Converting Temporary Sediment Basins to Permanent Stormwater Detention Ponds in Tennessee

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Abstract

In Tennessee, temporary sediment basins or equivalent controls are required on construction sites greater than a certain size to capture and retain sediment from stormwater runoff before it is discharged into offsite streams, lakes, and drainageways, until the site is fully and permanently stabilized. Sediment basins are required on construction sites primarily for the purpose of water quality control. Tennessee's 2011 Construction General Permit (CGP) specifies minimum requirements for sediment basins as to designer qualifications, design calculations, applicable drainage area, and inspection and maintenance. The 2011 CGP requirements that apply to sediment basins are summarized and reviewed. Once construction site development has been completed, all sediment and stormwater controls maintained during construction must be either removed or recommissioned for long-term (post-construction) stormwater management use. Construction site stormwater discharge permit coverage may then be terminated once the site is permanently stabilized. One of the controls commonly retained on site is the temporary sediment basin, converted and reconstructed as a permanent detention pond for reducing runoff volume and peak flow to pre-construction conditions. The transition and conversion from sediment basin to stormwater detention pond involves several important steps, usually consisting of dewatering, de-mucking, and removing sediment from the forebay and sediment pond area; removing the dewatering structures; surveying and checking basin dimensions, dam, and spillways; reengineering the storage and outlet facilities; reshaping and reexcavating the pond area to meet the stormwater control requirements; installing peak flow controls; repairing any damaged areas; and stabilizing the entire facility – all without allowing sediment to discharge into the receiving waters. Few state or local planning and engineering guidelines exist for achieving this conversion. Considerations and procedures that some states, engineers, and local officials use or require in converting sediment basins to stormwater detention ponds are reviewed. Based on this review, some simple procedures, guidelines, and recommendations for converting temporary sediment basins to permanent stormwater ponds are presented.

1. Introduction and Background – 2011 Construction General Permit Requirements

Tennessee has approximately 60,200 stream miles and 537,000 publicly-owned lake acres within its boundaries and the Tennessee Department of Environment and Conservation (TDEC) is committed to environmental stewardship of these streams and lakes. However, silt remains one of the greatest polluters of these Tennessee waters. According to TDEC's biennial 2010 305(b) Tennessee river and stream water quality assessment report, 21% of streams and rivers are affected by sediment or silt as a result of activities such as construction, agriculture, stream modification and bank erosion, and mining. Some of the significant economic impacts caused by silt are *increased water treatment costs, reduced reservoir and streamflow capacities, loss of navigation channels, and* increased likelihood of flooding. The addition of sediment and the physical modification of streams can affect the biological, chemical, and physical properties of water to the extent of impairing certain designated uses of Tennessee's waterways. Stream use classifications include fish & aquatic habitat, recreation, irrigation, livestock watering, and domestic and industrial water supply. TDEC also biennially compiles and reports a 303(d) list of so-called "impaired" streams and lakes in Tennessee that are "water-quality limited" and thus do not meet the water quality criteria for their designated uses. Many of these streams are reported to be impaired because of siltation and habitat-altered beds and banks. Agencies such as TDEC and the Tennessee Department of Transportation (TDOT) are committed to improve, and prevent further degradation of, its impaired waters, while protecting its unimpaired and Exceptional Tennessee Waters (ETW) and Outstanding National Resource Waters (ONRW).

One of the primary means of protecting Tennessee streams and lakes from siltation and habitat alteration associated with construction activities is through TDEC's Construction General Permit (CGP) for regulating stormwater discharges. The CGP, authorized under the Tennessee Water Quality Control Act of 1977 and by the U.S. Environmental Protection Act, the Federal Water Pollution Control Act, amended by the Clean Water Act of 1977, and the Water Quality Control Act of 1987, allows point source discharges of stormwater from construction sites in accordance with certain permit provisions, monitoring, and reporting requirements. The Tennessee CGP is normally updated every five years, the latest permit being issued by TDEC on May 23, 2011, and made effective May 24, 2011. Among the important CGP requirements for preventing erosion, controlling sediment, and managing stormwater at construction sites is the construction site operator's preparation and implementation of a Stormwater Pollution Prevention Plan, or SWPPP, for ensuring compliance with Tennessee's water quality standards. The Construction General Permit does not authorize stormwater or other discharges that would result in a violation of a state water quality standard and a possible enforcement action. A noteworthy, but subjective and sometimes controversial, CGP performance standard requires that discharged water must not cause an *objectionable* color contrast with the receiving stream.

The Construction General Permit regulations require that a Notice of Intent (NOI) form, a SWPPP, and a permit application fee be submitted to TDEC at least 30 days prior to the expected date of initial land disturbance to allow time for evaluating and approving the application and for issuing a Notice of Coverage (NOC). No land disturbance is permitted without a NOC. The NOI form is used to indicate the location and nature of the project, to identify receiving water(s), and to register names of site owners, developers, and/or contractors responsible for complying with the permit. The SWPPP identifies and/or describes the location and hydrology of the site and proposed construction activities; construction work phasing and sequencing; all potential types and sources of pollution likely to affect stormwater discharges from the site; all discharge outfall points and receiving streams and waters; a stormwater control and management plan; an erosion prevention and sediment control plan, including structural control and stabilization practices , for keeping the sediment on the construction site and out of the receiving stream or waters; limits of disturbance and special areas and buffer zones to be protected; and an inspection and maintenance plan.

The CGP requires that the SWPPP narrative be prepared by persons knowledgeable in erosion prevention and sediment control. Effective May 24, 2013, SWPPPs for construction sites draining into impaired or exceptional waters must be prepared by persons who have successfully completed the 2-day TDEC Level II course, *Design Principles for Erosion Prevention and Sediment Control for Construction Sites*. However, regardless of a receiving stream's classification, all calculations, plans, and specifications for any structural erosion, sediment or stormwater control measure, including sediment basins, must be prepared by a licensed professional engineer or landscape architect in accordance with Tennessee professional licensing board rules and requirements.

While the Tennessee CGP contains requirements for final stabilization of the construction site at project termination, including removal of all stormwater controls installed and maintained during construction, except for those intended for long-term use following termination of permit coverage, neither the SWPPP requirements nor the Tennessee Erosion & Sediment Control Handbook (the Handbook[1]) provides guidance for *recommissioning*, or converting, temporary sediment basins into permanent stormwater management detention ponds. Proposed

[1] The Handbook has been substantially revised and updated (August 2012) to incorporate new EPSC technologies and to meet the 2011 CGP requirements.

conversion guidelines will follow a discussion of sediment basin and stormwater management pond design requirements.

2. 2011 Temporary Sediment Basin Purpose and Requirements Summary

The main purpose of a temporary sediment basin is to remove, capture, and store sediment from a construction site to prevent sedimentation in off-site streams, lakes, and drainways. A sediment basin should never be considered a stand-alone or primary treatment facility, but the last segment of an integrated treatment train system that may include sheet erosion prevention and soil stabilization practices, sediment and perimeter controls, stormwater runoff control and management components, and non-stormwater pollution control practices. The 2011 Construction General Permit contains several requirements –general and specific –for achieving effective performance and for keeping the sediment on the construction site. Major requirements applicable to temporary sediment basin design, designer qualifications, construction, operation, maintenance, and inspection in Tennessee are summarized as follows:

- **Tennessee Erosion and Sediment Control Handbook:** The design, inspection, and maintenance of Best Management Practices (BMPs), including sediment basins, must be carried out in accordance with good engineering practices. At a minimum, the BMPs shall be consistent with the requirements and recommendations contained in the current (2012) edition of the Tennessee Erosion and Sediment Control Handbook. The Handbook may be accessed at www.tnepsc.org or http://www.tn.gov/environment/wpc/

- **Sediment Basin Definition:** A temporary basin is an impoundment formed by an embankment constructed across a drainageway, an excavation that creates a basin, or a combination of both. A sediment basin typically consists of a forebay cell (new requirement), embankment dam, storage for sediment and stormwater, permanent pool, primary or service spillway, emergency spillway, and surface dewatering device. Engineering design of sediment basins and other sediment controls must be included in SWPPPs for construction sites involving drainage to an outfall totaling 10 or more acres, or 5 or more acres if draining to impaired or exceptional quality waters. The size and shape of the basin depend on the location, size of drainage area, incoming runoff volume and peak flow, soil type and particle size, land cover, and receiving stream classification (i.e., impaired, unimpaired, or exceptional waters). Specific sediment basin design requirements are discussed in the next section.

Figure 1. Typical sediment basin with dewatering device.

- **Sediment Basin Installation Timing:** Erosion prevention and sediment control measures, including sediment basins, must be in place and functional before earth-moving operations begin, and must be maintained in operating condition throughout the construction period.

- **Site Assessment Inspection:** Quality assurance of erosion and sediment controls, including sediment basins, must be conducted to verify their installation, functionality, and performance at sites having outfalls draining 10 or more acres, or 5 or more acres if draining to impaired or exceptional quality waters, within a month of commencing construction of each structure. The Site Assessment should determine whether construction, operation, and maintenance of structures such as sediment basins accurately comply with permit requirements as presented in the SWPPP narrative, plans, and drawings, and specification details for erosion prevention, sediment control and stormwater management. The site assessment findings shall be documented and the documentation kept with the SWPPP at the site.

- **Site Assessment Inspector Qualifications**: Site Assessment inspections must be performed by persons having any of the following qualifications:

  1. Licensed PE or LA, or
  2. Certified CPESC professional, or
  3. Anyone who has successfully completed the 2-day Level II course

- **Sediment Basin Volume:** For construction sites draining 10 or more acres to outfalls, a sediment basin must be installed having a capacity that will provide treatment and storage for incoming sediment while controlling stormwater runoff from a 2-year, 24-hour storm until final stabilization of the site. For construction sites draining to impaired or exceptional waters, the drainage area is reduced to 5 or more acres and the design storm requirement is increased to a 5-year, 24-hour criteria. Sediment basin designers should check local regulations for more conservative storm requirements.

- **Equivalent Sediment Treatment and Controls:** Equivalent sediment treatment and control measures may be used if sufficiently justified to TDEC and if in accordance with the Tennessee Erosion and Sediment Control Handbook.

- **Design Storm Source:** Estimated design storm depths or intensities for any return period (i.e., 2-yr, 5-yr, 25-yr, etc.) and duration can be determined from the NOAA National Weather Service Atlas 14 Precipitation Frequency Data Server (PFDS) website: http://hdsc.nws.noaa.gov/hdsc/pfds/index.html. Designers should check local requirements for more conservative stormwater control criteria and other storm depth or intensity data specifications.

- **Discharge Control:** The Construction General Permit addresses only the installation of stormwater management measures and not the ultimate operation and maintenance of such structures after the construction activities have been completed, the site has undergone final stabilization, and the permit coverage has been terminated. Permittees are responsible only for the installation and maintenance of stormwater management measures prior to final stabilization of the site, and not for maintenance after stormwater discharges associated with construction activity have been eliminated from the site. All permittees are encouraged to limit the amount of post construction runoff, if not required by local building regulations or local MS4 program requirements, to minimize in-stream channel erosion in the receiving stream.

  Post-construction stormwater runoff management practices may include detention or retention structures to reduce peak flows, vegetated swales, natural depressions, filter strips, and other systems or combined practices that reduce runoff by increasing infiltration.

  Velocity dissipation devices must be placed at discharge locations and along the length of any outfall channel to provide a non-erosive velocity flow from the structure, including sediment basins, to the receiving stream so that the natural physical and biological characteristics and functions of the stream are maintained and protected (e.g., there should be no significant changes in the hydrological regime of the receiving water, including downstream channel or streambank erosion).

- **Inspection and Documentation Requirements**: Regular inspections of all erosion prevention, sediment control, and stormwater management measures must be performed twice weekly at least 72 hours apart using the 2011 TDEC Inspection Worksheet and Certification form to document inspection results. An alternative form may be used providing that equivalent content and certification language have been approved by TDEC. These forms and the Quality Assessment inspection reports need to be maintained on site and submitted to TDEC within 10 days of a request. The purpose of the twice-weekly inspections is to document and report performance problems, sediment control practice failures, stormwater outfall discharge compliance, and maintenance needs. Intermediate or additional inspections following significant storm events should be performed to check on any on- or off-site damages, structural failure, or areas in need of immediate attention. Inspection and follow-up maintenance and repair of large structures such as sediment basins are especially important in assuring continued effective performance, but also in preventing potential environmental damage, expensive cleanup costs, and downstream flooding from catastrophic water and mud releases resulting from dam failure.

- **Inspector Qualifications:** Inspectors performing the required twice weekly inspections must maintain active certification by successfully completing the Level I *"Fundamentals of Erosion Prevention and Sediment Control"* course. Copies of inspector certifications or training records should be kept on site.

- **Inspection follow up:** Based on the results of the Quality Assurance and twice-weekly inspections, any inadequate control measures or control measures in disrepair must be replaced or modified, or repaired as necessary, before the next rain event, but in no case more than 7 days after the need is identified.

- **Maintenance:** The SWPPP shall describe procedures to ensure that vegetation, erosion and sediment control measures, buffer zones, and other protective measures identified in the site plan are kept in good and effective operating condition. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event, but in no case more than 7 days after the need is identified. The Handbook requires that all sediment trapping and holding structures be cleaned when they reach 50 percent of their intended capacity.

