Site stabilization

NPDES/SDS Construction Stormwater permit requirements

Improperly treated and untreated runoff from exposed soils of a construction site can cause soil erosion and sedimentation problems resulting in the pollution of lakes, rivers, and other water bodies. This factsheet provides guidance on stabilizing a construction site to protect the quality of our water resources.

The erosion process

Erosion is the natural process in which soil and rock material is weathered and carried away by wind, rain, snow or ice. Factors such as rainfall, climate, location, and soil type that influence erosion.

Subsoil erosion at a construction site.

Construction activities increase the ability of soil to erode once the vegetation and the top soil are removed. When the subsoil is exposed to the elements, the soil can erode very quickly. Wind and rain carry the soil off the construction site and sediment is deposited into our surface waters. This causes adverse effects on the quality of our water and to the health of aquatic life. Sediment runoff often carries additional pollutants such as nutrients, petroleum products, fecal matter and other contaminates from construction sites that further impact our lakes and rivers. It has been shown that it is far less costly to prevent erosion than to attempt to mitigate the effects of erosion after it has occurred. Through proper use of best management practices (BMPs), including temporary and permanent covers to stabilize soils along with other practices to prevent erosion; such as the use of construction phasing, horizontal slope grading, vegetative buffers and water diversions, these effects can be substantially minimized.

What is required by the NPDES/SDS Construction Stormwater permit?

The National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Construction Stormwater permit identifies certain site requirements in regard to erosion prevention that, if utilized properly along with all other BMPs required by the permit, can effectively control erosion and sediment problems on a construction site.

Site stabilization is the process of implementing specific BMPs for the purpose of preventing soil from eroding. BMPs utilized for this purpose involve establishing a cover of some type over the exposed soils such as mulch, staked sod, riprap, erosion control blankets, or other material that prevents soil from eroding. Covering the soil with seed only, is not considered a stabilization practice. Mulch needs to be applied with the seed to stabilize the soil until the vegetation is established.

Sediment control BMPs, such as silt fence, rock checks, bio rolls, drainage swales, sediment traps or perimeter controls are utilized along with the soil stabilization BMPs. Perimeter controls are used to trap sediment prior to leaving the site, but alone are not considered soil stabilization practices. See http://www.pca.state.mn.us/index.php/view-document.html?gid=7420 for more on perimeter sediment controls.

At a minimum, the permit requires that the following practices are utilized to prevent soil from eroding at construction sites:

- Phase the construction when feasible to limit the amount of soil exposed at one time.
- Delineate areas not to be disturbed with flags stakes, silt fence or with signs. These areas also need to be noted on the plan sets.
- Avoid disturbance of steep slopes or utilize stabilization practices designed for steep slopes, such as terracing or slope draining to minimize erosion.
- Direct stormwater discharges from the site to vegetated areas in order to increase sediment removal and infiltrate stormwater on the site when feasible.
- Utilize vegetative buffers, horizontal slope grading, and maintenance to protect surface waters.
- Use check dams, sediment traps, riprap, or grouted rip rap at outlets and along conveyance channels to control velocity and minimize erosion along the channel and outlets.
- Install energy dissipation such as concrete aprons, splash pads, rip rap, and gabions at pipe outlets within 24 hours of connecting to a *surface water*.
- Initiate soil stabilization *immediately* on portions of the site, including soil stockpiles, where construction activity has temporarily or permanently ceased and will not resume for 14 days.
- Stabilize exposed soils within 24 hours on portions of the site that drain to a public water where the Department of Natural Resources (DNR) has declared "work in water restrictions" during fish spawning time frames.
- Stabilize the last 200 feet of the normal wetted perimeter of any temporary or permanent drainage ditch or swale that drains water from the site within 24 hours of connecting to a property edge or a discharge point to a *surface water*. Use erosion blankets, rip rap or other cover designed for concentrated flow areas.
- Note that the permit definition for *surface water* in the permit is not just lakes or streams, but also any natural or artificial water feature including drainage systems such as ditches, swales, or inlets. Therefore, ditches or swales that connect to another drainage system must follow these requirements.
- Stabilize the remaining portions of the ditch or swale within 14 days where construction of that portion of the ditch has temporarily or permanently ceased.

