pervious materials such as sand or gravel (Unified Soil Classes GW, GP, SW & SP) shall be placed in the downstream section of the embankment. Areas on which fills are to be placed shall be scarified prior to placement of fill. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Fill material shall be placed in six-inch to eight-inch thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing and hauling the construction equipment over the fill so that the entire surface of the fill is traversed by at least one wheel or tread track of the equipment or by the use of a compactor. The embankment shall be constructed to an elevation 5 percent higher than the design height to allow for settlement.
- D. Principal Spillway: The riser shall be securely attached to the pipe or pipe stub by welding the full circumference making a watertight structural connection. The pipe stub must be attached to the riser at the same percent (angle) of grade as the outlet conduit. The connection between the riser and the riser base shall be watertight. All connections between pipe sections must be achieved by approved watertight band assemblies. The pipe and riser shall be placed on a firm, smooth foundation of impervious soil as the embankment is constructed. Breaching the embankment is unacceptable. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the pipe or anti-seep collar. The fill material around the pipe spillway shall be placed in four-inch layers and compacted under and around the pipe to at least the same density as the adjacent embankment. Care must be taken not to raise the pipe from firm contact with its foundation when compacting under the pipe hunches. A minimum depth of two feet of hand compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

- E. Emergency Spillway: The emergency spillway shall be installed on undisturbed ground. The achievement of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and shall be constructed within a tolerance of  $\pm 0.2$  feet. If the emergency spillway requires erosion protection other than vegetation, the lining shall not compromise the capacity of the emergency spillway.
- F. Vegetative Treatment: The embankment and all other disturbed areas shall be stabilized in accordance with the appropriate permanent vegetative measure immediately following construction. In no case shall the embankment remain unstabilized for more than seven (7) days. For disturbed area stabilization techniques refer to Articles 8.10 through 8.14 and the latest edition of the Manual for Erosion and Sediment Control in Georgia.
- G. Erosion and Pollution Control: Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized. State and local law concerning pollution abatement shall be complied with.
- H. Safety: State and local requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.

#### **8.8.6 Maintenance**

All damages caused by soil erosion or construction equipment shall be repaired at or before the end of each working day. Sediment shall be removed from the basin when it reaches the specified distance below the top of the riser. This sediment shall be placed and stabilized in such a manner that it will not erode from the site. Sediment shall not enter adjacent streams or drainageways during sediment removal or disposal. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.

#### **8.8.7 Final Disposal**

When temporary structures have served their intended purpose and the contributing drainage area has been properly permanently stabilized, the embankment and resulting sediment deposits shall be leveled or otherwise disposed of in accordance with the approved sediment control plan. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the embankment and trapped sediment shall be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond shall be pumped dry, graded and backfilled.

#### **8.8.8 Plan Information to be Submitted**

Sediment basin designs and construction plans shall be submitted for review to the City,

the Soil and Water Conservation District and/or other agencies. The erosion and sediment control plan shall include the following:

1. The specific location of the basin showing existing and proposed contours.
2. Maintenance equipment access points.
3. Figures detailing the cross-section of the dam, principal spillway and emergency spillway, and the profile of the emergency spillway.
4. Details of the trash rack, concrete riser base, and outlet structure assembly.

The following shall be submitted on 8 ½” x 11” attachments;

1. A hydrological study, including information regarding state/storage relationship.
2. A temporary sediment basin design sheet
3. Figures detailing the cross-section of the dam, principal spillway and emergency spillway, and the profile of the emergency spillway.

#### **8.8.9 Procedure for Determining or Altering Sediment Basin Shape**

As specified in the latest edition of the Manual for Erosion and Sediment Control in Georgia, the pool area at the elevation of the principal spillway crest shall have a length to width ratio of at least 2:1. The purpose of this requirement is to minimize the “short-circuiting” effect of the sediment laden inflow to the riser and thereby increasing the effectiveness of the sediment basin. This procedure provides alternative parameters and methods of determining and modifying the shape of the basin.

The length of the flow path (L) is the distance from the point of inflow to the riser (outflow point). The point of inflow is the point that the stream enters the normal pool (level at the riser crest elevation). The pool area (A) is the area of the normal pool. The effective width ( $W_e$ ) equals the area (A) divided by the length (L). The length to width ratio (L:W) is found by the equation:

$$L : W = L / W_e \text{ where, } W_e = A / L.$$

In the event there is more than one inflow point, any inflow point which conveys more than 30 percent of the total peak inflow shall meet the length-width ration criteria.

The required basin shape may be obtained by proper site selection, by excavation, or by constructing a baffle in the basin. The purpose of the baffle is to increase the effective flow length from the inflow point to the riser. Baffles shall be placed mid-way between the inflow point and the riser. The baffle length shall be as required to provide the minimum 2:1 length-width ratio. The effective length ( $L_e$ ) shall be the shortest distance

the water must flow from the inflow point around the end of the baffle to the outflow point. Then:

$$L : W = L_e / W_e \text{ where, } W_e = A / L_e$$

See Figure M-11c for examples of sediment basin baffles. Note that the special case shown in Example C is allowable only when the two flow paths are equal.

The dimensions necessary to obtain the required basin volume and surface area shall be clearly shown on the plans to facilitate plan review, construction, and inspection.

## **8.9 TEMPORARY SEDIMENT TRAPS**

### **8.9.1 Definition**

A small, temporary ponding basin formed by constructing an earthen embankment with a control outlet, generally constructed of rock or gravel.

### **8.9.2 Purposes**

To detain sediment-laden runoff from small disturbed areas long enough to allow the majority of the sediment to settle out.

### **8.9.3 Conditions Where Practice Applies**

- A. Sediment trap shall be used no longer than 18 months.
- B. The sediment trap shall be constructed either independently or in conjunction with a temporary diversion dike.
- C. Sediment traps shall be used only for small drainage areas. If the contributing drainage area is greater than 5 acres refer to Article 8.8 and the latest edition of the Manual for Erosion and Sediment Control in Georgia, for temporary sediment basins design and construction specifications.
- D. Sediment shall be periodically removed from the trap. Plans shall detail how this sediment is to be disposed of, such as by use in fill areas on site or removal to an approved off-site dump
- E. Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.

### **8.9.4 Design Criteria**

- A. Drainage area for a sedimentation trap shall not exceed 5 acres.
- B. Storage capacity: The sediment trap shall have an initial storage volume of 67

yd<sup>3</sup>/acre of disturbed area, measured from the low point of the ground to the crest of the gravel outlet. Sediment shall be removed from the basin when the volume is reduced by one-half.

For a natural basin, the volume may be approximated as follows:

$$V = 0.4 \times A \times D.$$

Where:

V = the storage volume, ft<sup>3</sup>

A = the surface area of the flooded area at the crest of the outlet, ft<sup>2</sup>

D = the maximum depth, measured from the low point in the trap to the crest of the outlet, ft.

- C. Excavation: If excavation is necessary to attain the required storage volume, side slopes shall be no steeper than 2:1.
- D. Outlet: The outlet for the sediment trap generally consists of a crushed stone section of the embankment located at the low point in the basin. The minimum length of the outlet crest shall be 6 feet times the acreage of the drainage area. The crest of the outlet shall be at least 1.0 foot below the top of the embankment, to insure that the flow will travel over the stone and not the embankment.
- E. Embankment Cross-Section: The maximum height of the sediment trap embankment shall be 5 feet as measured from the low point. The minimum top widths (W) and outlet heights (H<sub>o</sub>) for various embankment heights (H) are shown in Table M-6. The side slopes of the embankment shall be 2:1 or flatter (see Figure M-12).

<b>Embankment Height (H)</b>	<b>Outlet Height (H<sub>o</sub>)</b>	<b>Minimum Embankment Top Width (W)</b>
1.5	0.5	2.0
2.0	1.0	2.0
2.5	1.5	2.5
3.0	2.0	2.5
3.5	2.5	3.0
4.0	3.0	3.0
4.5	3.5	4.0
5.0	4.0	4.5

Source: City of Atlanta, Georgia – Stormwater Design Manual, 1996.

### **8.9.5 Construction Specifications**

- A. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. To facilitate cleanout, the pool area shall be cleared.
- B. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment shall be compacted in 8-inch layers by traversing with construction equipment.
- C. The earthen embankment shall be seeded with temporary or permanent vegetation within 7 days of construction.
- D. Construction operations shall be carried out in such a manner that erosion and water pollution are minimized.
- E. All cut and fill slopes shall be 2:1 or flatter.

### **8.9.6 Maintenance**

Temporary sediment traps shall be inspected after each period of significant rainfall. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. The sediment removed shall be placed in the designated disposal area. The contaminated part of the gravel facing shall be replaced.

The structure shall be checked for damage from erosion or piping. The depth of the spillway shall be checked periodically to ensure it is a minimum of 1.0 ft below the low point of the embankment. Any observed settlement of the embankment shall be filled immediately to slightly above design grade. Any riprap displaced from the spillway shall be replaced immediately.