- **Local, MS4,or other Compliance:** Permittees must comply with any additional, or more protective or restrictive, erosion prevention, sediment controls, and stormwater management measures required by local jurisdictions, Municipal Separate Storm Sewer Systems (MS4) programs, or other state and federal agencies. All permittees are encouraged to limit the amount of post construction runoff, if not required by local building regulations or local MS4 program requirements, to minimize downstream flooding and receiving stream channel erosion.

- **Use of Chemical Flocculants:** When clay and other fine particle soils occur on construction sites in Tennessee, additional chemical treatment, such as the use of polyacrylamides, or PAM, may be used to produce a flocculant for enhancing settling and reducing the turbidity and amount of suspended sediment discharged from sediment basins. Generally, a treatment train must be designed and installed that introduces the flocculant <u>upgradient</u> from the settling zone, i.e., sediment basin, to produce sufficient chemical mixing before entering the basin. Section 7.40 (Flocculants) of Tennessee's Erosion and Sediment Control Handbook provides basic guidelines and details for using polyacrylamides (PAM) for sediment basin flocculation and suspended sediment removal. Among several important requirements for using PAM in conjunction with sediment basins are following the manufacturer's application rates and application instructions, testing and matching the soil, employing proper mixing procedures, and not applying PAM directly to streams, wetlands and other waters of the state.

3. Temporary Sediment Basin Components

A temporary sediment basin is created by (1) an embankment dam constructed across a wet weather swale, (2) an excavated pit, or (3) a combination of both. Sediment basins should never be constructed across perennial streams. A sediment basin typically consists of an embankment dam for swale or drainage way construction; storage for incoming sediment and stormwater, including a forebay cell; a principal or primary/service spillway; a secondary or emergency spillway; and a dewatering device. Several factors, such as basin size and shape, sediment characteristics, and inflow and outflow hydraulics, determine how effectively a basin performs. Unusual storm events; stage of construction; degree of site stabilization; season; and quality of installation, inspection, and maintenance also affect basin performance. Tennessee requires a permanent pool for capturing fine particles after a storm is over. A riser with a bottom opening, surrounded by rock baskets (shown in Figure 2), stone filters, silt fence fabric, stone filter rings, or straw bales, is not effective or acceptable practice for removing fine sediment particles. T**here should be no open bottom holes or ports in a temporary sediment pond riser– with or without frontal porous filters or similar devices.** The size and shape of the basin depend on available space, size of drainage area, incoming runoff volume and peak flow, soil type and particle size, land cover, and receiving stream classification (i.e., impaired, unimpaired, or exceptional waters). In locations where colloidal clay is a problem, additional treatment using chemical flocculation may be necessary. Frequently, a temporary sediment basin is designed and constructed with the intention of eventual conversion into a permanent stormwater control structure, such as a detention or retention pond, to comply with local stormwater regulations for reducing post-construction runoff peaks and volume. If this is the case, the sediment basin should be engineered and constructed to accommodate future size and hydraulic structure capacity requirements and to make the reconstruction transition as smooth and economical as possible (discussed later). Basin components, functions, and design criteria, based on 2011 CGP and 2012 Handbook requirements, are as follows:

Figure 2. Unacceptable hole & sediment filter arrangement at bottom of riser and sediment pond.

- <u>Basin size and shape:</u> Two important size and shape factors in basin design are effective length-to-width ratio (L/W) and surface area. Tennessee requires a minimum L/W ratio of 4 to minimize dead space and treatment shortcutting between inflow and outflow points. When site conditions do not allow an ideal L/W ratio, the effective path length may be achieved using baffles. Basins with large surface area-to-volume ratios are most effective in trapping sediment. Research shows that sediment-trapping efficiency depends primarily on sediment particle size and the ratio of basin surface area to inflow rate. The required minimum basin surface area (acres) at the crest elevation of the principal spillway, for achieving 70% - 80% fine particle capture, is based on 1% of the 2-yr, 24-hr (or 5-yr) peak inflow (cfs). The basin

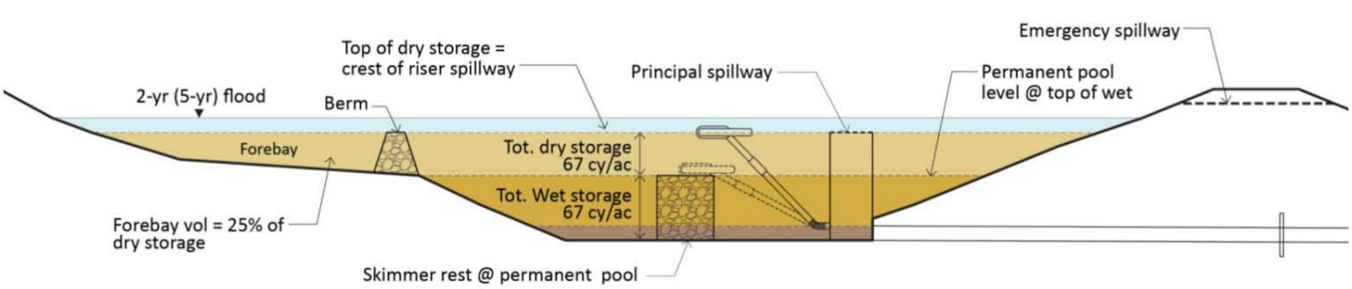

Figure 3. Wet and dry storage components of temporary sediment basin formed by dam.

volume, which depends on both depth and surface area, must have capacity to remove and store sediment while containing flood inflows without overtopping the dam.

- Sediment treatment volume, including forebay: The minimum total sediment basin *treatment* volume is based on one inch of erosion per acre of drainage, or 134 cu yds/acre. This volume is divided into half “dry” (67 cy/acre) and half “wet” (67 cy/acre) storage zones as shown in Figure 3. The dry storage is subdivided into 25% “forebay” (17 CY/acre) and 75% dry treatment (50 cy/acre) zones. The top of the dry storage establishes the crests of the principal spillway and forebay berm. The bottom of this zone establishes the upper level of the wet zone or permanent pool elevation and the lower limit of dewatering. Maintaining a permanent pool of water improves the trapping efficiency by increasing the flow-through or detention time of combined stormwater flow and sediment particles, while reducing the potential for resuspension of settled sediment from the bottom of the basin. The forebay, or pre-treatment cell, shown on the left, is expected to capture and retain most of the incoming larger sand and silt particles, while the wet zone is expected to capture and retain most of the finer silts and clays. The forebay (a new requirement), separated by a berm from the main basin, will reduce turbulence, spread out incoming concentrated flows, and allow larger particles to settle out in a more concentrated area before entering the main basin zone, thus making cleaning easier and more accessible.

Figure 4. Sediment basin with bermed forebay.

- Dewatering: Once a storm event stops and construction site runoff ceases, the water in the pond will eventually drain down to the crest of the principal spillway. At that time, the dry storage zone is designed to dewater down to the permanent pool level in 72 hours through either a floating surface skimmer or a stationary perforated vertical tube. The 72-hour dewatering time allows time following a storm to promote settling of fine particles such as fine silts and some clays. Floating surface skimmers are preferred over vertical perforated tubes because skimmers draw off decanted water from the upper inch or two of the dry zone, rather than from the top two or three feet of perforations. Perforated spillway risers or attached half-round perforated pipes that allow the sediment basin to empty are neither effective nor acceptable dewatering devices.

Figure 5. Floating surface dewatering installation.

- Stormwater controls – hydraulic capacity and spillways: The sediment basin must be designed to have sufficient storage capacity above the sediment treatment zones to handle construction site runoff without overtopping the embankment dam or overflowing an excavated basin. The CGP requires that the sediment basin have sufficient *minimum* storage and hydraulic capacity to handle both frequent and rare storm events. For separate principal and emergency spillways, the principal spillway must be sized for passing the peak flow from a2-year (or 5-year), 24-hour storm event and the emergency spillway for a 25-year, 24-hour event. If no emergency spillway is used, the principal spillway must be designed to pass the entire 25-year storm. Local regulations may require conservatively higher design storm criteria for spillways. Sufficient vertical freeboard must be provided above the maximum 25-year flood level to prevent the dam from being overtopped. Normally, it is assumed that runoff from the design storm event, in this case the 25-year flood, occurs when the sediment basin pool elevation is at its permanent pool level.

The principal spillway should be installed with a trash rack and anti-vortex and anti-flotation devices. The discharge drainpipe, leading from the spillway riser through the embankment dam, should be designed with seepage controls to prevent internal erosion of embankment soil along the pipe using anti-seep collars or drainage filters. The barrel through the dam should have structurally sound and watertight joints to prevent blowouts and dam failure. These design practices are especially important if the temporary sediment basin is to be converted to a permanent stormwater pond. Peak flows from storms occurring during construction can exceed the pre-disturbance or pre-construction peak flows when the construction site vegetation and topsoil are removed, causing the runoff coefficient to increase. For this reason, local regulations may require that the sediment basin be designed to limit the outflow peaks during the construction period to pre-construction conditions for a single storm event or a multi-range of events to prevent downstream flooding. In this case, the basin storage and outlet structures would need to be adjusted over and above the sediment treatment basin requirements.

Where special batch chemical treatment is sometimes used to clarify sediment-laden storm runoff, the design criteria for holding, controlling, and treating water in this type of basin facility will differ greatly from standard sediment basin design and construction criteria specified by the current CGP and contained in the Handbook. Discussion of this type of alternative treatment is beyond the scope of this paper.

- <u>Embankment dam (for swale construction):</u> For a sediment basin formed behind an embankment dam, the dam should be designed to have adequate height, including freeboard, to satisfy the storage capacity required by the wet and dry volumes while passing the 25-year flood event. The embankment dam, including its geometry, filter drains, keyway, etc., should be designed and constructed (especially soil compaction) according to standard geotechnical and hydraulic practices to assure structural integrity and maintain intended freeboard above the 25-year flood level. If the dam exceeds a certain combination of height and capacity, it may be subject to separate Tennessee Safe Dams regulatory and permit requirements.

- <u>Inlet and outlet controls:</u> Inlet discharges from the construction site should be located as far upstream or away from the outlet structure as possible to minimize short-circuiting and to maximize travel path and time through the basin. Path lengths for proximate inlets may need to be increased through the use of non-porous baffles. The basin should be protected at the inlet points to prevent scouring from concentrated flows. Energy should be dissipated from concentrated, high-velocity flows discharging from the principal and emergency spillways to prevent scouring in receiving streams or waters and immediate downstream properties.

- <u>Other:</u> The design, construction and operation of a temporary sediment basin should consider other factors such as safety, health and final disposition.

    - Safety – Appropriate measures should be used to protect the public from hazards presented by having a pool of water and soft mud that can cause drowning and entrapping "quicksand" conditions. Water bodies such as sediment basins can be attractive to neighborhood children and dangerous to anyone, including maintenance workers and inspectors, who may slip into the water and soft mud. Steep side slopes should be avoided, and the pond should be marked using appropriate warning signs and made as inaccessible as practical, to the public and animals, with fencing. The design should allow inspectors and maintenance personnel to have safe and convenient access to the embankment and basin side slopes for inspection and cleaning.

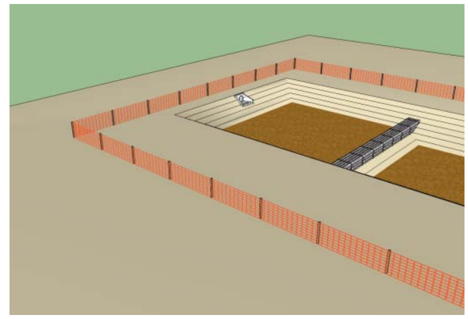

Figure 6. Protective fence around sediment basin.

- Health – Special attention may need to be given to the design, operation, maintenance, and use of anti-larvae treatment of sediment basins and areas where mosquito breeding and West Nile virus conditions prevail.
- Vandalism – Construction site owners, contractors, and inspectors should check regularly for any malicious destruction of critical sediment basin components whose damage, malfunction, or failure could adversely affect the performance of the basin or compromise the structural integrity of the dam or any downstream hydraulic pathways. For example, if a bottom drain is, or could be, opened, allowing the entire pool to be rapidly drained, a potentially heavy amount of bottom sediment could be released and subsequent rapid basin water drawdown could cause an upstream slope failure in the dam embankment.
- Final Disposal – Once temporary structures like sediment basins have served their intended purpose and the permitted construction site has been properly stabilized, the dam and sediment deposits should be leveled or otherwise disposed of and the basin area permanently stabilized. All inlet and outlet structures, including spillways, should be removed and permanent stormwater control measures installed as planned. However, if the sediment basin is to be converted to a permanent stormwater detention pond, specific procedures need to be implemented in accordance with acceptable engineering practices, the SWPPP and local regulatory requirements.

While temporary sediment basins are designed and constructed primarily for water quality control, they inherently provide some measure of peak flow attenuation. However, engineers are advised to check local regulations that require peak flow reduction controls for certain design storm events occurring during the construction period, when peak flows and runoff volumes from disturbed sites can greatly exceed those for the same design storms occurring <u>prior</u> to construction disturbance.

4. Permanent Stormwater Management Ponds

Permanent stormwater detention basins are designed mainly to limit post-construction flood peaks to pre-construction peak conditions to prevent downstream flooding. TDEC's2010 Phase II Small Municipal Separate Storm Sewer Systems (MS4) permit, applicable to approximately 85 Tennessee cities and counties, requires the development, implementation, and enforcement of local stormwater management programs, including minimum permanent stormwater controls involving runoff reduction and pollutant removal, by 2014.The MS4 program requires that stormwater discharges from new development and redevelopment sites be managed such that post-development hydrology does not exceed the pre-development hydrology at the site, in accordance with performance standards established by the MS4. TDOT is also included in the Phase II program, but cannot enact ordinances and codes.

Figure 7. Landscaped and well-maintained permanent stormwater detention pond.

Although Tennessee has no state-wide standard for reducing post-construction peak flows to pre-construction or pre-development conditions, Tennessee drainage case rulings, based on civil rule case law, weigh heavily toward not increasing peak flows or altering flow paths. Peak flow limitations in Tennessee are normally established at the local jurisdictional level. In lieu of any local requirements, engineers are advised to consider reasonable standards to protect downstream property from flooding.

Tennessee's four Phase I MS4 program cities of Chattanooga, Knoxville, Memphis, and Nashville have similar permanent stormwater management regulations for limiting post-development peak flow to pre-development conditions for specified 24-hour NRCS-type design storm events.

The City of Chattanooga, the Town of Signal Mountain, and Hamilton County require that stormwater detention be defined as limiting the peak discharge rate for the post-developed conditions to be no greater than the peak discharge rate for the pre-development conditions for the 1-, 2-, 5- , 10-, and25-year (and possibly 50- and 100-year) design storms

The City of Knoxville requires that "all detention structures must attenuate the post-development peak flow rates for the 1-, 2-, 5-, 10-, and 100-year design storms to discharge at or below pre-development peak flow rates.

The City of Memphis and Shelby County requires that, ideally, the release rate from any detention facility should approximate that of the site for the same storm prior to the proposed development. At minimum, the peak outflow rate from the 10-yar, 24-hour storm shall not exceed that of the site prior to development. However, the primary discharge structure must be able to handle all 24-hour storms up through the 10-year event. Further, the required detention volume must have capacity to attenuate the post-development mass outflow of water to the pre-development mass outflow during the most intense 7 hours of both the 2- and 5-year, 24-hour NRCS design storms.

Metro Nashville and Davidson County stormwater management regulations require that detention be used to protect downstream properties from flood increases due to upstream development. The design is required to control peak flow at the outlet of a site so that post-development peak flows are equal to or less than pre-development peak flows for the 2-, 5-, 10-, 25-, 50- and 100-year design storms.

TDEC's Performance Standards for 2010 General NPDES Permit stipulates that Tennessee's approximately 85 smaller city and county Phase II MS4smust implement and enforce permanent stormwater controls that include both runoff reduction and pollutant removal. MS4s must "require that stormwater discharges from new development and redevelopment sites be managed such that post-development hydrology generally does not exceed the pre-development hydrology at the site." Runoff reduction, which carries heavy concentrations of "first flush" pollutants, requires that the first inch of rainfall must be 100% managed with no storm water runoff discharged to surface waters. Peak flow reduction for specified design storms is normally achieved through prudent use of storage and combination of outflow control structures, using orifices and weirs.

5. Conversion Considerations

Converting a temporary sediment basin to a permanent stormwater detention pond should begin with the design of the sediment basin. Nationally, very little literature or detailed information is available to designers or site operators for planning or implementing conversions. However, some local jurisdictions, along with a few other state and federal agencies and sediment control experts, collectively emphasize careful planning and offer some general conversion guidelines.

Mississippi requires as part of its SWPPP an implementation sequence plan after the site is stabilized for converting sediment basins to stormwater detention ponds.

The Natural Resources Conservation Service (NRCS) Conservation Practice Standard Code 350 on Sediment Basins (January 2010), reinforces the need for "appropriate planning during the design phase" to ensure that the (sediment) basin can function as a stormwater detention or wildlife pond. The standard also notes that significant modifications to outlet structures may need to be made along with removal of accumulated sediment before converting the (sediment) basin to a new use.

Virginia, in its Stormwater Management Handbook section on Sediment Basin Conversion, warns against bringing in heavy construction equipment to modify the sediment basin riser assembly. Instead, Virginia emphasizes conversion planning by recommending that the outlet riser and barrel be designed and constructed for the larger capacity requirement, rather than having to disturb and risk the integrity of the embankment dam in making modifications or in replacing the temporary principal spillway riser and barrel with a permanent stormwater control structure after final stabilization. Virginia approaches the conversion of sediment basins to stormwater retention basins in the following manner:

> **When a proposed stormwater facility is used as a temporary sediment basin, the conversion to the permanent facility should be completed after final stabilization and approval from the appropriate erosion and sediment control authority.**
>
> In most cases the design criteria for the temporary sediment basin will require more storage volume (combined wet and dry) than that of a stormwater basin. In such cases, the extra volume should be allocated to the (wet or dry) component of the facility that would derive the greatest benefit from the increased storage. This will depend on the primary function of the facility (i.e., water quality enhancement, flood control, or channel erosion control). If modifications to the riser structure are required as part of the conversion to a permanent stormwater facility, they should be designed so that a) *the structural integrity of the riser is not threatened*, and b) *large construction equipment is not needed within the (converted) basin*. Any heavy construction work required on the riser, intended as a permanent structure, should be completed during its initial installation. It is **NOT** recommended to install a temporary riser structure in the sediment basin and then replace it with a permanent riser after final stabilization. This may affect the structural integrity of the existing embankment and barrel.
>
> The following additional criteria should be considered for a conversion:
>
> 1. Final elevations and a complete description of any modifications to the riser structure's geometry should be shown in the approved plans.
> 2. The wet storage area must be dewatered following the methods outlined in the 1992 Virginia Erosion & Sediment Control Handbook (VESCH) Dewatering section.
> 3. Sediment and other debris should be removed to a contained spoil area. Regrading of the basin may be necessary to achieve the final design grades and to provide an adequate topsoil layer to promote final stabilization.
> 4. Final modifications to the riser structure should be carefully inspected for watertight connections and compliance with the approved plans.
> 5. Final landscaping and stabilization should be performed according to the 1992 VESCH Landscaping section.

Fauquier County, Virginia, as part of its Checklist for Erosion & Sediment Control Plans (ca 2007),has developed a short procedure for converting sediment basins to dry stormwater ponds. The last step following completion of the conversion is a requirement for as-built plans in conjunction with the bond release. Fauquier County's guidelines for converting dry ponds to stormwater ponds are as follows:

1. Consult with the erosion and sediment control inspector prior to beginning the conversion from sediment basin to dry pond to ensure that the timing is appropriate for the conversion to take place.

2. Pump down basin – use approved dewatering measures. Effluent must be filtered.

3. Remove accumulated sediment (as needed) to establish the final grade of the pond. Sediment must be disposed of in an approved area.

4. Grade and roughen the bottom of the pond to prepare it for seeding.

5. Install debris/trash rack device on the low-flow orifice to prevent clogging.

6. Seed, mulch, and tack jute mesh or other suitable matting to the bottom of the pond.

7. After the conversion is complete, prepare and submit as-built plans of the pond(s) to the Department of Community Development in conjunction with the bond release request.

While Tennessee does not provide specific procedures or guidelines in its Handbook for converting sediment basins to storm water detention ponds, some TDEC field offices and at least three communities address this issue. Hamilton County, Tennessee, mentions in its Sediment Basin practices manual (Hamilton County2008) that temporary sediment ponds can be converted to permanent stormwater runoff management ponds, but they must meet all regulatory requirements for both wet (retention) or dry (detention) ponds, with frequent inspection and maintenance performed. Metro Nashville and Davidson County, in its Best Management Practices (BMP) Manual(Metro Nashville 2012) for temporary sediment/detention basin requirements, while not specifically referring to "conversion," does note that the sediment basin is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed . Further, for basins intended to serve as permanent facilities that treat stormwater quantity and/or quality, the facility should be designed and constructed to meet both the construction phase sediment control and the permanent quantity and/or quality storage and hydraulic requirements. The completed volume should be surveyed to ensure that permanent facility design requirements have been met.

In the absence of specific conversion requirements, a contractor will sometimes choose the easiest means to dewater and demuck the basin by opening the bottom drain hole, pumping the sediment-laden water into the outlet structure or nearest drain inlet, or siphoning or pumping it over the dam. However, dewatering the turbid water from the permanent basin needs to be done in a cautious manner so as not to suck or pump out the bottom slurry and sludge layer and not pollute receiving waters. Once the sediment basin is no longer needed and the construction site is stabilized, the City of Mt. Juliet, Tennessee, recommends pumping the water out through BMPs and monitoring discharge until the turbidity of the discharge begins to produce an "objectionable color contrast" with the receiving stream. Once this point is reached, water is to be pumped into stabilized grassy areas or buffer areas which have a filtering effect and serve to reduce part of flow volume through infiltration. Further treatment may be necessary, such as pumping into small settling pools formed from logs or eels and allowing overflow into grassy areas -- or if more demanding treatment is required, pumping into silt filter socks or bags. Mt. Juliet's goal is to minimize the handling and transport of spoils in order to reduce the risk of spills, tracking and other transfer. Once the basin is dewatered, the remaining bottom slurry is still very difficult to scoop out and properly dispose of. One option is to let the bottom slurry dry out to make it more manageable before removal and hope for no rain in the meantime. Another option is to dewater the bottom slurry by pumping from an excavated sump pit or depression near the outlet to speed the drying process, but this is slow and requires close attention and patience – a largely unwanted, time-consuming, and frustrating process for most contractors and their employees. In any case, the dewatering and de-mucking process can be complicated and requires a plan that prevents sediment from discharging into the receiving waters. Consequently, the SWPPP should include some type of plan or sequencing protocol for dewatering, de-mucking, and stabilizing the sediment basin for either (1) decommissioning the basin or (2) converting the basin to a permanent stormwater pond. Some TDEC field office SWPPP reviewers now require a detailed conversion or decommissioning plan before issuing a Notice of Coverage.

One TDEC field official reports that sediment basins are sometimes left unconverted, not cleaned, and abandoned in the sediment basin configuration. Occasionally, improperly constructed sediment basins having an open outlet hole at the bottom of the pond or riser, and therefore not having functioned as effective sediment-retaining structures, may not receive much attention to sediment removal and transitional treatment, other than perhaps removing an ineffective pile or basket of rock in front of, or rock filter ring around, the hole. In other cases, once construction is finished, the dewatering structure is simply removed at the permanent pool level of the sediment basin, without demucking or removing the accumulated sediment, and the basin is ill-advisedly transformed into a stormwater *retention* pond, thus allowing the construction phase sludge to be resuspended and released with each successive storm. Figure 8 illustrates a condition where a sediment basin was converted to a detention pond without removing the accumulated sediment.

Figure 8. Former sediment basin converted to a stormwater detention pond without removing sediment.

It is clear, then, that one of the major challenges in converting sediment basins to permanent stormwater ponds is safely removing and disposing of the bottom sediment slurry. The removal process is especially important if the basin slurry contains chemical flocculants such as polyacrylamides (PAM). Some states and cities have established both specific and general requirements for removing and disposing of basin sediment prior to converting to a permanent stormwater pond. These are as follows:

<u>Washington, D.C</u>., in its Standards and Specifications for Sediment Basins (March 2003),contains requirements for sediment disposal, final disposal, and conversion to a stormwater management structure as follows:

> **Sediment Disposal**: The sediment basin plans shall indicate the method(s) of disposing of the sediment removed from the basin. The sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the basin or adjacent to a stream or floodplain. **Disposal sites must be considered in an approved sediment control plan.** The sediment basin plans shall show the method of disposal of the sediment basin after the drainage area is stabilized, and shall include the stabilization of the sediment basin site. **Sediment shall not be allowed to flush into a stream or drainage way.**
>
> **Final Disposal:** When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits are to 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 basin material and trapped sediments must be removed and safely disposed of and the basin shall be backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry (using methods in Section G -Dewatering), graded, and back filled.
>
> **Conversion to Stormwater Management Structure**: After permanent stabilization of all disturbed contributory drainage areas, temporary sediment basins, if initially built and certified to meet permanent standards, may be converted to permanent stormwater management structures. To convert the basin from temporary to permanent use, the outlet structure must be modified in accordance with approved stormwater management design plans.

Additional grading may also be necessary to provide the required storage volume in the basin. **Conversion can only take place after all disturbed areas have been permanently stabilized to the satisfaction of the inspection authority and storm drains have been flushed.**

Pickens County, S. C. has published a Sample Construction Sequence that includes conversion of sediment basins to stormwater ponds. Following permanent/final stabilization the conversion steps include the following:

1. Clean out detention basins that were used as sediment control structures and re-grading of detention pond bottoms; if necessary, modification of sediment basin riser to convert to detention basin outlet structure.

2. Remove temporary sediment & erosion control measures after entire area draining to the structure is finally stabilized (it is recommended that the Project Owner/Operator have the SWPPP Preparer or registration equivalent approve the removal of temporary structures.)

3. Perform as-built surveys of all detention structures and submit to Pickens County Stormwater for acceptance.

4. Submit Notice of Termination (NOT) to Pickens County as appropriate.

California's Sediment Basin SE-2 manual (California Stormwater BMP Handbook January 2003Construction Errata 9-04) contains a simple note relating to converting sediment basins to stormwater detention ponds:

> Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Idaho, in its IDEQ Storm Water Best Management Practices Catalog (Sept 2005) discusses conversion to a stormwater management installation early as part of the construction phase sequence.

1. Install temporary measures to allow use as a sediment basin. Since these structures are designed to receive storm drain outfalls, diversion should not be necessary.

2. Completion and Disposition: When the areas contributing sediment to the system have been stabilized procedures can be taken to restore the system to its planned (permanent) use. The following removal and restoration procedure is recommended. For conversions these measures include (1) establishing a permanent stabilized outfall channel as noted on the plans, (2) restoring the area to grades shown on the plan and stabilize with vegetative measures, and (3) removing the accumulated sediment, open the low flow orifice, and seed all disturbed areas to permanent vegetation.

The Delaware Department of Transportation (DelDOT) requires a "Sequence of Construction" for each construction phase and stage of sediment and stormwater management. One of the final steps following Final Stabilization is conversion of sediment basins to permanent stormwater ponds. The final step following this is a general requirement for removal of all temporary sediment control practices. DelDOT requires that basin sediment be disposed of at a location approved by the Engineer.

Applied Polymer Systems, Inc. (APS), manufacturer and vendor of flocculating polymer products for erosion control and water clarification, publishes through the University of Central Florida's Stormwater Management Academy, a Polymer Enhanced Best Management Practice (PEBMP) Application technical guide for using polyacrylamides (PAM) on its website. The APS Guideline outlines a step-by-step guide for removing mud and sediment from a sediment basin using its powdered PAM product, Silt Stop®:

"Highly saturated soils and slurries can be messy and difficult to remove without spills or dripping. Adding a soil-specific polymer to the soil and mixing it in will bind the soil together, thickening the soil and making it easier to remove.

1. Application rate: 50 pounds of Silt Stop® powder/ 100-200 cubic yards. This application rate will vary with soil type and content.

2. Pump or drain off the water from the pond, leaving the wet sediment behind. Note that there can be **no standing water**.

3. Apply the site-specific Silt Stop® powder **evenly** to the surface of the sediment, and use the bucket of the removal equipment to **stir it into the soil** to maximum of 3 feet deep/ application. **DO NOT** dump the Silt Stop into a pile! Removal of sediment more than 3 feet deep shall be accomplished in layers.

4. Allow 10-20 minutes while mixing for the polymer to react with the soil, the more mixing you do, the less time this will take. There should be a visible texture change to the sediment to denote a completed reaction.

5. The polymer will cause the sediment to thicken, making it easier to remove without liquid spills or dripping.

6. The thickened sediment can then be used as a topsoil amendment to improve vegetation establishment, especially in areas prone to erosion. This material is not suitable for use as structural fill."

Figure 9. Application of flocculant powder to thicken bottom sediment slurry.


Figure 10. Removal of thickened bottom sediment.

<u>Florida</u>, in its Erosion and Sediment Control Manual Designer and Reviewer Manual (2007), outlines a simple procedure based on the above APS guideline, for PAM-enhanced mud and sediment removal from sediment basins:

"When designed properly, a sediment pond will collect and retain sediment. To maintain optimum efficiency, the sediment needs to be removed. Highly saturated soils can be messy and difficult without spills or dripping. Adding a soil-specific polymer to the soil and mixing it in, binding the soil together, thickening the soil, and making it easier to remove.

1. Pump off the water from the pond, leaving the wet sediment behind.
2. Apply polymer powder to the sediment, and use the bucket of the removal equipment to stir it into the mud, to a maximum of 3 feet deep/application.
3. Application rate: 50 pounds of polymer powder/ 100-200 cubic yards. This rate may vary with the clay/organic type and content.

4. Allow 10-15 minutes for the polymer to react with the soil, the more mixing you do, the less time this will take.
5. The polymer will cause the sediment to thicken, making it easier to remove without liquid spills or dripping.
6. The thickened sediment can then be used as a topsoil amendment to improve vegetation establishment. This material is not suitable for use as a structural fill."

The City of Orlando, Florida (see APS - Case Studies) routinely uses blended PAM during muck removal on its ponds and lakes. This material is reused as a topsoil amendment whenever possible to reduce disposal and transportation costs and improve vegetation establishment, especially in sandy soils.

TDEC requires that the SWPPP provide justification and a plan for applying all chemical amendments such as PAM for erosion control, sediment control, and thickening. One soil scientist expert on polyacrylamides use agrees that more research is needed in adding PAM to a basin prior to sediment removal to reduce turbidity in the disturbed supernatant and to stabilize the sediment (McLaughlin, 2012). SWPPP preparers, design engineers and construction site owner/operators are advised to consult closely with representatives of the product vendor, the regional TDEC Environmental Field Office, and any local or MS4 programs while developing and implementing the plan for using and handling polymers and for disposing of the thickened sediment. Application rates are highly dependent on the amount and chemistry of the sediment and water characteristics. Chemical amendments such as PAM should be carefully planned and applied under closely controlled and monitored conditions by qualified and trained personnel. Polymers and their flocs should be confined to the basin and not permitted to drain downstream.

6. Proposed guidelines for converting permanent sediment basins to permanent stormwater detention ponds

Based on available information, procedures, and experience from various sources, it is apparent that the following considerations and protocols should be given to converting a temporary sediment basin to a permanent detention pond:

1) Early planning& engineering ; construction timing– All relevant state and local regulations and permit requirements for permanent stormwater management ponds should be considered during the planning and design of temporary sediment basins. The temporary sediment basin and inlet/outlet facilities should be planned, sized and installed to meet both structural and capacity requirements for sediment treatment and storage, future stormwater management, and all flow controls, including impoundment/dam or excavated pit, dewatering device, drain, spillways, outlet controls, freeboard, and all other appurtenances. For example, the service spillway and outlet barrel assembly should be sized not only to handle the 2-yr, 24-hr (or 5-yr) storm for meeting hydrologic requirements during operation as a sediment basin, but to have capacity for meeting possible higher, post-development flow requirements for operating as a stormwater detention basin. Other considerations include installing an outlet stub at the bottom of the riser to serve as a dewatering connection port during sediment basin operation, and then using it as either an orifice or valved drain outlet part of the post-development peak flow control system for permanent stormwater management. Concrete riser boxes may be custom-ordered with sized knock-out ports for later use with or without orifice and weir plates for peak flow control during permanent stormwater control operation. However, under no circumstances should a bottom riser outlet be allowed to remain open during operation as a temporary sediment basin. The emergency spillway for permanent stormwater detention ponds should be designed and constructed with higher flow capacity than the TDEC-required minimum 25-year flood for sediment basins, to minimize overtopping the dam and risking catastrophic failure and damage.

2) Dewatering - Once the construction site is fully stabilized, the sediment basin should be carefully dewatered down to the top of the sediment layer in both the forebay and the main basin area. Dewatering should begin only after the pond has drained down to, or fallen below, the permanent or wet pool level. Dewatering the standing pool should be done slowly (at least a day) to prevent resuspension of captured sediment and upstream slope failure or slumping of the embankment dam. A surface skimmer installed to discharge into the bottom of the riser, could be used to dewater the wet storage zone down to the sediment layer. The forebay, containing mostly sands and coarse silts, if properly constructed above the wet pool, should dewater easily by gravity. However, dewatering the mucky bottom of the wet storage area containing mostly clay and fine silts, can be difficult and challenging. Dewatering the slurry in the bottom of the wet pool may require digging out a small pit at the lower end of the basin near the riser and pumping into a silt bag, or pumping or siphoning into a small clarification chamber. Dewatering may require three or four days of rain-free weather and a few additional days for the drained sediment to sufficiently dry out for handling.

3) Demucking and cleaning – Both the forebay and wet pond areas need to be cleaned and material disposed of, without releasing sediment or slurry into the outlet structure and receiving stream or local drainage system. Once the bottom material has been sufficiently dewatered and dried, it may be scooped out with a track hoe or loader down to the bottom of the planned detention pond grade and disposed of as fill or topsoil according to the approved SWPPP. In some cases, wet bottom material may require polymer thickening according to an approved dosage, application, mixing, and disposal plan. To prevent damage, heavy equipment should not be used around the riser, outlet barrel, and foundation.

4) Sediment disposal – Most basin sediment can be used for fill or topsoil. If the sediment contains flocculated polymers from basin operation or mixed polymers applied directly to the bottom sediment, a disposal plan should be submitted to TDEC for approval before disposing on- or off-site.

5) Removing sediment basin controls – If the forebay is to be retained and used for permanent post-development first-flush, water quality treatment and runoff reduction, the forebay berm may be left in place and any necessary infiltration practices installed. However, the main sediment basin dewatering device assembly should be removed, along with the resting pad if a surface skimmer had been used. The riser foundation, trash rack (including any anti-vortex device), and outlet barrel connection should be closely inspected for structural integrity and prepared for use as a service spillway and peak flow control. Extreme caution should be used in modifying the outlet riser structure for permanent stormwater control so as to not threaten the integrity of the riser and barrel assembly. Any heavy construction work required on the riser should be completed during its initial installation. It is not recommended to install a temporary riser structure in the sediment basin and then replace it with a permanent riser after final stabilization.

6) Checking dimensions and inspection- The sediment basin should be surveyed to check all dimensions and elevations to ensure intended storage, hydraulic capacity, and freeboard for permanent stormwater detention ponds. Earthen embankment dams, if not properly compacted during original sediment basin construction, may have settled to the extent of losing the intended minimum freeboard required by the permanent stormwater detention pond for the emergency spillway design discharge. For this reason, the embankment dam crest profile should be checked for sagging and loss of freeboard. The embankment dam should be inspected by a dam safety or geotechnical engineer for both longitudinal and transverse cracks, slumping, depressions, and bulges, especially in the area over the outlet pipe of the service spillway, where internal erosion and loss of embankment material may be occurring as a result of riser displacement, loose pipe joints, crushed pipe, differential settlement, poor compaction around the outlet pipe, or excessive seepage and piping along the pipe barrel. All permanent inlet headwalls and scour-prevention practices such as rock rip rap and associated geotechnical linings should be inspected for

damage. Any damage, embankment instability or excessive settlement, lack of required storage capacity, or hydraulic control problems should be repaired or reconstructed under the supervision of a dam safety engineer.

7) Installing stormwater controls – All single- or multi-stage orifices and/or weirs for controlling peak flows and valves should be carefully installed without damaging the service spillway facility. Orifice and weir control knock-outs and cover plates should be carefully removed and checked for correct sizing and elevations.

8) Final stabilization –The stormwater detention pond bottom, sides, upstream and downstream dam slopes, and dam crest should be stabilized with permanent vegetation practice to prevent erosion and sediment resuspension. Seeding, mulch, sodding, and blankets and matting should be inspected for proper installation.

9) Close-out – The completed permanent stormwater detention pond, embankment, and all outlet works should be inspected, surveyed and certified by a licensed professional engineer to verify that the facility has been constructed according to the approved engineering plans and specifications (i.e., as-builts). Continuing functionality and performance and public health and safety are post-construction imperatives for permanent stormwater ponds. There should be a jurisdictional Maintenance Agreement to ensure long-term maintenance care of and easement access to the pond and facilities for inspection, cleaning, and repair by the financially responsible person(s), owner(s), or homeowners association.

7. Summary

Receiving waters need to be protected from sediment pollution and erosion damage during both the construction and the conversion phases. Sediment basins are a widely-accepted stormwater treatment practice for keeping sediment on a construction site, but the same facilities are often later used to manage the hydrologic effects of post-construction stormwater. Converting a temporary construction site sediment basin to a permanent stormwater management pond requires early planning and careful execution. Sediment basin design and installation, which must satisfy minimum local and state regulations for trapping sediment, also should incorporate reasonable measures to protect the downstream channel from erosion damage and flooding. For basins to be converted to stormwater ponds, the hydrologic and hydraulic design should consider ultimate storage and spillway capacities and the outlet control configuration required for stormwater management purposes. In most cases, the storage and hydraulic design requisites for construction and for post-construction phases will be different, and the basin should be constructed to accommodate the larger storage and hydraulic capacity needed for capturing and storing sediment, handling flood events without spilling over, and reducing peak flows. Sediment basin design should also incorporate design elements for equipment access to facilitate sediment removal and disposal during the construction phase, in removing or decommissioning (not abandoning!) an unneeded basin as part of final stabilization, and in recommissioning or converting to a permanent stormwater control pond. This latter conversion plan should provide the developer/contractor with sufficient practical guidance for dewatering the bottom slurry; drying out or thickening the resulting sludge; removing, handling, and disposing of sediment; removing all sediment basin appurtenances; checking basin dimensions; making necessary repairs; and installing permanent hydraulic controls in compliance with MS4 and other local stormwater regulations.

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