Special considerations

If the construction site is within one mile of a special or impaired water (defined in Section 23.3 through Section 23.7 of the permit), as determined by the aerial radial distance from the site and not the flow distance; the following additional erosion prevention requirements are required in regard to preventing erosion:

- Initiate stabilization of all exposed areas immediately at the site and ensure the stabilization is complete no later than seven days after the construction activity in that area has temporarily or permanently ceased.
- Maintain an undisturbed buffer zone of not less than 100 feet from special waters at all times. If construction is such that the buffer must be encroached, use redundant BMPs sufficient to protect the special water. For more information on buffers, see http://www.pca.state.mn.us/index.php/view-document.html?gid=7400.

For full details of the permit requirements, a copy of the NPDES/SDS Construction Stormwater permit is available online: www.pca.state.mn.us/water/stormwater/stormwater-c.html.

Managing soil stabilization timelines

Temporary stabilization BMPs are meant to cover bare soil to reduce the potential of soil erosion during the construction. It is important to utilize temporary stabilization techniques throughout the duration of the project as well as at the end of the project to achieve final stabilization.

The permit requires that the Permittees take action to initiate soil stabilization immediately when it is known that *construction activities* will not resume for 14 days for most sites, seven days for sites that drain to special or impaired waters and within 24 hours for sites where DNR "work in water restrictions" apply during fish spawning timeframes. Plan to utilize temporary cover on portions of the site that will sit dormant for these periods of time whether or not final grading has been completed.

Note that *construction activity* is defined in the permit as land disturbance that changes topography or existing soil cover and does not include the construction activity on the site to build vertical infrastructure such as buildings or bridges or application of pavement to roads and parking lots. Vehicle traffic on the site is also not considered *construction activity* for purposes of the permit. Therefore, even if building construction or other non-soil disturbing activity is continuing at the site, the surrounding soils that are not actively worked must still be stabilized within the permit timelines.

Initiating immediately means by the end of the day following the day land-disturbing activities have temporarily or permanently ceased. Activities that can be taken to initiate stabilization include:

- Starting to prep the soil of the area to be stabilized for vegetative or non-vegetative stabilization.
- Starting to apply mulch or other non-vegetative product to at least a portion of the area to be stabilized.
- Starting to seed or plant at least a portion of the area to be stabilized.
- Alternatively, finalizing arrangements to have the soil stabilization product installed within the deadline for completing the soil stabilization.

Due to constantly changing circumstances at construction sites and limited life span of temporary BMPs, expect that stabilization BMPs may need to be replaced several times over the length of the project. Having additional materials available at the site can help manage the soil stabilization requirements and timelines for completing maintenance.

What else can I do to keep my site stabilized and limit soil erosion?

- Minimize the total area of a site exposed at once by leaving as much vegetation on site as possible, for as long as possible, to reduce the overall amount of disturbed area.
- Minimize the length of time that soil is exposed by stabilizing areas as work progresses.
- Prevent runoff from flowing across disturbed areas by diverting the flow to vegetated areas.
- Break up slope lengths and steepness to promote sheet flow with check dams.
- Cover soil stockpiles.
- Promptly stabilize soils after construction activity has stopped on any portion of the site.
- Regularly inspect the site and promptly repair, replace or enhance stabilization BMPs that are not performing adequately.
- Ensure mulch, hydromulch, erosion blankets, and other stabilization BMPs are applied according to the manufacturer's specifications.
- Keep track of weather reports and take action to protect the site prior to heavy rain, snow or frozen conditions.
- Keep extra stabilization BMPs onsite for quick response to failing BMPs and predicted storm events.

Any and all tools that you plan to implement on the site should be included in the site's Stormwater Pollution Prevention Plan (SWPPP). When writing the SWPPP, include a description of the practices and integrate them into the time line of all construction activities. In addition, label the locations of the practices on site plans and include detailed specifications for each practice. Including these elements into the SWPPP before construction

activity begins will aid in proper planning for the site and ensure that the sediment and erosion control techniques are implemented effectively and efficiently.

