

CONSTRUCTION SITE STORMWATER MANAGEMENT

This chapter provides clarification on Knox County's requirements for erosion prevention and sediment control (EPSC) for large construction sites and small residential lots, construction site waste management practices and stormwater pollution prevention practices. The objectives of Knox County's construction site stormwater management regulations are:

- To protect streams within Knox County from sedimentation and other pollutants that may result from construction activities;
- To rely first on erosion controls and phasing to reduce the potential for off-site sedimentation;
- To prevent off-site sedimentation from land-disturbances of any size;
- To mirror, to the extent practical, the requirements of the State of Tennessee Construction General Permit; and
- To comply with the requirements of the State of Tennessee Municipal Separate Storm Sewer System (MS4) permit.

9.1 TN Construction General Permit

In general, Knox County's requirements for construction site EPSC mirror the State's regulations, as defined in the General NPDES Permit for Discharges of Stormwater Associated with Construction Activities, also called the NPDES Construction General Permit (CGP). The CGP is administered by the Tennessee Department of Environment and Conservation (TDEC). The State of Tennessee requires that the owner or operator for each construction site that disturbs one or more acres, or sites that disturb less than one acre but are part of a larger plan of development or sale, obtain coverage under the Tennessee CGP. A Notice of Intent (NOI) to obtain coverage under the CGP and a copy of the Stormwater Pollution Prevention Plan (SWPPP) must be submitted to, and reviewed by, TDEC. Once TDEC has approved the NOI, a Notice of Coverage (NOC) is issued to the permittee.

The Knox County Stormwater Management Ordinance requires that the design, installation, maintenance and inspection of EPSC design standards and best management practices (BMPs) be in accordance with the State of Tennessee CGP, the *Tennessee Erosion and Sediment Control Handbook*, and this manual. Since the CGP is renewed and potentially modified every five years, this requirement refers to the Tennessee CGP and TDEC handbook that are valid and in-use at the time that the grading permit application is submitted. The Director of Engineering and Public Works (Director) has the authority to invoke more stringent requirements for construction site stormwater management where necessary. When the provisions of the ordinance, this chapter and another local or State regulation conflict or overlap, that provision which is more restrictive or imposes higher standards or requirements must be followed.

Since construction site stormwater management requirements of the State and Knox County are so similar, much of the information that is submitted to TDEC as part of the Tennessee CGP NOI can also be used to apply for a grading permit in Knox County as part of the EPSC plan. Construction sites that require coverage under the Tennessee CGP must submit a copy of the NOC and SWPPP with the EPSC plan that is submitted to Knox County Engineering to obtain a grading

permit. The EPSC plan will not be considered complete if a copy of the NOC and SWPPP are not included. More information on the grading permit application and EPSC plan contents can be found in Volume 1, Chapter 4 and Appendix D, respectively.

9.2 General Principles

Knox County's erosion prevention and sediment control program guidance is based upon the *Tennessee Erosion and Sediment Control Handbook*. The following paragraphs provide clarification and additional guidance for EPSC measures for land disturbing activities of any size that are located in Knox County.

- **Erosion prevention is the first line of defense to prevent off-site sedimentation.** In the past, erosion within a construction site has been considered acceptable and part of the overall construction process, and emphasis was placed on the control of eroded sediments. However, erosion increases the potential for off-site sedimentation and increases site grading costs. Relying first on erosion prevention measures reduces the potential for enforcement actions resulting from off-site discharges of sediment, the maintenance requirements for sediment control measures, and overall grading costs.
- **Minimize the area that is disturbed.** Developers and contractors should disturb only building envelopes, leaving the surrounding areas undisturbed thereby maintaining pre-development infiltration rates and runoff coefficients. If water quality buffers and natural areas will be used as post-construction water quality controls, limiting the disturbed area will be required in those areas at a minimum.
- **Sequence land disturbing activities to minimize the amount of time that such areas are exposed to storm events.** For example, if a development will ultimately disturb 75 acres, the land disturbing activities should be phased or sequenced into smaller, more manageable sections with EPSC measures prescribed for each section.
- **Sediment must be retained on-site.** Construction and land-disturbing activities inherently cause sediment migration. However, the Knox County Stormwater Management Ordinance prohibits off-site sediment discharges. Sediment controls must be designed to retain sediment on the development site and prevent sediment from discharging onto adjacent property, into the storm drain system, or into the street.
- **All disturbed areas must be permanently stabilized after construction has ceased.** To prevent the potential for ongoing erosion and sedimentation, permanent ground cover must be provided on all areas that were disturbed during construction. The permanent ground cover can consist of any of the following: permanent grasses or other permanent vegetative cover; asphalt or concrete pavement; rip rap or other hard armor for channels and slopes; or buildings.

9.3 Regulations and Policies

9.3.1 General

General regulations and policies for construction site stormwater management are as follows:

1. All EPSC measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications (where applicable) and good engineering practices. All EPSC measures selected must be able to slow runoff so that rill and gully formation is prevented. When steep slopes and/or fine particle soils are present at the site, additional physical or chemical treatment of stormwater runoff may be required, and must be fully described. If periodic inspections or other information indicate that a control measure has been used inappropriately, or incorrectly, the owner or operator must replace or modify the control for relevant site situations.

2. Discharges from construction sites must leave the project area in a non-erosive manner. Discharges from sediment basins and traps must be through a pipe or a conveyance lined with rip-rap or other stabilized spillway so that the discharge does not cause erosion.
3. Construction materials buried onsite shall meet the provisions of Section 4.8 of the Knox County Zoning Ordinance.
4. Construction related wastes shall be managed in accordance with the requirements of the Tennessee CGP.
5. For installation of any waste disposal systems on site, or sanitary sewer or septic system, the plan should provide for the necessary sediment controls. Owners or operators must also comply with applicable State and/or local waste disposal, sanitary sewer or septic system regulations for such systems, to the extent that these are located within the permitted area.
6. If permanent or temporary vegetation is to be used as a control measure, then the timing of the planting of the vegetation cover must be discussed in the EPSC plan or SWPPP. Delay in planting cover vegetation until winter months or dry months should be avoided, if possible.
7. If sediment escapes the construction site, off-site accumulations of sediment that have not reached a stream must be removed at a frequency sufficient to minimize offsite impacts (e.g., fugitive sediment that has escaped the construction site and has collected in a street must be removed so that it is not subsequently washed into storm sewers and streams by the next rain and/or so that it does not pose a safety hazard to users of public streets). Owners or operators shall not initiate remediation/restoration of a stream without consulting Knox County and TDEC first. Approval from Knox County or TDEC does not authorize access to private property. Arrangements concerning removal of sediment on adjoining property must be settled by the owner or operator with the adjoining landowner.
8. Sediment should be removed from sediment traps, silt fences, sedimentation ponds, and other sediment controls as necessary, and must be removed when design capacity has been reduced by 50%.
9. Sediment laden water to be pumped from excavation and work areas must be held in settling basins or filtered prior to its discharge into surface waters. Water must be discharged onto a stabilized outlet point so that the discharge does not cause erosion and sedimentation.
10. Litter, construction debris, and construction chemicals exposed to stormwater shall be picked up prior to anticipated storm events or before being carried off of the site by wind (e.g., forecasted by local weather reports), or otherwise prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, daily pick-up, etc.). After use, materials used for erosion prevention and sediment control should be removed or otherwise prevented from becoming a pollutant source for stormwater discharges.
11. Offsite erodible material storage areas (also including overburden and stockpiles of dirt, etc.) used primarily by the permitted project are considered a part of the project and shall be addressed in the EPSC and included in the calculation of the EPSC portion of the performance bond.
12. Construction must be phased for projects in which over **25** acres of soil will be disturbed. Areas of the completed phase must be stabilized within 15 days. No more than **25** acres of active soil disturbance is allowed at any time during the construction project.
13. The following records shall be maintained on or near site: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; the dates when stabilization measures are initiated; inspection records and rainfall records.
14. Owners or operators shall maintain a rain gauge and daily rainfall records at the site, or use a nearby reference site for a record of daily amount of precipitation. The location of the rain gauge shall be shown on the EPSC plan.