After all sediment-producing areas have been permanently stabilized, the structure and all unstable sediment shall be removed. The area shall be smoothed to blend with the adjoining areas and restored as described later in this document.

## **8.10 DISTURBED AREA STABILIZATION (WITH MULCHING ONLY)**

### **8.10.1 Definition**

Application of a protective layer of plant residues or other suitable materials produced on the site if possible, to the soil surface.

### **8.10.2 Purpose**

Applying mulch to disturbed areas may reduce runoff and erosion, conserve moisture, prevent surface compaction or crusting, control undesirable vegetation, modify soil temperature, and increase biological activity in the soil.

### 8.10.3 Requirement for Regulatory Compliance

Mulch or temporary grassing shall be applied to all exposed areas within 14 day of disturbance. Mulch can be used as a singular erosion and sediment control device for up to six months, but shall be applied at the appropriate depth, anchored, and have a continuous cover over at least 90 percent of the soil surface. Maintenance shall be required to maintain appropriate depth and 90 percent coverage. If the area will require erosion and sediment control for less than six months, temporary vegetation may be used instead of mulch. If an area will require erosion and sediment control for more than six months, permanent vegetative techniques shall be used. For temporary and permanent vegetation specification see Articles 8.11 through 8.13 and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

### 8.10.4 Specifications

Mulching Without Seeding: This standard applies to grades or cleared areas where seedlings may not have a suitable growing season to produce an erosion retardant cover, but which can be stabilized with a mulch cover.

#### A. Site Preparation

1. Necessary grading shall be performed to permit the use of equipment for applying and anchoring mulch.
2. Erosion and sediment control measures such as dikes, diversion, berms, terraces and sediment barriers shall be installed as needed.
3. Compacted soil shall be loosened to a minimum depth of 3 inches.

#### B. Mulching Materials

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches providing the soil is completely covered.
2. Wood waste (chips, sawdust or bark) shall be applied at a depth of 2 to 3 inches. Where feasible, organic material from the clearing stage of development shall remain on site, be chipped, and applied as mulch. This method of mulching can greatly reduce erosion and sediment control costs.
3. Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection. This material can be salvaged and re-used.

#### C. Applying Mulch

1. Dry straw or hay mulch and wood chips shall be uniformly applied by hand or by mechanical equipment.

2. If the area will eventually be covered with perennial vegetation, 20-30 pounds of nitrogen per acre in addition to the normal amount shall be applied to offset the uptake of nitrogen caused by the decomposition of the organic mulches.
3. Apply polyethylene film on exposed areas.

D. Anchoring Mulch

1. Straw or hay mulch may be pressed into the soil using a disk harrow with the disk set straight or with a special “packer disk.” The disks shall be smooth or serrated and shall be 20 inches or more in diameter and spaced 8 to 12 inches apart. The edges of the disks shall be dull enough not to cut the mulch but to press it into the soil leaving much of it in an erect position. Straw or hay mulch shall be anchored immediately after application.
2. Appropriately sized netting shall be used to anchor wood waste. The openings of the netting shall not be larger than the average size of the wood waste chips.
3. Polyethylene film shall be anchored by trenching at the top and incrementally as necessary.

### **8.10.5 Maintenance**

All mulches shall be inspected periodically, and after rainstorms to check for rill erosion, dislocation, or failure. Where erosion is observed, additional mulch shall be applied. If washout occurs, the slope grade shall be repaired, reseeded, and the mulch reinstalled. Inspections shall continue until the permanent vegetation has been firmly established.

## **8.11 DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING)**

### **8.11.1 Definition**

Planting rapid growing seeds to provide initial, temporary cover for erosion and sediment control on disturbed and denuded areas.

### **8.11.2 Purpose**

The purpose of temporary seeding is to reduce erosion, sediment and runoff damages to downstream resources until permanent vegetation or other erosion and sediment control measures can be established. In addition, it provides residue for soil protection and seedbed preparation and reduces problems of mud and dust production from bare soil surfaces during construction. Other purposes may include improvement of wildlife habitat, aesthetics, tilth, infiltration, and aeration.

### 8.11.3 Requirement for Regulatory Compliance

Mulch and temporary grassing shall be applied to all exposed areas within 14 days of disturbance. Temporary grassing, instead of mulch, can be applied to rough graded areas that will be exposed for less than six months. If an area will require erosion and sediment control for longer than six months, permanent perennial vegetation shall be used. If optimum planting conditions for temporary grassing is lacking, mulch can be used as a singular erosion and sediment control device for up to six months but it shall be applied at the appropriate depth, anchored, and have a continuous cover over at least 90 percent of the soil surface. For mulch specifications refer Article 8.10 and to the latest edition of the Manual for Erosion and Sediment Control in Georgia.

### 8.11.4 Conditions Where Practice Applies

On any cleared, bare, or sparsely vegetated soil surfaces where vegetative cover is needed for up to six months, or until establishment of finished grade or a permanent vegetative cover. Applications of this practice include diversions, dams, temporary sediment basins, temporary road banks, and soil stockpiles. Temporary vegetative measures shall be coordinated with permanent measures to assure economical and effective stabilization. Some species of temporary vegetation are not appropriate as companion crop for permanent vegetation because of their potential to out-compete the permanent species. Contact the NRCS of the local SWCD for more information.

### 8.11.5 Specifications

- A. Grading and Shaping: Slopes that can be stabilized by hand-seeded vegetation or with hydraulic seeding equipment may not require shaping or grading. Erosion and sediment control practices such as closed drains, ditches, dikes, diversions, sediment basins and others shall be installed for areas where excessive water run-off needs to be controlled.
- B. Seedbed Preparation: Good seedbed preparation is essential to successful plant establishment. A good seedbed is well pulverized, loose, and smooth. Sealed or crusted surfaces shall be loosened just prior to seeding to provide a place for seeds to lodge and germinate. Soil that is sealed or crusted shall be pitted, trenched or otherwise scarified by disking, raking, harrowing, or other suitable methods.

When hydroseeding methods are use, seedbed preparation shall not be required. When using conventional or hand seeding is used and the soil material is loose and not sealed by rainfall, seedbed preparation is not be required.

- C. Lime and Fertilizer: Soils shall be tested to determine if fertilizer is needed. Fertilizer shall not be required on reasonably fertile soils or soil material. For soils with very low fertility, 500 to 700 pounds of 10-10-10 fertilizer or the equivalent shall be applied per acre. To better incorporate the fertilizer into the soil, the fertilizer shall be applied before land preparation procedures occur.

Agricultural lime is required unless soil tests indicate otherwise. Apply agricultural lime at a rate of one ton per acre. Graded areas require lime application.

- D. Seeding: A grass or grass-legume mixture suitable to the area and season of the year shall be selected from the Plants, Planting Rates, and Planting Dates for Temporary Cover or Companion Crops Table, in the latest edition of the Manual for Erosion and Sediment Control in Georgia. Seed shall be uniformly applied by hand, cyclone seeder, drill, cultipacker-seeder, or hydraulic seeder (slurry including seed and fertilizer). Drill or cultipacker-seeders shall normally place seed one-quarter to one-half to one inch deep. Appropriate depth of planting is ten times the seed diameter. Soil shall be “raked” lightly to cover the seed with soil if seeded by hand.
- E. Mulching: In most cases temporary vegetation can be established without the use of mulch. Mulch without seeding may be considered for short-term protection. For disturbed area stabilization with mulch see Article 8.10 and the latest edition of the Manual of Erosion and Sediment Control in Georgia.
- F. Irrigation: During times of drought, water shall be applied at a rate that will not cause runoff and erosion. The soil shall be thoroughly wet to a depth that will insure germination of the seed. Subsequent applications shall be made when needed.

## **8.12 DISTURBED AREA STABILIZATION (WITH PERMANENT VEGETATION)**

### **8.12.1 Definition**

Planting perennial vegetation such as trees, shrubs, vines, grasses, or legumes, on exposed areas for final permanent stabilization. Permanent perennial vegetation shall be used to achieve final stabilization.

### **8.12.2 Purpose**

The purpose of establishing permanent vegetation in disturbed areas is to protect the soil surface from erosion, reduce damage from sediment and runoff to downstream areas, improve wildlife habitat and visual resources and improve aesthetics.

### **8.12.3 Requirement for Regulatory Compliance**

This practice or sod shall be applied immediately to rough graded areas that will require erosion and sediment control for longer than six months or to all areas at final grade. For disturbed area stabilization using sod refer to Article 8.13 and the latest edition of the Manual for Erosion and Sediment Control in Georgia. Final stabilization means that all soil disturbing activities at the site have been completed, and that for unpaved areas and areas not covered by permanent structures, at least 70 percent of the soil surface is

uniformly covered in permanent vegetation or equivalent permanent stabilization measures (such as the use of riprap, gabions, permanent mulches or geotextiles) have been employed.

Permanent vegetation is the planting of perennial vegetation such as trees, shrubs, vines, grasses, or legumes, on exposed areas for permanent soil stabilization. A crop of perennial vegetation appropriate for the region which is capable of providing a 70 percent coverage within the growing season shall be used to achieve permanent soil stabilization. Acceptable plants and grasses are listed in Section 5.0 of this document and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

#### **8.12.4 Conditions Where Practice Applies**

Permanent perennial vegetation shall be used to provide a protective cover for exposed areas including cuts, fills, dams, and other denuded areas.

#### **8.12.5 Planning Considerations**

- A. Conventional planting methods shall be used where possible.
- B. To aid in the establishment of permanent cover, companion crops shall be used. This technique is especially helpful during marginal planting periods.
- C. Following a summer or winter annual cover crop, no-till planting shall be used. An excellent procedure is to use no-till planting of sericea lespedeza into stands of rye.
- D. Block sod provides immediate cover and shall be used to control erosion adjacent to concrete flumes and other structures. For disturbed area stabilization using sod specifications refer Article 8.13 and the latest edition of the Manual for Erosion and Sediment Control in Georgia.
- E. Irrigation shall be used when the soil is dry or when summer plantings are done.
- F. To ensure long-lasting erosion and sediment control, low maintenance native plants shall be used.
- G. Mowing shall not be performed during the quail nesting season, (September to April).
- H. In critical area plantings wildlife plantings shall be included.

**Wildlife Plantings** – Commercially available plants beneficial to wildlife species include the following:

Mast Bearing Trees – Beech, Black Cherry, Blackgum, Chestnut, Chinkapin, Hackberry, Hickory, Honey Locust, Native Oak, Persimmon, Sawtooth Oak and Sweetgum. All trees that produce nuts or fruits are favored by many game species. Hickory provides nuts used mainly by squirrels and bear.

Shrubs and Small Trees – Bayberry, Bicolor Lespedeza, Crabapple, Dogwood, Huckleberry or Native Blueberry, Mountain Laurel, Native Holly, Red Cedar, Red Mulberry, Sumac, Wax Myrtle, Wild Plum and Blackberry. Plant in patches without tall trees to develop stable shrub communities. All produce fruits used by many kinds of wildlife, except for lespedeza which produces seeds used by quail and songbirds.

Grasses, Legumes, Vines, and Temporary Cover – Bahiagrass, Bermudagrass, Grass-Legume mixture, Partridge Pea, Annual Lespedeza, Orchardgrass (for mountains), Browntop Millet (for temporary cover) and Native grapes. Provides herbaceous cover in clearings for a game bird brood-rearing habitat. Appropriate legumes such as vetches, clovers and lespedezas may be mixed with grass, but they may die out after a few years.

#### **8.12.6 Construction Specifications**

- A. Grading and Shaping: Slopes that can be stabilized by hand-seeded vegetation or with hydraulic seeding equipment may not require shaping or grading. Vertical banks shall be sloped to ensure plant establishments.

When using conventional seeding and fertilizing the slope shall be graded and shaped, where feasible and practical, so that equipment can be used safely and efficiently during seedbed preparation, seeding, mulching, and maintenance of the vegetation.

Concentrations of water that will cause excessive soil erosion shall be diverted to a safe outlet. Erosion and sediment control practices shall conform to the appropriate standards and specifications contained in this section and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

- B. Lime and Fertilizer

1. Rates and Analysis: In areas where permanent vegetation is to be established, agricultural lime shall be applied as indicated by soil test or at a rate of one to two tons per acre. Graded areas require lime application. Agricultural lime shall not be required in areas to be planted with only trees. If lime is applied within six months of planting permanent perennial vegetation, additional lime shall not be required. Agricultural lime shall be within the specifications of the Georgia Department of Agriculture.

Lime spread by conventional equipment shall be “ground limestone.” Ground limestone is calcitic or dolomitic limestone that has been ground so that 90 percent of the material will pass through a 10-mesh sieve, not less than 50 percent will pass through a 50-mesh sieve, and not less than 25 percent will pass through a 100-mesh sieve.

Agricultural lime spread by hydraulic seeding equipment shall be “finely ground limestone.” Finely ground limestone is calcitic or dolomitic limestone ground so that 98 percent of the material will pass through a 20-mesh sieve and not less than 70 percent will pass through a 100-mesh sieve.

Refer to the Fertilizer Requirements table in the latest edition of the Manual for Erosion and Sediment Control in Georgia for initial fertilization, nitrogen, topdressing, and maintenance fertilizer requirements for a particular species or combination of species.

2. Application: When hydraulic seeding equipment is used the initial fertilizer shall be applied in a mixed slurry of seed, inoculant (if needed), and wood cellulose or wood pulp fiber mulch. The slurry mixture shall be kept thoroughly mixed throughout the application and shall be uniformly spread over the area within one hour after being placed in the hydroseeder.

Finely ground limestone will be mixed with water and applied immediately after mulching is completed or in combination with the top dressing.

When conventional planting is used the lime and fertilizer shall be applied uniformly in one of the following ways:

- a. Apply before land preparations so that it will be mixed into the soil during seedbed preparation
- b. Mix with the soil to be used to fill the holes or distribute in furrows
- c. Broadcast after steep surfaces are scarified, pitted or trenched
- d. A fertilizer pellet shall be placed at root depth beside each pine tree seeding.

- C. Plant Selection: For approved species refer to Section 5.0 and the Plants, Planting Rates, and Planting Dates for Permanent Cover, Durable Shrubs and Ground Covers for Permanent Cover, and Trees for Erosion Control tables in the latest edition of the Manual for Erosion and Sediment Control in Georgia. Before using any species not listed, it shall be approved by the State Resource Conservation of the Natural Resources Conservation Service.

Plants shall be selected on the basis of species characteristics; site and soil conditions; planned use and maintenance of the area; time of year of planting; method of planting and the needs and desires of the land user.

Some perennial species are easily established and can be planted alone. Other perennials are slow to become established and shall be placed with another perennial species. The additional species will provide quick cover and ample soil protection until the target perennial species becomes established.

Plant selections may also include annual companion crops. Annual companion crops shall be used only when the perennial species are not planted during their optimum planting period. Care shall be taken in selection of companion crop species and seeding rates because annual crops will compete with perennial species for water, nutrients and growing space. Ryegrass shall not be used in any seeding mixtures containing perennial species due to its ability to out-compete desired species chosen for permanent perennial cover.

Seed Quality - The term “pure live seed” is used to express the quality of seed. Pure live seed, PLS, is expressed as a percentage of the seeds that are pure and will germinate. The percent of PLS helps to determine the amount of seed needed. For further information and an example of calculating PLS refer to the Disturbed Area Stabilization (with Permanent Vegetation) section in the latest edition of the Manual for Erosion and Sediment Control in Georgia.

- D. Seedbed Preparation: Seedbed preparation may not be required where hydraulic seeding and fertilizing equipment is to be used. When using conventional seeding, seedbed shall be prepared as follows:
- E. Broadcast plantings: Minimum tillage shall adequately loosen the soil to a depth of 4 to 6 inches; alleviate compaction; incorporate lime and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of straw or hay mulch if a disk is to be used. Tillage shall be performed with any suitable equipment. Where feasible, tillage shall be done on the contour. Where slopes are too steep for the safe operation of tillage equipment, the soil surface shall be pitted or trenched across the slope with hand tools to provide two places 6 to 8 inches apart in which seed may lodge and germinate. Hydraulic seeding may also be used
- F. Individual plants: In areas where individual plants are to be set, the soil shall be well prepared by excavating holes, opening furrows, or dibble planting. When using nursery stock plants, holes shall be large enough to accommodate roots without crowding.

Four to six months prior to planting pine seedlings, the area shall be subsoiled 36 inches deep on the contour. Subsoiling shall be done when the soil is dry, preferably in August or September.

- G. Inoculants: All legume seed shall be inoculated with appropriate nitrogen-fixing bacteria. The inoculant shall be a pure culture prepared specifically for the seed species and used before the expiration date. A mixing medium recommended by the manufacture shall be used to bond the inoculant to the seed. All inoculated seed shall be protected from the sun and high temperatures and shall be planted the same day inoculated.

For conventional seeding, two times the amount of inoculant recommended by the manufacturer shall be used. For hydraulic seeding, four times the amount of inoculant recommended by the manufacture shall be used. No inoculated seed shall remain in the hydroseeder longer than one hour.

H. Planting

Hydraulic seeding: A slurry consisting of seed, inoculant, fertilizer, wood cellulose or wood pulp fiber mulch, and water shall be uniformly applied to the area to be treated. Apply within one hour after the mixture is made.

Conventional seeding: Seeding shall be done on a freshly prepared and firmed seedbed. To insure uniform distribution of the seed during broadcast planting, a cultipacker-seeder, drill, rotary seeder, other mechanical seeder, or hand seeding shall be used. The seed shall be covered lightly with 1/8 to 1/4 inch of soil for small seed and 1/2 to 1 inch for large seed when using a cultipacker or other suitable equipment.

No-till seeding: This application is permissible into annual cover crops when planting is done following maturity of the cover crop or if a temporary cover stand is sparse enough to allow adequate growth of the permanent species. Seed shall be uniformly distributed and planted at the proper depth. No-till seeding shall be performed with appropriate no-till seeding equipment.

Individual plants: Shrubs, vines and sprigs shall be planted with appropriate planters or hand tools. Pine trees shall be planted manually in the subsoil furrow. Nursery stock plants shall be planted at the same depth or slightly deeper that they grew at the nursery. The tips of vines and sprigs shall be at or slightly above the ground surface. Where individual holes are dug, fertilizer shall be placed in the bottom of the holes, followed by the addition of two inches of soil and setting of the plant. All plants shall be set in a manner that will avoid crowding of the roots.

- I. Mulching: Mulch shall be used on all permanent vegetation application. Mulch applied to seeded areas shall achieve 75 percent soil cover.

Mulching material and rate of application shall consist of one of the following:

1. Dry straw or dry hay : Straw or hay that is dry, of good quality and free of weed seeds shall be used. Straw shall be applied at the rate of 2 tons per acre. Hay shall be used at a rate of 2 1/2 tons per acre.

2. Wood cellulose mulch or wood pulp fiber: Wood cellulose or wood pulp fiber shall be used with hydraulic seeding. It shall be applied at the rate of 500 pounds per acre. Dry straw or dry hay shall be applied (at the rate indicated in item 1 above) after hydraulic seeding.
3. One thousand pounds of wood cellulose or wood pulp fiber, which includes a tackifier, shall be used with hydraulic seeding on slopes 3/4:1 or steeper.
4. Sericea lespedeza hay containing mature seed shall be used at a rate of three tons per acre.
5. Pine straw or pine bark – Shall be applied at a thickness of 3 inches for bedding purposes. Other suitable materials in sufficient quantity may be used where ornamentals or other ground covers are planted. Pine straw or pine bark shall not be used on seeded areas.
6. When using temporary erosion control blankets or block sod, mulch is not required.
7. Bituminous treated roving may be applied on planted areas on slopes, in ditches or dry waterways to prevent erosion. Bituminous treated rowing shall be applied within 24 hours after an area has been planted. Application rates and materials must meet Georgia Department of Transportation specifications.

Wood cellulose and wood pulp fibers shall not contain germination or growth inhibiting factors. They shall be evenly dispersed when agitated in water. The fibers shall contain a dye to allow visual metering and aid in uniform application during seeding.

- J. Applying Mulch: Straw or hay mulch shall be spread uniformly using blower-type spreading equipment, other spreading equipment or by hand within 24 hours after seeding and/or planting. Approximately 75 percent of the soil surface shall be covered. Wood cellulose or wood fiber mulch shall be applied uniformly with hydraulic seeding equipment.
- K. Anchoring Mulch: Straw or hay mulch shall be anchored immediately after application by one of the following methods:
  1. Hay and straw: The hay or straw mulch shall be pressed into the soil immediately after it is spread. Special “packer disks” or disk harrows that are 20 inches or more in diameter, set straight, 8 to 12 inches apart, and with smooth or serrated edges shall be used. The edges of the blade shall be dull enough to press the mulch into the ground without cutting it, leaving much of it in an erect position. Mulch shall not be plowed into the soil.

2. Synthetic tackifier or binder: Synthetic tackifier or binders approved by GDOT shall be mixed according to the manufacturer's specifications and applied in conjunction with or immediately after the mulch is spread. For tackifiers and binders specifications refer to the latest edition of the Manual for Erosion and Sediment Control in Georgia.
  3. Rye or wheat: To stabilize the mulch, rye or wheat can be included with the Fall and Winter plantings. They shall be applied at a rate of one-half to one-quarter bushel per acre.
  4. Plastic mesh or netting: Plastic mesh or netting may be needed to anchor straw or hay mulch on unstable soils and areas receiving concentrated flow. The mesh or net openings shall be no larger than one inch by one inch. These materials shall be installed and anchored according to manufacturer's specification.
- L. Bedding Material: Mulch shall be used as a bedding material to conserve moisture and control weeds in ornamental beds, around shrubs, and on bare areas on lawns.
  - M. Irrigation: Irrigation shall be applied at a rate that will not cause runoff and erosion.
  - N. Topdressing: Topdressing shall be applied on all temporary and permanent (perennial) species planted alone or in mixtures with other species. For recommended rates of application see the Fertilizer Requirements table in latest edition of the Manual for Erosion and Sediment Control in Georgia.
  - O. Second Year and Maintenance Fertilization: For recommended second year fertilizer rates and maintenance fertilizer see the Plants, Planting Rates, and Planting Dates for Permanent Cover table in the latest edition of the Manual for Erosion and Sediment Control in Georgia.
  - P. Lime Maintenance Application: One ton of agricultural lime shall be applied every 4 to 6 years or as indicated by soil tests.

### **8.12.7 Use and Management**

Mowing shall not take place during quail nesting season, between May and September. *Sericea lespedeza* shall be mowed only after the seeds have become mature. Mowing shall occur only after frost, between November and March. Bermudagrass, Bahiagrass and Tall Fescue shall be mowed as desired. At least 6 inches of top growth shall be maintained under any use and management. Moderate use of top growth is beneficial after establishment.

## **8.13 DISTURBED AREA STABILIZATION (WITH SOD)**

### **8.13.1 Definition**

A permanent vegetative cover using sods on highly erodible or critically eroded lands.

### **8.13.2 Purpose**

The purpose of using sod is to establish immediate ground cover, reduce runoff and erosion, improve aesthetics and land value, reduce dust and sediments, stabilize waterways and critical areas, filter sediments, nutrients and bugs, reduce downstream complaints, reduce the likelihood of legal action, reduce the likelihood of work stoppage due to legal action, and increase “good neighbor” benefits.

### **8.13.3 Conditions Where Practice Applies**

This application is appropriate for areas which require immediate vegetative covers, drop inlets, grass swales and waterways with intermittent flow.

### **8.13.4 Planning Considerations**

Sod can initially be more costly than seeding, but the advantages justify the increased initial costs.

Advantages are:

- A. Immediate erosion and sediment control, green surface, and quick use.
- B. Reduced failure as compared to seed as well as the lack of weeds.
- C. Can be established nearly year-round.

Sod is preferable to seed in waterways and swales because of the immediate protection of the channel after application. Sod must be staked in concentrated flow areas (see Figure M-13).

### **8.13.5 Construction Specifications**

- A. Soil Preparations: The soil surface shall be brought to final grade. The soil surface shall be cleared of trash, woody debris, stones and clods larger than 1”. The sod shall be applied to soil surface only and not frozen surfaces, or gravel type soils. Topsoil, which has not recently been treated with herbicides or soil sterilants, may be applied to help guarantee a good stand.

Fertilizer shall be mixed into the soil surface at a rate indicated by soil tests. Agricultural lime shall be applied based on soil tests or at a rate of 1 or 2 tons per acre.

- B. Installation: The sod shall be laid with tight joints and in straight lines. The joints shall be staggered and not overlapping. On slopes steeper than 3:1 the sod shall be anchored with pins or other approved methods (See Figure M-13).

After installation, the sod shall be rolled or tamped to insure good contact between sod and soil. The sod and underlying soil shall be irrigated to a depth of 4 inches immediately after installation. Irrigation shall also be used to supplement rainfall for a minimum of 2-3 weeks.

### **8.13.6 Materials**

Sod shall be certified and selected from a source that is grown in the general area of the project.

- A. Sod shall be machine cut and contain  $\frac{3}{4}$ " (+ or -  $\frac{1}{4}$ ") of soil.
- B. Sod shall be cut to the desired size within + or - 5%. Torn or uneven pads shall be rejected.
- C. Sod shall be cut and installed within 36 hours of digging.
- D. Planting shall be avoided when there is a threat of frost or hot weather if irrigation is not available.
- E. The sod type shall be shown on the plans and installed according to the Sod Planting Requirements table in the latest edition of the Manual for Erosion and Sediment Control in Georgia.

### **8.13.7 Maintenance**

Areas where adequate stands of sod are not obtained shall be re-sodded. New sod shall be mowed sparingly. The grass height shall not be cut less than 2"-3". Fertilizer shall be applied at a rate indicated by soil tests. Agricultural lime shall be applied based on soil tests or at a rate of one ton per acre every 4 to 6 years.

## **8.14 EROSION CONTROL MATTING AND BLANKETS**

### **8.14.1 Definition**

A protective covering (blanket) or soil stabilization mat used to establish permanent vegetation on steep slopes, channels or shorelines.

### **8.14.2 Purpose**

The purpose of erosion control matting and blankets is to provide a microclimate which protects young vegetation and promotes its establishment and to reinforce the turf to resist

forces of erosion during storm events.

### **8.14.3 Conditions Where Practice Applies**

Matting and blanket shall be applied on steep slopes where the hazard of erosion is high and planting is likely to be too slow in providing adequate protection cover. In concentrated flow areas, all slopes steeper than 2.5:1 and with a height of ten feet or greater, and cuts and fills within the stream buffer, shall be stabilized with the appropriate erosion control matting or blanket. On streambanks where moving water is present, matting can prevent new plantings from being washed away.

### **8.14.4 Planning Considerations**

- A. Temporary Erosion Control Blankets: includes temporary “combination” blankets (rolled erosion control blankets – RECB) consisting of a plastic netting which covers and is intertwined with a natural organic or manmade mulch; or a jute mesh which is typically homogeneous in design and can act alone as a soil stabilization blanket.

Temporary blankets as a minimum shall be used to stabilize concentrated flow areas with a velocity less than 5 ft/sec and slopes 2.5:1 or steeper with a height of 10 feet or greater. Temporary blankets will deteriorate in a short period of time and provide no enduring erosion protection.

Benefits of using erosion control blankets include the following:

1. Protection of seed and soil from raindrop impact and subsequent displacement
2. Thermal consistency and moisture retention for seedbed areas.
3. Stronger and faster germination of grasses and legumes.
4. Planing off excess stormwater runoff.
5. Prevention of sloughing of topsoil added to steeper slopes.

- B. Permanent Erosion Control Matting: consists of permanent non-degradable, three-dimensional plastic structures, which can be filled with soil prior to planting. These mats are also known as permanent soil reinforcing mats (turf reinforcement matting). Roots penetrate and become entangled in the matrix, forming a continuous anchorage for surface growth and promoting enhanced energy dissipation. Matting shall be used when a vegetative lining is desired in stormwater conveyance channels where the velocity is between five and ten feet per second.

Benefits of using erosion control blankets include the following:

1. All benefits gained from using erosion control blankets.
2. Causes soil to drop out of stormwater and fill the matrix with fine soils which become the growth medium for the development of roots.
3. Acts with the vegetative root system to form an erosion resistant cover which resist hydraulic lift and shear forces when embedded in the soil within stormwater channels.

#### **8.14.5 Materials**

All blankets and matting materials shall be on the GDOT Qualified Products List (QPL #62 for blankets, QPL #49 for matting). All blankets shall be nontoxic to vegetation and to the germination of seed and shall not be injurious to the unprotected skin of humans. At a minimum, the plastic netting shall be intertwined with the mulching material/fiber to maximize strength and provide for ease of handling.

Temporary Blankets: Machine produced temporary combination blankets shall have a consistent thickness with the organic material evenly distributed over the entire blanket area. All combination blankets shall have a minimum width of 48 inches. Machine produced combination blankets include straw blankets, excelsior blankets, coconut fiber blankets, wood fiber blankets and jute mesh.

Permanent Matting: Permanent matting shall consist of a lofty web of mechanical or melt bonded polymer nettings, monofilaments, or fibers which are entangled to form a strong and dimensionally stable matrix. Polymer welding, thermal or polymer fusion, or the placement of fibers between two high strength, biaxially oriented nets bound securely together by parallel lock stitching with polyolefin, nylon or polyester threads are all appropriate bonding methods. Mats shall maintain their shapes before, during and after installation, under dry or water saturated conditions. Mats must be stabilized against ultraviolet degradation and shall be inert to chemicals normally encountered in a natural soil environment.

#### **8.14.6 Site Preparation**

After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. Surface must be smooth to ensure proper contact of blankets or matting to the soil surface. If necessary, redirect any runoff from the ditch or slope during installation.

#### **8.14.7 Staples**

The following are considered appropriate stapling and staking materials.

- A. Temporary Blankets: This includes straw, excelsior, coconut fiber, and wood fiber blankets. Staples shall be used to anchor temporary blankets. U-shaped wire (11 gauge or greater) staples with legs at least 6 inches in length and a crown of one inch or appropriate biodegradable staples can be used. Staples shall be of sufficient thickness for soil penetration without undue distortion.
- B. Permanent Matting: Sound wood stakes, 1 x 3 inches stock sawn in a triangular shape, shall be used. Depending on the compaction of the soil, select stakes with a length from 12 to 18 inches. U-shaped staples shall be 11 gauge steel or greater, with legs at a minimum of 8 inches in length and a 2 inch crown.

#### **8.14.8 Planting**

Lime, fertilizer, and seed shall be applied in accordance with seeding or other type of planting plan completed prior to installation of temporary combination blankets or jute mesh. For permanent mats, the area must be brought to final grade, plowed, limed, and fertilized. After the permanent mat has been installed and backfilled, the entire area shall be grassed.

#### **8.14.9 Maintenance**

All erosion control blankets and matting shall be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure shall be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.

### **8.15 SPECIFIC EROSION AND SEDIMENT CONTROL MEASURES**

#### **8.15.1 Overland Control Structures**

##### **8.15.1.1 Longitudinal Slopes**

- A. Diversions shall be installed as indicated in Figure M-4a. Where required, temporary diversions shall be installed as soon as possible following the clearing operation.
- B. Silt fences or hay bales shall be installed at the outlet end of diversions as indicated in Figure M-8a, Figure M-8b and Figure M-9 where vegetation is not sufficient to provide adequate filtration.
- C. Silt fences shall be installed as required at the bases of slopes adjacent to road and stream crossings.

**8.15.1.2 Side Hill Runoff Control Measures**

- A. Excavation operations shall be used to create swales/berms on the downhill side of the construction disturbance limits whenever necessary in conjunction with silt fences or hay bales in order to intercept runoff.
- B. Discharge points shall be protected with silt fences and/or hay bales.
- C. Silt fences and/or hay bales shall be installed at the downstream side of the right-of-way directly across (perpendicular to flow) small swales servicing small drainage basins.
- D. Silt fences and/or hay bales shall be installed along swales and intermittent stream bank (parallel with flow) when the stream is serviced by a larger drainage basin.
- E. Silt fences or hay bales shall be installed along the downgradient side of the disturbed area upslope of any stream, lake, or pond which is adjacent to or parallel to the construction right-of-way. As much width as possible of natural vegetation shall be maintained (as a filter strip) between the edge of clearing and the edge of the water body. Silt fences and/or hay bales shall be required in all cases where the limits of the disturbed area extend to within the following distances of streams, ponds, or other areas to be protected:

<u>Length of Vegetative</u> <u>% Slope</u>	<u>Filter Strip</u>
< 15%	50 ft.
15 – 30%	75 ft.
>30%	100 ft.

**8.15.2 Temporary Stream Crossings**

**8.15.2.1 Staging Areas**

- A. Staging areas shall be located at least 50 feet back from the stream bank, where topographic conditions permit.
- B. The size of the staging areas shall be limited to the minimum needed for storage and prefabrication of construction material/equipment for stream crossings.
- C. Chemicals, fuels, lubrication oils, or refuel construction equipment shall not be stored within 100 feet of the stream bank.

**8.15.2.2 Spoil Pile Placement/Control**

- A. Trench spoil shall be placed beyond the limits of stream banks at all stream crossings.

- B. Spoil piles located beyond the limits of stream banks shall be protected with silt fences and/or hay bales.
- C. Spoil material shall not be stored along stream banks where it could be washed away by high stream flows.
- D. Where possible, spoil material or other soils on site shall be used to create small embankments/berms or other measures which control the direction and velocity of overland flow.

### **8.15.2.3 Crossing Procedures**

All stream crossings shall provide means for passage of aquatic life forms. Either shoal type (overflow) crossings or bridge or culvert crossings (dry traffic surface with the flow passage opening beneath) are acceptable. In no event will the City approve a crossing (for example, of porous limerock base) which relies on seepage as a method for passing stream flow (seepage is not capable of providing acceptable passage for aquatic biota).

- A. Crossings shall be constructed as nearly perpendicular to the axis of the stream channel as engineering and routing conditions permit. The City shall be provided a set of drawings in advance of construction and a monthly notification during construction indicating the location (stationing) where construction, including stream crossings, is projected to occur in the coming monthly period.
- B. The pipe size shall be large enough to convey the full bank flow of the stream without appreciably altering the stream flow characteristics (see Table M-7). The structure shall be designed to withstand flows from a 10-year, 24-hour frequency storm or other storm specified in Title 12-7-1 of the Official Code of Georgia Annotated. Structures shall be protected from washouts by elevating the bridges above adjacent floodplain lands, crowning of the fill over the pipes or by use of diversions, dikes or island type structures.

<b>Contributing Drainage Area (acres)</b>	<b>Average Slope of Watershed</b>			
	<b>1%</b>	<b>4%</b>	<b>8%</b>	<b>16%</b>
1 – 25	24	24	30	30
26 – 50	24	30	36	36
51- 100	30	36	42	48
101 – 150	30	42	48	48
151 – 200	36	42	48	54
201 – 250	36	48	54	54
251 – 300	36	48	54	60
301 – 350	42	48	60	60
351 – 400	42	54	60	60
401 – 450	42	54	60	72
451 – 500	42	54	60	72
501 – 550	48	60	60	72
551 – 600	48	60	60	72
601 – 640	48	60	72	72

<sup>a</sup> Assumptions for determining the table: USDA-NRCS Peak Discharge Method CN=65; rainfall depth (average for Georgia) = 3.7" for 2-year frequency.

Source: Manual for Erosion and Sediment Control in Georgia, 2000, Georgia Soil and Water Conservation Commission.

C. Minor streams: <15 feet wide or <2 feet average depth.

1. Timber rip-rap (covered with geotextile fabric and soil) providing vehicle access across stream shall be used.
2. In-stream equipment shall be limited to that needed to construct the crossing.
3. In-stream trenching and backfill work shall be completed within 72 hours whenever feasible.

D. Major streams: >15 feet wide but <100 feet wide

1. Optional methods to be used in providing vehicle access across streams include:
  - a. Equipment and/or timber pads and culvert.
  - b. Clean rockfill shoal crossing.
  - c. Flexi-float or portable bridge.
2. In-stream equipment shall be limited to that needed to construct the crossing.

3. In-stream trenching and backfill work shall be completed within 72 hours whenever feasible.
- E. Rivers: >100 feet wide
1. Size criteria based on:
    - a. Inability to cross using culvert bridge.
    - b. Inability to store trench spoil on riverbank.
  2. Site-specific construction procedures shall be submitted to the City for review and approval prior to initiation of any construction at crossing.
- F. All culvert, bridges, rock, and timber riprap shall be removed from streams and rivers during final clean up and restoration.

### **8.15.3 Trench Dewatering**

- A. Trenches shall be dewatered into upland areas in such a manner that no silt laden water flows directly into any surface waters.
- B. Silt laden water shall be discharged through a functional siltation barrier (hay bales or silt fencing) or a minimum of 100 linear feet of vegetated area before entering streams or other surface waters.

### **8.15.4 Wetland Crossings**

#### **8.15.4.1 Staging Areas**

- A. Staging areas shall be located at least 50 feet from wetland edge, where topographic conditions permit.
- B. The size of staging areas shall be limited to the minimum needed for wetland crossing.
- C. Chemicals, fuel, lubrication oils, or refuel construction equipment shall not be stored within 100 feet of the stream bank. Appropriate spill prevention and control measures shall be implemented.

#### **8.15.4.2 Spoil Pile Placement/Control**

- A. Spoil material shall be placed beyond the edge of a wetland.
- B. Spoil piles shall be protected with silt fences and/or hay bales.

- C. Spoil material shall not be stored near the edge of a wetland where it could be washed away into the wetland.

#### **8.15.4.3 Crossing Procedures**

- A. If a wetland cannot be avoided and must be crossed, the utility shall be routed in a manner that minimizes the length of wetland crossing and disturbances.
- B. Tree stumps, or brush rip-rap shall not be used to stabilize the utility right-of-way.
- C. Clearing of right-of-way shall be limited to 30 feet wherever possible.
- D. Vegetation shall be cut off only at ground level, leaving existing root systems intact. Cut vegetation shall be removed from wetlands for disposal.
- E. Pulling of tree stumps and grading activities shall be limited to directly over trenches; stumps or root systems shall not be removed from non-trenched portions of the right-of-way in wetlands.
- F. Construction equipment operating in wetland shall be limited to that needed to dig trench, install pipe, backfill trench, and restore the right-of-way.
- G. Construction equipment shall be operated off of timber or wooden equipment pads if standing water or saturated soils are present.
- H. All timber or wooden equipment pads shall be removed upon completion of construction.
- I. “Push-pull” or “float” technique shall be used to place pipe in trench whenever water and other site conditions allow.

#### **8.16 TUNNELING**

All sewers or utilities that can be tunneled under the stream or the Greenway System must meet the following requirements:

- A. At stream crossings, the crown of the pipe must be at least 3 feet below the stream or waterbody bed.
- B. For sanitary sewers the pipe material must be ductile iron or reinforced concrete.
- C. For water mains the pipe material must be ductile iron.
- D. Excavation pits shall be located outside the Greenway System.

Each tunnel crossing must be evaluated individually. The designer must take into account stream width, flow conditions, soil conditions, and other factors in designing a proper tunnel. The design plans for tunneling under the Greenway System must be submitted to the City for approval before construction can begin.

## 9.0 SELECTED REFERENCES

- A. Atlanta, Georgia. Stormwater Management Design Manual. Atlanta, 1996.
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- C. Georgia Power Company. "Distribution and Network Underground Requirements – Erosion and Sedimentation Control."
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# **APPENDIX N**

## **CITY OF ATLANTA GREENWAY ACQUISITION PROJECT**

### **STANDARD OPERATING PROCEDURES FOR MAINTENANCE OF EXISTING UTILITIES WITHIN THE GREENWAY SYSTEM**

**Prepared By:**



**USInfrastructure, Inc.**

**1000 Mansell Exchange West, Suite 220  
Alpharetta, GA 30022**

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## 1.0 INTRODUCTION

The following Standard Operating Procedures (SOPs) shall guide entities proposing to perform emergency or scheduled maintenance to existing utilities within the Greenway System. The purpose of these SOPs is to ensure that emergency and scheduled maintenance activities are performed in a manner consistent with the requirements of the Consent Decree and the Greenway Acquisition Plan.

This document presents SOPs for the following activities:

- A. Emergency maintenance to existing utilities within the Greenway System.
- B. Scheduled maintenance to existing utilities within the Greenway System.
- C. Restoration of Greenway Properties disturbed during emergency or scheduled maintenance to existing utilities.
- D. Scheduled maintenance of vegetation growing within existing utility easements within the Greenway System.

These SOPs are designed to minimize erosion and sedimentation within Greenway Properties by:

- A. Minimizing the quantity and duration of soil exposure during emergency or scheduled maintenance of existing utility systems
- B. Requiring the installation of and maintenance of erosion and sediment control measures during emergency or scheduled maintenance construction activities.
- C. Restoring disturbed properties by establishing vegetation immediately following completion of emergency or scheduled maintenance construction activities.

These SOPs do not replace existing utility-specific guidelines for emergency and scheduled maintenance of existing utilities or restoration of utility easements after maintenance activities, but do establish minimum requirements for such activities on Greenway Properties. These SOPs do not limit the City, or other responsible local government or agency, from imposing additional or more stringent requirements to control erosion and/or sediment.

As stated in Section VIII.D.2.m of the Consent Decree, “Any infrastructure for human activity within the Greenway Properties shall be designed and constructed with prevention of non-point source pollution as the primary consideration”. This does not mean that prevention of non-point source pollution is the sole consideration. This means that cost or other factors will not outweigh non-point source pollution prevention as the primary concern. Only safety design consideration shall be as important as non-point source pollution prevention.

## **2.0 EMERGENCY MAINTENANCE TO EXISTING UTILITIES WITHIN THE GREENWAY SYSTEM**

It is anticipated that circumstances may arise when emergency maintenance will need to be performed on an existing utility within the Greenway System. In emergency situations there is little time to plan, permit, or install erosion and sediment control measures before construction activities begin. However, if more than 24-hours are needed to complete the emergency maintenance activities, a permit or variance may be required. It is the responsibility of the entity performing the emergency maintenance to determine when and if a permit and/or variance is required. In the event that more than 24-hours are needed to complete the emergency maintenance activities, erosion and sediment control measures shall be installed as soon as possible, but no later than 24-hours from the beginning of the emergency maintenance activities. Best management practices (BMPs) for erosion and sediment control shall meet the minimum requirements established in Appendix M (Standard Operating Procedures for Construction of New Utilities) and the latest edition of the Manual for Erosion and Sediment Control in Georgia. Emergency maintenance activities are applicable in situations such as when repairs are needed for a sewer or water line break or a downed power line. Ultimately it is the responsibility of the entity performing the maintenance to determine what constitutes an emergency.

## **3.0 SCHEDULED MAINTENANCE TO EXISTING UTILITIES WITHIN THE GREENWAY SYSTEM**

The entity proposing to perform scheduled maintenance to an existing utility within the Greenway System shall be responsible for the preparation of a land disturbance plan which must include, at a minimum, an erosion and sediment control plan. The erosion and sediment control plan shall include specifications describing how erosion and sediment control will be maintained during the scheduled maintenance activities, including the BMPs to be implemented. BMPs for erosion and sediment control shall meet the minimum requirements established in Appendix M (Standard Operating Procedures for Construction of New Utilities) and the latest edition of the Manual for Erosion and Sediment Control in Georgia. A copy of the erosion and sediment control plan shall be kept on site at all times.

The City and other responsible local government or agency shall be notified before scheduled maintenance activities begin inside the Greenway System. The City and other responsible local government or agency may inspect the site to ensure that adequate erosion and sediment control measures are in place prior to construction, that adequate erosion and sediment control measures are maintained until the project is completed, and that the site has been restored to as close to its original condition as feasible once maintenance activities have been completed.

### **3.1 PERMITS, VARIANCES, AND PLANS**

It is the responsibility of the entity performing maintenance within the Greenway System to determine what permits, plans, or variances are required for maintenance activities. For

example, the State of Georgia may have requirements under their General Storm Water Permit Program or Fulton County may require a Stream Buffer Variance and a Land Disturbance Activity Permit. Requirements may vary from one jurisdiction to another. Therefore, it is imperative that the entity performing the maintenance has a clear understanding of local requirements.

### **3.1.1 State of Georgia General Storm Water Permitting**

At the time of the writing of this document, construction projects that are five (5) acres or larger in size require coverage under the State of Georgia NPDES, General Permit GAR100000, for authorization to discharge storm water associated with construction activities. One of the construction activities this permit authorizes is the discharge of storm water associated with construction activities from linear construction that will result in the disturbance of more than five (5) acres. As stated in the permit “‘Linear Construction’ or ‘Linear Construction Project’ means construction activities that are not part of a common development and where the length of the project is at least 25 times longer than the width of the project and the construction activity is being conducted by the Georgia Department of Transportation, by a local government, or by a utility company or utility contractor”. It is the responsibility of the entity performing the maintenance to determine if they need to apply for coverage. Application is made by submittal of a Notice of Intent (NOI) and a permit fee to:

Northwest Georgia Regional Office  
Georgia Environmental Protection Division  
Suite 114  
4220 International Parkway, Suite 101  
Atlanta, GA 30354  
Telephone (404) 675-6240

The NPDES general construction permit requires the use of Best Management Practices (BMPs) to control stormwater runoff for all rainfall events up to and including a 25-year 24-hour rainfall event. BMPs used shall be consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the State Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is permitted. For some sites, additional BMPs beyond those identified in the Manual may be necessary for erosion and sediment control for all rainfall events up to, and including, a 25-year 24-hour rainfall events.

To ensure compliance with State water quality standards, the general permit requires inspections of the construction site as well as sampling and analysis of stormwater runoff from the site. The permit also requires daily recording of on-site precipitation. Detailed requirements for inspection and sampling are provided in the general permit. The guidelines set forth in this document and the latest edition of the Manual for Erosion and Sediment Control in Georgia will be used in conjunction with the State general permit to ensure that the best possible procedures are used for erosion and sediment control.

### **3.1.2 Stream Buffer Variance**

The State of Georgia Environmental Protection Division (EPD) enforces minimum stream buffer requirements. At the time of the writing of this document the EPD's requirements prohibit construction activities within a 25-foot buffer along the banks of all state waters or within a 50-foot buffer along the banks of any state waters classified as 'trout streams' (the State of Georgia Department of Natural Resources maintains the most current stream classifications). The Director of the EPD may grant a variance that is at least as protective of natural resources and the environment as provisions described in Title 12-7-6 of the Official Code of Georgia Annotated. The Director of the EPD may also grant a variance where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion and sediment control measures are incorporated in the project plans and specifications and are implemented during construction. The buffer distance is measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action. It is the responsibility of the entity performing the maintenance to determine if a variance is required from the State of Georgia, the City, or other responsible local government or agency.

### **3.1.3 Land Disturbance Activity Permits (LDP)**

It is the responsibility of the entity performing the maintenance within the Greenway System to determine if a Land Disturbance Activity Permit is required from any authority having jurisdiction. A Land Disturbance Activity Permit may contain the following information:

- A. Name, address, and contact telephone number.
- B. Narrative description of the maintenance activities to be conducted.
- C. Description of BMPs to be used.
- D. A site map.
- E. An activity schedule.
- F. Supportive data.
- G. Plans and specifications for restoring the site to a natural state with permanent vegetation.

The entity performing the maintenance shall contact the City and other responsible local government or agency for specific Land Disturbance Activity Permit requirements.

## **3.2 SITE CLEARING**

The following SOPs shall be followed during the site clearing phase for scheduled maintenance projects within the Greenway System:

- A. All cut and fill activities occurring within the EPD's mandated 25-foot stream buffer (50-foot buffer for trout streams) shall be stabilized with appropriate erosion control matting and blankets.
- B. The area to be cleared shall be clearly delineated to ensure that no disturbance occurs beyond the area identified. Except for perpendicular utility crossings, any open cut, grading, or clearing shall be set back from the streambanks to the greatest distance feasible. Except for manholes, portals, and the maintenance access to such facilities, the Greenway System must remain in a natural state even where crossings are perpendicular to the stream. Where feasible, scheduled utility maintenance projects are recommended to have no more than a thirty-foot (30') construction width (for projects paralleling the stream).
- C. Vegetation to be preserved shall be identified and clearly marked by flagging before clearing begins. Vegetation to be preserved shall include: vegetation vital to streambank stabilization; vegetation providing food and/or habitat to a federally listed endangered species, threatened species, or species of concern; vegetation that is a federally listed endangered species, threatened species, or species of concern; and vegetation that comprises a wetland ecosystem.
- D. Stemmed vegetation such as brush, shrubs, and trees shall be removed at or near the ground level, leaving the root systems intact.
- E. When pruning is necessary to clear the scheduled maintenance construction area, pruning cuts shall be made in accordance with the International Society of Arboriculture (ISA) Standards.
- F. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation to be preserved.
- G. Trees, which have fallen into water bodies or beyond the construction area, shall be removed immediately.

## **3.3 EROSION AND SEDIMENT CONTROL**

### **3.3.1 Maintenance Project Planning and Preliminary Grading**

Efforts shall be made during initial planning and whenever possible during scheduled maintenance phases, to minimize the amount of area cleared and graded (exposed) as well as the total exposure time. Plans must consider topography and soil type, so as to create the lowest practicable erosion potential. Whenever feasible, preliminary grading

operations shall be used to control the flow direction and velocity of runoff water and thereby dissipate energy. Where feasible, swales and diversion berms shall be used to direct runoff water to locations where treatment by sediment barriers can be performed. Where feasible, transverse diversion berms, installed perpendicular to the flow of water down slopes and in drainage channels, shall be used to reduce runoff water velocity. Cleared slopes shall be harrowed with construction equipment to create small diversion channels along the contours of the slope perpendicular to the direction of runoff flow. This action not only reduces flow velocities of runoff water traveling down the slopes, but also reduces flow quantities by increasing the area of exposed soil and thus enhancing percolation of runoff water. Grading equipment shall cross flowing streams by the means of bridges or culverts, except when such methods are not feasible, provided in any case that such crossings shall be kept to a minimum.

Dust from the disturbed area shall be controlled. Temporary means for controlling dust shall include mulching or vegetative cover with temporary seeding (see the latest edition of the Manual for Erosion and Sediment Control in Georgia). Emergency means for controlling dust shall include tillage or irrigation.

### **3.3.2 Erosion and Sediment Control Practices**

Erosion and sediment control practices must be implemented prior to any land disturbing activities resulting from scheduled maintenance within the Greenway System. Control of factors affecting erosion and sediment can be provided by a number of basic practices. The establishment of a dense stand of vegetation is probably the most effective means of controlling erosion and sediment; however, this control measure is often not practical until the completion of a project. Prior to and during the scheduled maintenance of utilities within the Greenway System, temporary erosion and sediment control measures shall be implemented and maintained until the construction area is restored as described later in this document.

Soft engineering techniques shall be used for erosion and sediment control. Hard engineering techniques shall only be used after soft techniques have failed and the failure is due to the inability of soft techniques to address the erosion problem. Improper choice of soft engineering techniques or improper design, implementation, and/or maintenance shall not be justification to turn to hard engineering techniques.

Appendix M presents summaries of techniques, (including their applications) used to control erosion and sedimentation. Erosion and sediment control measures shall be designed and implemented in accordance with the design standards established in Appendix M and the latest edition of the Manual for Erosion and Sediment Control in Georgia. If a conflict occurs between the design and construction standards presented in this document and those presented in the latest edition of the Manual for Erosion and Sediment Control in Georgia, the more stringent design and construction standards shall prevail. The selection of the most appropriate erosion and sediment control measure will be made by the entity performing scheduled maintenance to a utility on Greenway Property based on site specific conditions.

### 3.4 CONSTRUCTION METHODS

After all appropriate erosion and sediment control measures have been installed, the designated scheduled maintenance project can proceed as approved by the City with recommendations from any other responsible local government or agency. All clearing work and construction operations shall be conducted in such a manner as to effectively control soil erosion and prevent non-point source pollution loads from entering streams, ponds, and/or wetlands. At any time during the scheduled maintenance project, the City, with recommendations from any other responsible local government or agency, has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations and to direct the entity performing work on Greenway Properties to provide immediate permanent or temporary erosion and sediment control measures to prevent adverse impacts to wetlands or water courses on the Greenway Property.

Prohibited construction procedures include, but are not limited to, the following:

- A. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
- B. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
- C. Pumping of silt-laden water from trenches or excavations into surface waters or wetlands.
- D. Damaging vegetation adjacent to or outside of the construction area limits.
- E. Disposal of trees, brush, debris, plants, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
- F. Alteration of the flow line of any stream, unless such work is of a temporary nature, has been specifically authorized by the authority having jurisdiction, and is necessary to divert flow from excavation work so that debris and sediments are not released into streams.
- G. Open burning of debris within Greenway properties.

All conveyance channels, drainage outlets, and erosion and sediment control measures must be constructed to withstand the expected velocity of flow from a 25-year frequency storm without erosion.

#### **4.0 RESTORATION OF THE GREENWAY PROPERTIES AFTER EMERGENCY OR SCHEDULED MAINTENANCE TO EXISTING UTILITIES**

Permanent soil stabilization measures shall be applied to disturbed areas within 30 days after all soil disturbing activities have been completed and the final grade has been reached on any portion of the construction project site. Permanent soil stabilization means that for unpaved areas and areas not covered by permanent structures, at least 70% of the soil surface is uniformly covered in permanent vegetation or equivalent permanent stabilization measures (such as the use of riprap, gabions, permanent mulches, or geotextiles) have been employed. Until these conditions are satisfied and permanent control measures and facilities are operational, interim stabilization measures and temporary erosion and sediment control measures shall not be removed. Efforts shall be made to return the site to its natural condition. Native vegetation shall be used in such efforts. Acceptable plants and grasses are listed in Section 5.0 of this document and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Temporary soil stabilization measures shall be applied immediately to disturbed areas that are not at final grade but shall remain dormant for longer than 60 days. Areas that have been stabilized by temporary measures must be permanently stabilized once all soil disturbing activities are complete and the area is at final grade. Also, permanent stabilization measures shall be applied immediately to rough graded areas that will require erosion and sediment control for longer than six months.

#### **4.1 PERMANENT VEGETATION**

Permanent vegetation is the planting of perennial vegetation such as trees, shrubs, vines, grasses, or legumes, on exposed areas for permanent soil stabilization. A crop of perennial vegetation appropriate for the region which is capable of providing a 70% coverage within the growing season shall be used to achieve permanent soil stabilization.

The purpose of establishing permanent vegetation in disturbed areas is to protect the soil surface from erosion, reduce damage from sediment, reduce runoff to downstream areas, improve wildlife habitat and visual resources, and improve aesthetics. Permanent soil stabilization applies to each phase of construction. For linear construction projects on land used for agricultural or silvicultural purposes, permanent stabilization may be accomplished by stabilizing the disturbed land for its agricultural or silvicultural use. For design and construction specifications for disturbed area stabilization with permanent vegetation see Appendix M and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Sod shall be used to establish a permanent vegetative cover on highly erodible or severely eroded lands. Sod establishes immediate ground cover and thereby reduces runoff, erosion, and dust, which results in improved aesthetics; higher land values; stabilized waterways and critical areas; less sediments, nutrients and bugs; less downstream complaints; reduced likelihood of legal action and work stoppage due to legal action; and increased “good neighbor” benefits.

Sod is appropriate for areas that require immediate vegetative covers such as drop inlets, grass swales, and waterways with intermittent flow. Sod can initially be more costly than seed, but the advantages justify the increased initial costs.

The advantages to sod include the following:

- A. Immediate erosion and sediment control, green surface, and quick use.
- B. Reduced failure as compared to seed.
- C. Lack of weeds.
- D. Can be established almost year-round.

Sod is preferable to seed in waterways and swales because of the immediate protection of the channel after application. Sod must be staked in concentrated flow areas. For design and construction specifications for disturbed area stabilization with permanent sod see Appendix M and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

#### **4.2 EROSION CONTROL MATTING AND BLANKETS**

This stabilization technique provides a protective covering (blanket) or a soil stabilization mat to establish permanent vegetation on steep slopes, channels, or shorelines. The purpose of erosion control matting and blankets is to provide a microclimate that protects young vegetation and promotes its establishment and to reinforce the turf against forces of erosion during storm events.

Matting and blankets shall be applied on steep slopes where the hazard of erosion is high and planting is likely to be too slow in providing adequate protective cover. Concentrated flow areas, slopes steeper than 2.5:1 and with a height of ten feet or greater, and cuts and fills within the stream buffer, shall be stabilized with the appropriate erosion control matting or blanket. On streambanks where moving water is present, matting can be used to prevent new plantings from being washed away. For design and construction specifications for erosion control using matting and blankets see Appendix M and the latest edition of the Manual for Erosion and Sediment Control in Georgia.

Benefits of using erosion control blankets include the following:

- A. Protection of seed and soil from raindrop impact and subsequent displacement.
- B. Thermal consistency and moisture retention for seedbed areas.
- C. Stronger and faster germination of grasses and legumes.
- D. Planing off excess stormwater runoff.

- E. Prevention of sloughing of topsoil added to steeper slopes.

Benefits of using erosion control matting include the following:

- A. All benefits gained from using erosion control blankets that are listed above.
- B. Collects soil out of stormwater which becomes the growth medium for the development of roots.
- C. Assists the vegetative root system in forming an erosion-resistant cover resistant to hydraulic lift and shear forces when embedded in the soil of stormwater channels.

## **5.0 SCHEDULED VEGETATIVE MAINTENANCE ON EXISTING UTILITY EASEMENTS WITHIN THE GREENWAY SYSTEM**

It is the responsibility of the entity owning a utility easement on Greenway Property to determine if a permit is required to trim vegetation from the easement. Vegetation shall be trimmed in a manner to insure that at least six (6) inches of top growth shall be maintained under any use and management. The following SOPs shall be followed during scheduled vegetative maintenance of existing utility easements within the Greenway System:

- A. The area to be trimmed shall be clearly delineated to ensure that no disturbance occurs beyond the area identified. Trimming of vegetation along the existing utility easement is suggested to have no more than a twenty-foot (20') width (for utilities paralleling the stream).
- B. Vegetation that does not require trimming shall be identified and clearly marked by flagging before vegetative maintenance begins. Every effort shall be made to preserve the following: vegetation vital to streambank stabilization; vegetation providing food and/or habitat to a federally listed endangered species, threatened species, or species of concern; vegetation that is a federally listed endangered species, threatened species, or species of concern; and vegetation that comprises a wetland ecosystem.
- C. Stemmed vegetation such as brush and shrubs shall be trimmed leaving at least six (6) inches of growth. When removal of a tree cannot be avoided, it shall be removed at ground level, leaving the root system intact.
- D. When pruning is necessary during vegetative maintenance procedures, pruning cuts shall be made in accordance with International Society of Arboriculture (ISA) Standards.
- E. Trees, tree limbs, and other vegetative debris which have fallen into water bodies or beyond the utility easement area, shall be removed immediately.

- F. Mowing shall not take place during quail nesting season, between May and September. Sericea lespedeza shall be mowed only after the seeds have become mature. Mowing shall occur only after frost, between November and March. Bermudagrass, Bahiagrass and Tall Fescue shall be mowed as desired.

## **6.0 TRAINING OF PERSONNEL INVOLVED IN EMERGENCY AND SCHEDULED MAINTENANCE OF EXISTING UTILITIES WITHIN THE GREENWAY SYSTEM**

Key personnel involved in emergency and scheduled maintenance of existing utilities within Greenway Properties shall be trained in the requirements of the Consent Decree, the Greenway Acquisition Plan, and these SOPs. The key personnel shall also be trained on the proper installation, implementation, and inspection of erosion and sediment control measures.

A “pre-construction” meeting may be held between the City, other responsible local government or agency, and key personnel of the utility or construction agency following training in order to ensure that all parties have a common understanding as to how scheduled maintenance will be performed within the Greenway System.

## **7.0 SELECTED REFERENCES**

- A. Atlanta, Georgia. Stormwater Management Design Manual. Atlanta, 1996.
- B. Atlanta, Georgia. Atlanta Sewer Group (Montgomery Watson). “Collection and Transmissions Systems Maintenance Management Plan (MMP).” Atlanta, 2000.
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