The following are examples of additional erosion control techniques to be incorporated into the project plans:

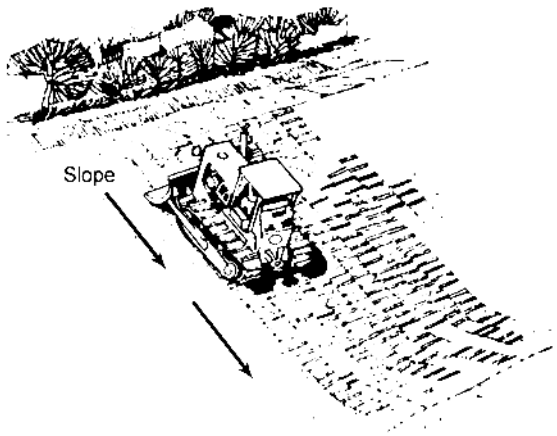
Construction site phasing is the development of a construction work schedule that strategically coordinates the timing of land disturbing activities to minimize soil exposure and plans for the timely installation of all erosion and sediment control practices. The goal of construction site phasing is to disturb a smaller portion of an overall site, substantially finish grading and other construction activities and achieve temporary or permanent stabilization in the area before disturbing the next portion of the overall site. Soil exposure time is decreased, soil and erosion control practices are more manageable, and permit violations can be easily avoided.

Leave as much vegetation on a site as possible to reduce the overall disturbed area.

Lot benching is often utilized in subdivision developments. Lots are strategically graded to direct the runoff from each lot to a stable outlet rather than to an adjacent lot. Lot benching can result in reduced slope lengths and steepness, decreasing the potential for soil erosion. Lot benching establishes drainage patterns early in the construction process for each lot therefore avoiding potential drainage problems in the future when home construction begins.

Surface roughening involves roughening the surface of the soil on slopes in a horizontally grooved pattern. This is often accomplished by tracking, stair-step grading or ripping and grooving. The roughened surface reduces erosion by decreasing runoff velocity, increasing infiltration, and aiding in the establishment of temporary or permanent vegetation and cover.

Slope tracking roughens the surface of a slope and decreases the velocity of runoff.



Low impact development (LID) is a stormwater management approach with the goal of keeping stormwater where it falls and reducing or even eliminating stormwater runoff from a site. LID integrates stormwater management practices into the planned or existing infrastructure in a way that mimics the predevelopment hydrology of the site. The techniques provide the filtering of sediment, nutrients, heavy metals and other pollutants from the runoff and result in decreased erosion, increased infiltration, and improved water quality. LID techniques such as protecting natural and existing vegetation, avoiding steep slopes, protecting infiltration areas and minimizing soil compaction can be utilized to prevent unnecessary erosion and sediment pollution problems. For additional information on LID visit: www.pca.state.mn.us/publications/p-gen3-06.pdf.

Application of temporary and permanent covers

Permanent cover should be used to accomplish final stabilization at the end of a project or on areas that will sit dormant for an extended period of time. The following are commonly used temporary and permanent cover practices that can be combined and used in conjunction with each other depending on the specifics of a site:

- Seed mixes are available to establish temporary and permanent vegetative cover on exposed soil. The Minnesota Department of Transportation (Mn/DOT) has researched various seed mixes and has identified mixes for specific site characteristics and uses. Reference the Mn/DOT Standard Specifications for Construction and the Mn/DOT Seeding Manual for specifics on seed mixes for your site. Links to both Mn/DOT documents are in Resources at the end of this fact sheet.

- Providing proper moisture, nutrients and fertilization are important to establishing permanent vegetation. Fertilization is site specific and should be chosen after a soil test is completed. For more information on soil testing, see the Soil Testing Laboratory at the University of Minnesota at http://soiltest.cfans.umn.edu/.
- Mulch is applied to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. Common mulch materials are straw or wood chips. It is important to apply at proper rates to ensure adequate coverage. Straw mulch is typically applied at two tons/acre to achieve at least 90% soil coverage.

Hydrodraulic soil stabilizers promote the rapid growth of vegetation and prevent erosion.

- Hydraulic soil stabilizers are hydraulically applied soil tackifiers or mulch material. The soil tackifiers help "glue" soil particles together to prevent erosion. There are many types, each with its own purpose. They may be applied with or without seed. Hydraulic soil stabilizers are often used as a temporary application on steep slopes or areas with limited access or to aid in seed germination (hydroseeding). They are not appropriate for use in concentrated flow locations, such as in road ditches with a continuous slope of greater than 2%. It is also important to apply the product at correct rates to be effective in preventing erosion. Hydromulches should provide 100% soil coverage.
- Erosion control blankets and turf reinforcement mats are single or multiple layer sheets made of natural and/or synthetic materials that provide structural stability to bare surfaces and slopes. Blankets and mats are often used in conjunction with seed mixes to promote vegetation establishment. A wide variety of blankets and mats exist for use under varying circumstances. In addition, compost can be used for erosion control and site stabilization.

Erosion control blanket stabilizes pond slopes.

