



Chapter 5 EROSION AND SEDIMENT CONTROL PLAN

5.1 Overall Requirements

An erosion and sediment control plan (ESCP) is required for most types of development within the City of Knoxville. The use of source control BMPs to control erosion before it starts is the preferred method of long-term sediment control. However, the best protection on active construction sites is generally obtained through simultaneous application of both source control and sediment containment BMPs. This combination of controls is effective because it prevents most erosion before it starts and has the ability to capture sediments that become suspended before the transporting flows leave the construction site.

BMPs for erosion and sediment control are selected to meet the BMP objectives based on specific site conditions, construction activities, and cost-effectiveness. Since construction site conditions are constantly changing, different BMPs may be needed at different times during construction.

In most cases permanent BMPs can be implemented most effectively when they can be integrated into other aspects of the project design. This requires that stormwater control be considered early in the design process. Stormwater detention is required for most types of development and some types of redevelopment within the City of Knoxville. Some BMPs can be incorporated into stormwater detention facilities with modest design refinements and limited increases in land area and cost. Some areas can be used for more than one purpose, usually in a cost-effective way. Landscaped open space, which is relatively flat, may be combined with stormwater quality/quantity facilities. Vegetated swales and buffer areas may be used as roadside corridors or along parking lots.

5.2 Minimize Disturbed Areas

The first step for selecting BMPs is to compare the project layout and schedule with onsite management measures that, where appropriate, can limit the exposure of the project site to erosion and sedimentation. Scheduling and planning considerations are the least expensive way to limit the need for erosion and sediment control measures. Consider the following procedures to minimize disturbed areas:

1. Do not disturb any portion of the site unless an improvement is to be constructed there. Retain existing vegetation and ground cover where feasible, especially along streams and watercourses and along the downstream perimeter of the site.
2. Minimize the size of disturbed areas and time of exposure by careful phasing of construction. Minimize the amount of denuded areas and any new grading activities during the wet months of December through May. Do not clear any portion of the site until active construction begins. Use temporary cover (such as seeding or straw) whenever construction is halted or delayed.
3. Phased grading operations should limit the amount of areas exposed to the process of erosion at any one time. Only the areas that are actively involved in cut and fill operations or are

otherwise being graded should be exposed. Exposed areas should be stabilized as soon as grading is complete in that area.

4. Construct permanent stormwater control facilities such as detention basins and perimeter channels early in the project and use these BMPs for sediment trapping, slope stabilization, and runoff velocity reduction throughout the construction period.
5. Quickly complete construction on each portion of the site. Install landscaping features and other improvements that permanently stabilize each part of the site immediately after the land has been graded to its final contour.

The purpose of site stabilization BMPs is to prevent erosion by covering disturbed soil. This covering may be vegetative, chemical, or physical. Any exposed soil is subject to erosion - either by rainfall striking the ground, runoff flowing over the soil, wind blowing across the soil, or vehicles driving on the soil. Thus all exposed soils should be stabilized except where active construction is in progress. Locations on a construction site which are particularly subject to erosion and should be stabilized as soon as possible include:

- Slopes
- Highly erosive soils
- Construction entrances
- Stream channels
- Soil stockpiles

5.3 Site Perimeter Controls

The purpose of site perimeter controls is to protect downstream areas from erosion, sediment, flooding problems, and excessive runoff. By doing this, the contractor will not only be obeying the laws, but also making good neighbors. If construction phasing will allow, consider installing permanent stormwater control facilities (detention basins and perimeter channels) early in the project and use these BMPs for sediment trapping, slope stabilization, and runoff velocity reduction throughout the construction period.

- Disturbed areas or slopes that drain toward adjacent properties, storm drain inlets or receiving waters should be protected with continuous berms, silt fences, sandbags, straw bales, etc. to prevent sediment discharge. The contractor should be prepared to stabilize those soils with additional protective measures prior to the onset of rain.
- When grading has been completed, the areas should be protected with vegetative measures such as mulching, seeding, planting, emulsifiers, or a combination of these methods. The combination of erosion protection measures and sediment control devices should remain in place until the area is permanently stabilized.
- Significant offsite flows (especially concentrated flows) that drain onto disturbed areas or slopes should be controlled through use of continuous berms, earth dikes, drainage swales, and lined ditches that will allow for controlled passage or containment of flows.
- Concentrated flows that are discharged offsite should be controlled through outlet protection and velocity dissipation devices in order to prevent erosion of downstream areas. See ES-25, Outlet Protection, for various types of velocity dissipation devices.

- Perimeter controls should be placed everywhere runoff enters or leaves the site, before clearing and grubbing begin. Both runoff and sediment typically overload perimeter controls, so that constant monitoring and maintenance is required. Additional controls within the interior of the construction site should supplement perimeter controls once rough grading is complete.

5.4 Internal Erosion and Drainage Design

When perimeter controls and outfall devices have been installed, internal erosion and drainage design can be addressed. Internal design elements are generally more time-intensive. The middle of a project site is where construction phasing and sequencing becomes important. Until the permanent facilities are constructed, temporary stormwater facilities will be subjected to erosion from concentrated flows.

- These facilities should be stabilized through temporary check dams, geotextile mats, and under extreme erosive conditions by lining with concrete.
- Long or steep slopes should be terraced at regular intervals. Terraces will slow down the runoff and provide a place for small amounts of sediment to settle out.
- Slope benches may be constructed with either ditches along them or back-sloped at a gentle angle toward the hill. These benches and ditches intercept runoff before it can reach an erosive velocity and divert it to a stable outlet.
- Creating a rough surface for runoff to cross (such as tall grass) can reduce overland flow velocities.

5.5 Inspection and Maintenance

Inspection and maintenance are the key elements in controlling erosion and sediment. Erosion and sediment control devices are installed as necessary and moved around the project site. Inspection should be performed after each rainfall and at least weekly. Maintenance must be performed immediately whenever deficiencies are noted. Checklists can help to document the inspection and maintenance process. The Knoxville Land Development Manual contains a Final Site Inspection Checklist (in Appendix A), which can also be adapted and used as a weekly erosion control inspection checklist.

Larger projects should generally arrange for a pre-construction assistance meeting in order to coordinate erosion control objectives and methods with the city inspector prior to commencing clearing and grading. The city inspector will visit the project periodically and will also be involved in the final inspection checklists and approval.

Many BMP controls work on the same principle; the velocity of sediment-laden runoff is slowed by temporary barriers or traps, which pond the stormwater, allowing the sediments to settle out. Therefore, sediment removal is an important activity in maintaining several BMPs. Excessive sediment should be removed from the stormwater both within and along the perimeter of the project site. Appropriate strategies for the inspection and maintenance of erosion and sediment control features include:

1. Verify that sediment-laden stormwater is directed to temporary sediment traps or basins. Verify that sediment basins and traps are at low points below disturbed areas.
2. Protect all existing or newly installed storm drainage structures from sediment clogging by providing inlet protection for area drains and curb inlets. Stormwater inlet protection can utilize sand bags, sediment traps, or other similar devices.

3. Excavate permanent stormwater detention ponds early in the project, use them as sedimentation ponds during construction, remove accumulated sediment, and landscape the ponds when the upstream drainage area is stabilized.
4. Inspect temporary sediment barriers such as silt fences, straw bale barriers, rock filters, and continuous berms after each rainfall. These barriers should only be used in areas where sheet flow runoff occurs. They are ineffective if the runoff is concentrated into rill or gully flow.
5. Internal outfalls must also be protected to reduce scour from high velocity flows leaving pipes or other drainage facilities.

5.6 ESCP Preparation Guidance

In general, the ESCP will consist of a narrative and a drawing. The project designer may choose to have the narrative included on a drawing or issued as a report. The owner of the land being developed has the ultimate responsibility for the ESCP preparation and submittal. The owner may designate someone to prepare the plan, but the owner still has the ultimate responsibility.

A narrative is required in order to explain the decisions concerning erosion and sediment control. The narrative should be adequate to allow a reviewer to make intelligent judgments concerning the effectiveness of the controls. It should contain complete and concise information regarding information that is not usually shown on drawings, such as construction schedules, existing soils, calculations and computations, types of vegetation, inspection and maintenance of controls, etc.

The level of detail should be appropriate to the project size and complexity. A sketch is usually adequate for constructing a house on a single subdivision lot. Projects near streams and other sensitive areas will require a high level of detail. In general, properties with a high percentage of impervious area will need a higher level of detail than properties with a low percentage of impervious area. Steep slopes may also affect the amount of effort in preparing an ESCP.

The Tennessee Department of Transportation (TDOT) is an excellent source for erosion control details. There are over 300 TDOT Standard Roadway and Structure Drawings, grouped into the following categories: roadway design, culverts and endwalls, catch basins and endwalls, roadway and pavement appurtenances, safety appurtenances and fence, traffic control appurtenances, and erosion control and landscaping. Contact TDOT for further details on how to purchase this reference, or these details may also be viewed and downloaded as Acrobat files from www.tdot.state.tn.us/Chief_Engineer/engr_library/design/Std_Drwg_Eng.htm TDOT drawing RD-L-4 contains a standard legend which can be helpful in depicting erosion and sediment control items.

A typical checklist for preparing an ESCP is included on pages 5-6 and 5-7. Many engineering firms and construction contractors have their own checklists or templates for preparing an ESCP.

Many engineering firms and construction contractors have a standard set of general notes, which are generally sufficient. The following list contains general notes for a typical small project.

Typical General Notes for Erosion and Sediment Control Plans:

1. As a minimum, all erosion and sediment control practices will be constructed and maintained according to the standards located in the City of Knoxville BMP Manual, the City of Knoxville Stormwater and Street Ordinance, and as required by state and federal laws.
2. A copy of the approved erosion and sediment control plan shall be maintained at the project site at all times. This copy shall be made available to the City of Knoxville Engineering Department upon request.
3. Prior to commencing land-disturbing activities in any area not on the approved erosion and sediment control plan, the contractor shall submit a supplementary erosion control plan to the City of Knoxville Engineering Department for review and approval.
4. All erosion and sediment control measures are to be placed prior to or as the first step in clearing and grading. The contractor is responsible for any additional erosion control measures necessary to prevent erosion and sedimentation as determined by the City of Knoxville Engineering Department.
5. The City of Knoxville Engineering Department must be notified prior to dewatering operations. Water must be pumped through an approved filtering device. The City of Knoxville Engineering Department may suspend dewatering operations if pollution is observed.
6. The contractor shall inspect all erosion and sediment control devices at least once a week and at least once a day during rainfall events. The contractor shall perform any repairs or maintenance immediately in order to ensure effective erosion and sediment control.
7. The contractor shall maintain a record of all inspections and maintenance activities at the project site. This record shall be made available to the City of Knoxville Engineering Department upon request.

Typical Checklist for Preparing Erosion and Sediment Control Plan, Sheet 1

Project: _____
Reviewer: _____
Date: _____

Narrative

- _____ Basic report format – Site name and address, author of report, legibility, page numbers, correct spelling.
- _____ Project description – Purpose of grading or construction activity, total area to be disturbed.
- _____ Existing site conditions – Describe vegetation, drainage patterns, topography.
- _____ Proposed site conditions – Types of ground cover, drainage patterns, site grading.
- _____ Adjacent property and uses.
- _____ Types of soils – Soil names and descriptions, erodibility, permeability, depth, texture, shrink/swell potential, hydrologic soil group.
- _____ Critical or sensitive areas – Steep slopes, streams, wetlands, sinkholes, etc.
- _____ Construction scheduling – Duration of clearing, open grading, installation of permanent stormwater controls.
- _____ Inspection and maintenance schedule for BMPs and erosion control devices.
- _____ Supporting calculations for BMPs and erosion control devices. In general, detention basins and stormwater conveyance systems will have separate calculations.

Typical Checklist for Preparing Erosion and Sediment Control Plan, Sheet 2

Project: _____
Reviewer: _____
Date: _____

Site Plan

- _____ Basic drawing format – North arrow, scale, engineer stamp, site name and address, legibility, drawing legend, typical abbreviations.
- _____ Vicinity map – A small map showing the surrounding area, including landmarks, streams, and roads.
- _____ Existing vegetation and trees.
- _____ Limits of clearing and grading.
- _____ Existing and proposed contours – Appropriate interval, contours match together.
- _____ Site development – Show all buildings, roads, parking lots, and other structures.
- _____ Construction access routes, borrow areas, spoil areas.
- _____ Existing and proposed drainage structures – Sizes, materials, slopes, other important dimensions.
- _____ Drainage patterns and watershed boundaries – Indicate drainage area for each watershed.
- _____ Property boundaries and easements.
- _____ Location of critical or sensitive areas.
- _____ Location of BMPs and erosion control devices – Typical placement as construction work progresses.
- _____ Details for BMPs and erosion control devices.