15. Owners or operators shall implement practices to protect the stormwater conveyance system from sedimentation.
16. Disturbed areas will be considered permanently stabilized and ready to be released from the Performance and Indemnity Agreement when a permanent vegetative cover has been established over at least 70% of the site. Note that the Director can require greater coverage when the potential for off-site sedimentation or accelerated erosion exists.

9.3.2 Protection of Water Quality Buffers

During construction, water quality buffers around streams, wetlands, ponds, and other water bodies must be protected from disturbance and from sediment-laden runoff from the site. Prior to beginning land-disturbing activities at a site, water quality buffers must be identified and flagged in the field for protection. Water quality buffers cannot be used as vegetated filters for sediment control.

9.3.3 Stabilization of Disturbed Areas

Disturbed areas within the project site must be permanently or temporarily stabilized within 15 days after construction activity in that portion of the site has temporarily or permanently ceased unless the soil is frozen, soggy, or otherwise unworkable.

Pre-construction vegetative ground cover must not be destroyed, removed or disturbed more than 10 days prior to grading or earth moving unless the area is seeded and/or mulched or other temporary cover is installed.

Stabilization of disturbed areas refers to measures that protect soil from accelerated erosion. Applicable practices include, but are not limited to, vegetative groundcovers, mulch, or the application of gravel base on areas to be paved. Unpacked gravel containing fines (silt and clay sized particles) or crusher run will not be considered a non-erosive surface. Soil stabilization specifications should be provided for year round seeding and the particular site conditions. Specifications for establishing a groundcover should include seeding mixtures for permanent and temporary seed establishment, soil amendments, mulch application, and application of a tackifier to hold the mulch in place.

Permanent vegetative cover shall be established on disturbed areas not otherwise permanently stabilized. Areas that were previously disturbed and provided with a permanent vegetative groundcover will not be considered established until a groundcover is achieved which, in the opinion of the Department of Engineering and Public Works, is mature enough to control soil erosion and to survive severe weather conditions. Generally, final stabilization of a site with a vegetative groundcover has been achieved when the following has been provided:

- All cut and fill slopes have a permanent groundcover with at least 70% coverage, and the slopes do not contain evidence of rill or gully erosion.
- All concentrated flow paths have been stabilized against erosion with a permanent measure (groundcover, rip rap, concrete, etc.) at least 70% coverage, and the concentrated flow paths do not contain evidence of erosion.
- All other areas of the site have a permanent groundcover with at least 70% coverage, and the site does not contain evidence of accelerated erosion.

The Engineering Director can have more stringent requirements in accordance with the Knox County Stormwater Management Ordinance.

When conditions are not conducive to establishing a permanent vegetative cover, a temporary cover can be established, provided that a permanent cover is provided when conditions have

improved. Temporary covers can include annual grains or mulch anchored with netting, crimping or other appropriate anchor.

9.3.4 Off-Site Sedimentation

Properties adjacent to or downstream from a disturbed site must be protected from sediment. This may be accomplished by preserving a well-vegetated filter strip around the lower perimeter of the land disturbance or by installing perimeter controls such as sediment barriers, filters, diversion berms, or sediment basins.

9.3.5 Construction Sequencing

Sediment basins and traps, perimeter diversion berms, sediment barriers and other measures intended to trap sediment onsite must be constructed as a first step in grading and be made functional before upslope land disturbance takes place. Water quality buffers must also be identified and protected with flagging or fencing prior to beginning land-disturbing activities on the site. All sediment control practices at hydraulic outlets from the site must be installed before additional construction may take place within the area draining to the outlet. Earthen structures such as dams, dikes, cut and fill slopes and diversions must be seeded and mulched within 15 days of installation.

9.3.6 Structural Controls

The EPSC plan must include a description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and discharge of pollutants from exposed areas of the site. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Structural controls shall not be placed in streams or wetlands except as authorized by a Section 404 Permit and/or Aquatic Resource Alteration Permit (ARAP).

Erosion prevention and sediment control measures must be designed according to the size and slope of disturbed drainage areas with the goal of detaining runoff and trapping sediment. In addition, erosion prevention and sediment controls must be designed to control the rainfall and runoff from a 2-year return frequency, 24-hour duration storm event, as a minimum. When clay and other fine particle soils are present at the construction site, chemical treatment may be used to minimize the amount of sediment being discharged.

For an outfall in a drainage area of a total of 10 or more acres, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2-year return frequency, 24-hour duration storm event and runoff from each acre drained, or equivalent control measures, must be provided until final stabilization of the site. The basin must have both wet storage (i.e., permanent pool) and dry storage components, in accordance with the *Tennessee Erosion and Sediment Control Handbook*. Where an equivalent control measure is substituted for a sediment retention basin, the equivalency must be justified to Knox County Engineering. Runoff from any undisturbed acreage should be diverted around the disturbed area and the sediment basin. Diverted runoff can be omitted from the volume calculation. Sediment storage expected from the disturbed areas must be included and a marker installed signifying the need for cleanout of the basin.

All calculations of drainage areas, runoff coefficients and basin volumes must be provided in the EPSC plan. The discharge structure from a sediment basin must be designed to retain sediment during the lower flows. Muddy water to be pumped from excavation and work areas must be held in settling basins or filtered or chemically treated prior to its discharge into surface waters. Water must be discharged through a pipe, well-grassed or lined channel or other equivalent means so that the discharge does not cause erosion and sedimentation.

9.3.7 Special Requirements for Priority Construction Activities

Priority construction activities have additional local and State requirements for BMP design, site inspections and buffer zones. Priority construction activities are defined in the Knox County Stormwater Management Ordinance as land disturbing activities that are located in a watershed that discharges into waters recognized by the State of Tennessee as impaired for siltation, or high quality waters. Knox County Engineering can assist owners or operators in determining if the land disturbing activity is considered a priority construction activity. The policies below are applicable to all priority construction activities.

- It must be clearly noted on the EPSC or small lot EPSC plan that the new development or redevelopment is a priority construction activity.
- Additional design, inspection, and buffer zone requirements for discharges into impaired or high quality waters that are stated in the Tennessee CGP must be implemented for all priority construction activities.
- Owners and operators of priority construction activities must attend a pre-construction meeting with Knox County Engineering prior to approval of a grading permit.
- The priority construction activity will be inspected for conformance with the EPSC plan and all local EPSC requirements by Knox County Engineering (or a duly authorized agent of Knox County Engineering) at least once per month.

9.3.8 Cut and Fill Slopes

Cut and fill slopes must be designed and constructed in a manner which will minimize erosion and potential slope failure. Consideration must be given to the length and steepness of the slope, the soil type, upslope tributary area, groundwater conditions, and other applicable factors. To promote proper maintenance, all cut and fill slopes should be graded no steeper than 3 feet horizontal to 1 foot vertical (3:1), unless otherwise specified in this manual. Cut and fill slopes must be stabilized once the final slope has been established.

9.3.9 Construction Exits

A stabilized stone construction exit shall be placed at any point where traffic will be leaving a construction site to a public right-of-way, street, alley, sidewalk, or parking lot. Stone pads shall contain ASTM-1 stone, 6 inches thick with a geotextile fabric liner underneath and be a minimum of one hundred (100) feet long and 20 feet wide. For individual lot construction, stone pads must be installed to the extent practicable, and contractors must use the stone pad during construction to avoid tracking soil, mud and debris off the project site. The intent of construction exits is to prevent tracking of mud or debris off the construction site.

9.3.10 Good Housekeeping Practices

On all construction sites, site operators are required to control construction site wastes to prevent water quality impacts to the maximum extent practicable. Non-stormwater discharges into the storm drain system constitute a violation of the Stormwater Management Ordinance (see Section 12). The EPSC plan must include good housekeeping practices as they relate to stormwater quality, as outlined in this section. Specific measures must be included in and shown on the plan to address:

- Spill prevention for chemicals used on site;
- Materials storage for chemicals stored on site;
- Waste management;
- Concrete truck and masonry washout areas;

- Vehicle maintenance conducted on site; and,
- Trash and construction debris management.

All contractors and sub-contractors working on the site must be made aware of the good housekeeping practices included in the plan.

9.3.10.1 Spill Prevention

Spills and leaks are often sources of stormwater pollutants and can be avoided. Avoiding spills is easier than cleaning up spills after they occur. Heavy equipment and other vehicles should be inspected daily for leaks and repaired as necessary. If equipment is to be fueled onsite, the fueling areas must be designated on the EPSC and other site development plans and provided with containment and spill cleanup measures.

When spills do occur, clean up should not include hosing the area off. The SWPPP must describe measures to be taken to prevent and clean up after a spill, such as excavating contaminated soils and placing them on heavy plastic sheeting or using absorbent material to absorb the material and then disposing of the material in approved containers to prevent contact with stormwater. Spills in excess of two (2) gallons must be reported to Knox County Department of Engineering and Public Works.

Portable sanitary facilities at the site must be maintained to prevent discharge of sewage into the storm drain system or into streams.

Concrete truck wash down areas must be designated on the EPSC and other site development plans. The designated area must fully contain the washings to prevent residual concrete tailings from entering a stormwater system or stream. Other equipment washing must be performed in a designated area, and these areas noted on the EPSC and other site development plans. Wash water must be adequately treated prior to discharging to the storm drain system or routed to the sanitary sewer.

Construction vehicle maintenance must be performed at least 50 feet away from any storm drain system. Drip pans and other containment systems must be employed to prevent spills.

9.3.10.2 Materials Storage

All chemicals must be stored in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. These areas should be shown on EPSC and other site development plans. Shipping and receiving practices must minimize materials spills and exposure to stormwater.

9.3.10.3 Trash and Debris Management

All construction trash must be properly managed and disposed. Trash and construction debris should be controlled in a centralized area that is protected from wind and rain. All construction debris and trash must be removed and properly disposed of from the site after construction has been completed.

9.4 Erosion Prevention and Sediment Control Plans

The owner or operator of land development activities not exempted by Section 4.1 of the Stormwater Management Ordinance must obtain a grading permit prior to commencing land-disturbing activities. An EPSC plan must be submitted to obtain a grading permit.

EPSC plans identify the erosion prevention practices, both temporary and permanent, and sediment control measures that are appropriate for the individual site conditions. In addition, the

plan must include a description of measures to be installed to control other construction-related wastes such as litter, construction debris, concrete washout and solvents. Other items to include are: a construction schedule; design calculations supporting structural controls on the project; a location map; vegetation specifications for stabilization purposes; and any other information necessary to support the EPSC plan for a specific development. Specific requirements for the EPSC plan are presented in the EPSC plan checklist, in Volume 1, Appendix D of this manual.

When developing the EPSC plan, the designer should consider the following items:

- Limit the disturbance to the minimum necessary for the development site. Keeping the disturbed area minimized in turn minimizes the sizes of sediment controls. Protect areas that are not to be disturbed to prevent inadvertent disturbances. In addition to minimizing sediment and erosion control required on the site, minimizing disturbed areas and protecting undisturbed areas aids in the treatment of post-construction stormwater management (see Volume 2, Chapter 5 for more information on post-construction stormwater management).
- Undisturbed off-site drainage should be routed around disturbed areas instead of through the project site. Large amounts of off-site drainage routing through a project site can cause measures to be grossly oversized and overwhelmed during storm events.
- Particular attention should be given to concentrated flow paths inside the development site. Disturbing concentrated flow paths should be avoided. Instead, the conveyance should be isolated from the surrounding disturbed area. In the event that the concentrated flow path must be disturbed, the conveyance should be stabilized as soon as possible and erosion control measures applied to prevent erosion.
- Sediment controls should be designed for all stormwater outfalls that have disturbed areas within their drainage boundaries. Stormwater outfalls are those points where runoff flows onto adjacent properties, into roadways, or into streams.
- Construction sequences provided in the EPSC plan should address the installation of perimeter measures for the initial grading phase prior to beginning any land disturbing. It should also address the application of temporary and permanent groundcovers, the ongoing maintenance of measures, and the final removal of temporary measures once the site has been stabilized. Consider providing a phased grading plan for large sites or those sites that have sensitive features (streams, wetlands, sinkholes, steep slopes, etc.).

9.4.1 Plan Modifications

Once EPSC plans have been approved and are under construction, field modifications are often necessary and beneficial. Minor modifications of grading plans are permissible without resubmitting plans to Knox County Engineering for approval. Minor modifications could consist of shifting a control to better fit the site topography, increasing the sediment control capacity, installing a more robust measure (for example, installing a rock berm instead of a silt fence), or decreasing the size of the disturbance. However, major modifications, such as omitting controls, using a different control, or substantially modifying the drainage patterns of a site, must first obtain approval from the Director before implementing the change. Knox County inspectors may require a plan modification when, upon inspection, measures are found to be ineffective.

9.5 Deficient Performance

If at any time it is determined by the Department of Engineering and Public Works, the property owner, or designated construction site inspector/manager that the erosion prevention and sediment control practices as originally designed are not capable of controlling erosion and/or preventing sediment from leaving the site under storm conditions, then additional controls must be implemented and a plan modification will be required. Additional controls must be implemented to a level and until a time in which the Director is satisfied that the controls are adequate. If Knox

County inspectors determine that adequate inspections and maintenance procedures are not being implemented or the controls as designed are not meeting performance objectives presented in the Stormwater Management Ordinance or these regulations, the inspector may issue a Notice of Violation citing actions to be taken and a time frame for compliance. If appropriate actions are not taken as specified on the notice-of-violation, a stop work order may be issued.

9.6 Inspections and Maintenance

All permitted land-disturbances must be inspected during the life of the project until the site has been permanently and finally stabilized. Documentation of inspections should be maintained at the project trailer or with the person/individual responsible for performing the inspections. Inspections must be conducted twice every week, at least 72 hours apart. Often, it is advantageous to inspect erosion prevention and sediment control measures during rain events to see how well the system of measures is actually working.

Inspections should be performed by qualified personnel that have taken the TDEC Level I Fundamentals of Erosion Prevention and Sediment Control for Construction Sites and have passed the exam. Inspections should be performed on all areas of active construction, including areas that have not been finally stabilized, areas used for storage of materials or stockpiles, exits and entrances for construction traffic, outfall points from the project, and structural controls. These areas should be inspected for signs of erosion, sedimentation, or the discharges of other pollutants from the site. Any controls found to be inadequate must be repaired within 7 days following the inspection, and the EPSC plan modified (if necessary) within 14 days of the inspection.

The following information should be provided on an inspection form:

- Name of the project;
- Name of inspector;
- Date, time, site and soil conditions;
- Major observations related to the implementation of the EPSC plan, including measures that need maintenance or upgrade; signs of pollutant discharge; evidence of erosion and areas that have been or need to be stabilized;
- Any actions taken since the last inspection to repair measures or mitigate any previous problems.

An inspection checklist can be found in Appendix F of Volume 1 of this manual. When requested, copies of completed inspection reports must be provided to Knox County within a timely manner.

9.7 Small Lot EPSC Plans

Prior to issuing a building permit, a project that has not previously been required to obtain a grading permit must provide a small lot EPSC plan. Preparation of a small lot EPSC plan is much simpler than the EPSC plan required for a grading permit. A template that can be utilized to prepare a small lot EPSC Plan can be found in Appendix E of Volume 1 of this manual.

The permittee is required to adhere to the small lot EPSC plan and prevent sediment from leaving the building site. The permittee is also responsible for stabilizing the site prior to the issuance of a Certificate of Occupancy.

In some circumstances, a small lot EPSC plan may not provide adequate protection to streams, sinkholes and other stormwater systems from sedimentation. In such situations, the Director can require a more detailed EPSC plan.



References

Tennessee Department of Environment and Conservation (TDEC). *General NPDES Permit for Discharges of Stormwater Associated with Construction Activities*. Permit No. TNR100000. Issued June 16, 2005.

Tennessee Department of Environment and Conservation (TDEC). *Tennessee Erosion and Sediment Control Handbook*. Second Edition. March, 2002.