- Compost can be used as an erosion control measure and to establish vegetation as well. The compost should be finished and without odor. It can be applied quickly and uniformly with hydraulic application.
- Sod is commonly used for permanent stabilization and for immediate visual aesthetics on a bare site. Sod can provide immediate stabilization around drop inlets and in swales, ditches, and channels.

What best management practices should I choose for my site?

Choosing the right BMP can be challenging with so many options. Often price is a deciding factor, however the least expensive erosion protection techniques may not be the longest lasting, the most cost effective or the most appropriate for your site. Insufficient protection may leave you with the cost of repairing an eroded slope, replacing the BMP over and over again and/or fines for permit violations. Carefully consider the specifics of your project including the climate, existing soils, and slope lengths and steepness before choosing a cover or practices. In the long run, choosing the right products and practices for your site will save you time and money.

Cold climate considerations

The best approach to winter months is to plan ahead at the start of a project and develop a sequenced construction schedule to ensure that all exposed areas have cover before the first freeze. Preparation of vegetative cover should begin in the fall. Seeds must be started early enough for them to germinate, establish roots and provide cover before the winter begins. Reference the Mn/DOT Standard Specification for

Construction for specifics on the last seeding date in your area. If construction is continuing through winter and new areas are disturbed, cover material can be applied over snow.

It is important to note that all construction sites must remain in compliance with the NPDES permit throughout the winter even if no construction is occurring. For this reason, ensure the site is compliant with permit requirements prior to ceasing construction due to frozen conditions. The site must be inspected and maintained during the winter whenever snowmelt or rainfall occurs even if construction is not active. If construction continues or resumes during the winter, inspection and maintenance must continue on a regular basis during the winter months.

Maintenance and inspection

The NPDES permit requires that the entire construction site be inspected once every seven days or within 24 hours of a rainfall event greater than 0.5 inches in 24 hours. All non-functioning BMPs must be replaced, repaired or supplemented with functional practices within 24 hours of discovery or as soon as field conditions allow access. The permittee is responsible for the operation and maintenance of all erosion prevention and sediment control Best Management Practices (BMPs) for the duration of the project. All inspections and maintenance and any changes throughout the construction process should be recorded and kept onsite with the SWPPP.

Stabilization BMPs should be inspected and maintained through the winter season.

What is final site stabilization?

As defined in the NPDES/SDS Construction Stormwater permit, final stabilization is achieved when all soil disturbing activity is completed and the exposed soils have been stabilized with a vegetative cover with a uniform density of at least 70% over the entire site or by equivalent means to prevent soil failure. Simply seeding and mulching is not considered acceptable cover for final stabilization. Final stabilization must consist of an established permanent cover, such as a perennial vegetative cover, concrete, rip rap, gravel, rooftops, asphalt, etc.

Final stabilization is achieved when all soil disturbing activity is completed and the exposed soils have been stabilized with a vegetative cover with a density of 70% over the entire site.

The permanent stormwater treatment system must be in place and functioning. Drainage ditches and other conveyance systems must have all collected sediment cleaned out and be stabilized with permanent cover. Temporary erosion and sediment control BMPs must be removed.

For residential construction sites, individual lots are considered to have final stabilization if the structure or building is completed, temporary erosion protection and down gradient perimeter, control is in place, and the residential lot has been sold to the homeowner. The permittee is required to give the new homeowner a copy of the MPCA's "Homeowner Fact Sheet." http://www.pca.state.mn.us/publications/wq-strm2-07.pdf.

For construction on agricultural land, final stabilization can be achieved by returning the land to its preconstruction agricultural use, such as crop production or rangeland. This does not apply to construction projects on agricultural land that will not be returned exclusively to agricultural use after all the construction is complete. For more information, see the factsheet http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/crop-production-on-npdes/sds-construction-stormwater-permitted-sites.html.

Resources

Mn/DOT approved products list https://www.dot.state.mn.us/products/

Mn/DOT seeding manual https://www.dot.state.mn.us/environment/erosion/seedmixes.html

Mn/DOT standard specifications for construction http://www.dot.state.mn.us/pre-letting/spec/index.html

MPCA protecting water quality in urban areas – manual – chapter 6: erosion prevention and sediment control http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

MPCA stormwater construction inspection guide http://www.pca.state.mn.us/publications/wq-strm2-10.pdf.

U.S. Environmental Protection Agency NPDES menu of BMPs https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu