Stream Restoration Verification Guidance

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The guidance is revised to incorporate comments provided by the Chesapeake Bay Program Verification Review Panel (CBP Water Quality GIT Verification Committee, 2013a and b). Additional changes were not needed following the Panel's April 2014 meeting.

Part 1: The Need for Verification

Verification of the initial and long term performance of urban and non-urban stream restoration projects is critical to ensure that nutrient and sediment pollutant load reductions are achieved and sustained across the Chesapeake Bay watershed and provides a means by which state agencies/regulators can also measure functional loss or gain related to these projects. The need for verification is underscored by the estimated 700 miles of planned stream restoration projects by the six Bay watershed states and the District of Columbia in their respective Watershed Implementation Plans and the need to address biological impairments identified as part of local TMDLs across the Bay watershed. While this guidance focuses on individual stream restoration projects, it is recognized that stream restoration is part of watershed-wide efforts to restore the health of the Chesapeake Bay.

The Center for Watershed Protection (Center) in their role as the Chesapeake Bay Program's Sediment Reduction and Stream Corridor Restoration Coordinator, developed guidance with input from the Chesapeake Bay Program (CBP) Partnership's Habitat Goal Implementation Team (GIT). The guidance is adapted from the 2013 Urban Stormwater Workgroup Memo, *Final Recommended Principles and Protocols for Urban Stormwater BMP Verification* (Goulet and Schueler, 2013) and *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* (Schueler and Stack, 2013). Additional guidance for stream restoration projects, specific to riparian wetlands, should also refer to verification guidance on wetlands prepared by the Habitat GIT's Wetlands Workgroup as indicated in Part 4 of this report.

The guidance included in this document is based on the premise that the most important step to assure a project is performing correctly is to first determine that the project is designed correctly and supports clearly articulated goals and objectives. Tools, such as checklists, that standardized information on stream restoration projects may facilitate implementation of this guidance by the Bay jurisdictions. Forthcoming tools as a result of efforts by the Maryland Department of the Environment (MDE) and U.S. Fish and Wildlife Service (USFWS) may provide additional guidance for verification methods that may assist in these efforts.

The Habitat GIT has asked the Center to help coordinate the work of the Stream Health Workgroup (SHWG) with the USFWS, who will be charged with promoting and coordinating the adoption of the Stream Restoration Verification Guidance among the seven Bay watershed jurisdictions.

Part 2: Key Definitions for Stream Restoration Project Verification

The following terms are defined to clarify the application of this guidance to stream restoration project verification.

Stream Restoration Projects*:* Refers to any natural channel design, baseflow channel design, or legacy sediment removal, or other restoration project that meets the qualifying conditions for credits as described in Schueler and Stack (2013), including environmental limitations and stream functional improvements. The types of stream restoration projects are defined as:

1. ***Legacy Sediment Removal*** *(LSR)* - A class of aquatic resource restoration that seeks to remove legacy sediments and restore the natural potential of aquatic resources including a combination of streams, floodplains, and palustrine wetlands.

2. ***Natural Channel Design*** *(NCD*) - Application of fluvial geomorphology to create stable channels that maintain a state of dynamic equilibrium among water, sediment, and vegetation such that the channel does not aggrade or degrade over time. This class of stream restoration utilizes data on current channel morphology, including stream cross section, plan form, pattern, profile, and sediment characteristics for a stream classified according to the Rosgen (1996) classification scheme, but which may be modified to meet the unique constraints of urban streams.

3. ***Wet Channel Regenerative Stormwater Conveyance*** *(RSC)* - Also known as baseflow channel design, these practices are located further down the perennial stream network and use instream weirs to spread storm flows across the floodplain at minor increases in the stream stage for events much smaller than the 1.5-year storm event, which has been traditionally been assumed to govern stream geomorphology and channel capacity. Wet channel RSC may also include sand seepage wetlands or other wetland types in the floodplain that increase floodplain connection or interactions with the stream.

Legacy Stream Restoration Projects*:* Refers to the population of stream restoration projects in a community that the state has reported to EPA for inclusion into any past version of the CBWM for sediment or nutrient reduction credit.

Non-Conforming Stream Restoration Project*:* Projects that do not conform to the reporting requirements of the stream restoration protocols outlined in Schueler and Stack (2013) and instead receive credit using the interim rate.

Part 3: Background on Verification of Stream Restoration Projects

Stream restoration projects are subject to a series of permits, including National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permits, U.S. Army Corps of Engineers permits, and state-specific permits. These permits are summarized in Table 15. Each permit has its own requirements for monitoring and reporting. However, the current post construction and maintenance inspections are not oriented toward verifying the actual pollutant removal performance of the stream restoration projects. Instead, local inspections primarily focus on whether the project was installed per design, and that its future condition will not cause harm to public safety and/or cause nuisance problems in the community. For verification purposes related to the Chesapeake Bay TMDL requirements, it will be necessary to develop improved inspection guidelines that utilize visual indicators to verify that the performance of the project is adequate to still achieve the intended nutrient and sediment pollutant load removal rate.

Table 15. Permits Required for Stream Restoration Projects

Permit	**Description**
All States	
Nationwide Permits (NWPs)	Nationwide permits are general permits implemented by the U.S. Army Corps of Engineers (ACE) for commonly recurring activities that have minimal individual and cumulative adverse impacts to the environment. Most NWPs have been suspended in Maryland and Pennsylvania since they are duplicated by State Programmatic General Permits already in place. However, NWP 27 (Aquatic Habitat Restoration, Establishment, & Enhancement Activities) is still in place and states that activities must result in net increase in aquatic resource functions and services over the existing conditions.
State Programmatic General Permits (SPGPs)	SPGSs authorize work in Waters of the United States within individual states for activities that would cause no more than minimal adverse environmental effects. They are administered by the U.S. Army Corps of Engineers in conjunction with state agencies. Individual states have specific enforcement thresholds on the size of the area impacted that are included under the general permits. In most cases, projects authorized by the state agencies do not need ACE review of the application.
Individual Permits (IPs)	Individual permits, also known as a standard permits, are implemented by the ACEand are generally reserved for projects with potential for substantial environmental impacts. An individual permit (IP) requires a full public interest review, including public notices and coordination with involved agencies, interested parties and the general public. IPs involve large/complex projects exceeding thresholds and conditions of nationwide and state general permits (highways on new alignment, subdivisions, dredging).
NPDES MS4 Permits	Phase 1 and Phase 2 communities have NPDES MS4 permit conditions which require them to have programs and staff in place to ensure that maintenance inspections are done according to a prescribed cycle. The frequency of maintenance inspections ranges from 3 to 5 years, depending on the permit status of the jurisdiction. In addition, most MS4 communities have an annual BMP reporting requirement, and often provide aggregate information to the state on the number and type of BMPs that are installed during the reporting period.
State-Specific	
Virginia Marine Resources Commission Subaqueous Permit	The subaqueous permit program enforced by the Virginia Marine Resources Commission applies to activities impacting perennial streams with drainage areas that exceed 5 mi^2 or with a mean annual instream flow of 5 cubic feet per second. A joint local/state/federal permit application is required and is subject to a public interest review. The permit may include restrictions on the time of year for construction activities and specific construction methodologies. Monitoring reports are required every year for 5 years, the 7^{th} and 10^{th} years, and every year thereafter until the project is demonstrated to be stable for 2 successive years.
Virginia Water Protection (VWP)	The Virginia Water Protection (VWP) permit program is administered by the Virginia Department of Environmental Quality's Office of Wetland and

Permit	Description
Permits	Stream Protection and involves the regulation of water withdrawal projects, excavation, filling, or activities that affect the biological, chemical or physical properties of surface waters (including streams, lakes and wetlands). Generally, activities requiring a permit include dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical or biological properties of surface waters. The VWP general permits include separate permits for impacts less than ½ acre, utility projects, linear transportation projects, and development activities. A joint local/state/federal permit application is required.

The *Final Recommended Principles and Protocols for Urban Stormwater BMP Verification* (Goulet and Schueler, 2013) documents several challenges that still need to be addressed to develop an effective verification system for urban stormwater BMPs in the Chesapeake Bay watershed. Most of these challenges also apply to stream restoration projects. This guidance identifies additional challenges specific to stream restoration projects.

- There are a variety of stream restoration techniques, such as natural channel design, baseflow channel design and valley/floodplain restoration, which regulators may not necessarily have experience reviewing.

- Stream restoration projects often do not follow a consistent design process where the project's goals and objectives are established through an analysis of the restoration potential which in turn is determined through a systematic assessment of stream functions.

- Post construction monitoring is typically required for 3-5 years to satisfy permits. However, stream restoration projects are subject to catastrophic damage from extreme flood events. To ensure that the projects still exist and are operating as designed, monitoring is needed on an indefinite basis. The Stream Restoration Expert Panel recommended the maximum duration for removal credits as 5 years, with indefinite renewal of the credit pending field performance inspections.

Part 4. Guidance for Verifying Stream Restoration Projects

The following guidance is recommended to verify stream restoration projects are implemented and operating correctly in each of the seven Chesapeake Bay watershed jurisdictions.

1. *Methods to Verify Individual Stream Restoration Projects.* The level of detail needed for verification will be based on the type of project (natural channel design, baseflow channel design, and removal of legacy sediments), as well as the size, complexity, and landscape position of the proposed project. It is important that the method used to verify stream restoration projects identifies key features that relate to stream function and project goals and objectives. The USFWS and EPA have developed a function-based framework for stream restoration projects and is presented in the "*A Function-Based Framework for Stream Assessment and Restoration Projects.*"

(http://www.fws.gov/chesapeakebay/stream/protocols.html, http://water.epa.gov/lawsregs/guidance/wetlands/upload/12-natural_channel_design.pdf) This framework provides an excellent example of how the assessment, design and project goals can be an integral part of the verification process. The USFWS has also developed the *Function-based Stream Restoration Project Process* that illustrates how the framework can be applied to stream restoration projects (http://www.fws.gov/chesapeakebay/stream/demoprojects.html). Using the framework will greatly benefit non-conforming projects that use the interim rate for estimating nutrient and sediment load reduction. These projects may lack the detail necessary to use the protocols developed by the expert panel, however, a post construction checklist can establish a baseline that can verify that the project is meeting minimum performance standards to warrant the interim rate reductions.

2. *Maintenance and Monitoring tied to Performance.* Regular inspections and maintenance of stream restoration projects are critical to ensure their benefits in preventing sediment and nutrient pollution are maintained and extended over time, as well as to maintain other local design objectives (e.g., habitat improvement, channel stability, and landscape amenity). Therefore, the verification process should ensure that stream restoration projects are installed and maintained properly over their design life to qualify for their sediment and nutrient reduction credits. This will require verification protocols to define: (1) the frequency for field verification of stream restoration practices; and (2) the process for downgrades if maintenance is not performed. All qualifying projects must have a designated authority responsible for development of a project maintenance program that includes routine maintenance and long-term repairs. Monitoring is the actual part of verification which can be used to determine if the project is functioning as designed. If it is not functioning as designed, then the monitoring data may be used to identify factors responsible such as improper construction or the need for maintenance. The USWS is in the process of developing a *Rapid Function-based Stream Restoration Monitoring Protocol* that will be available in April 2014 and can be obtained at http://www.fws.gov/chesapeakebay/stream/protocols.html.

3. *Utilize Existing Maintenance and Monitoring Inspection Frameworks.* The existing MS4 and 404 Permit/401 Certification inspection and maintenance framework and local sediment control regulations for hundreds of communities in the Chesapeake Bay watershed should be the foundation of any stream restoration verification system. Routine maintenance data collected under these frameworks will ultimately inform the verification process described in #8 below. In addition, maintenance and inspection requirements included in state and federal agricultural cost-share programs should be incorporated into verification of non-urban stream restoration projects. Many of the monitoring and inspection requirements under Nationwide 27 and local permits are limited to 3 - 10 years. It is therefore important for the installing agency to continue inspections throughout the project life. The Habitat GIT will work with the state and federal regulatory agencies to determine how their existing maintenance and inspection programs can be used to support implementation the Chesapeake Bay Program Partnership's basin-wide BMP verification framework.

4. *Removal Rate Tied to Field-based Measurement Methods that verify stream design criteria*. The verification of nutrient and sediment removal rates using the *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* should be based on design criteria that can be field verified using measurement methods. Design criteria should be established after a stream function-based assessment determines what restoration potential (goals and objectives) is achievable. Instructions for how to develop function-based assessment, design criteria and measurement methods can be found in Harman and Starr (2011). The maximum duration for which the stream restoration pollutant removal rate applies is 5 years, which can be renewed based on a field performance inspection that verifies the project still exists, is adequately maintained, and is operating as designed. The protocols being developed by USFWS for MDE may be helpful in defining performance indicators to assess project performance.

5. *Stream Restoration Verification as Adaptive Management.* It is recommended that field assessments provide the information needed to verify which projects are functioning as designed to achieve their defined goals and objectives and those projects that require preventative or corrective maintenance to maintain their function(s). Such assessments may also identify factors contributing to the project's success or failure that may be used to inform changes, as needed to existing designs or future monitoring.

Until recently, post-project monitoring has been rarely conducted to assess how well stream restoration projects meet their intended design objectives over time. Real world data collected on actual stream restoration performance enables local and state agencies to improve the next generation of projects in an adaptive management process. This process can isolate the specific site conditions, design features and maintenance tasks that influence stream restoration longevity and performance, and incorporate these into improved design specifications, review and inspection procedures and maintenance requirements. It is recommended that future stream restoration expert panels would review such data to determine if these improved projects would qualify for a higher removal rate, and refine restoration methods and practices that ultimately ensure greater project success.

Bay jurisdictions are encouraged to keep informed of the development of guidance and tools that may assist in these efforts. For example, workshop findings from an upcoming STAC workshop *Designing Sustainable Stream Restoration Projects within the Chesapeake Bay Watershed* may help to identify methods to evaluate projects, in addition to the guidelines for a detailed function-based stream assessment method, a rapid function-based stream assessment method, and a stream restoration design review method under development by Maryland Department of the Environment (MDE) and U.S. Fish and Wildlife Service (USFWS), along with input from stream restoration professionals.

6. *Stream Restoration Reporting Must be Consistent with CBP Approved Practices and Definitions.* Each state has a unique system to report stream restoration projects as part of their MS4 and 404/401 permits. In some cases, states are still developing and refining their reporting systems. Consequently, it may not be possible or even desirable to implement a basin-wide stream restoration reporting format. However, to get credit in the implementation of nutrient and sediment pollutant load reducing practices, stream restoration implementation data using CBP-approved rates or methods, reporting units and geographic location (consistent with NEIEN standards), and periodically updated data

based on the local verification of projects in the field is needed. The Habitat GIT will initiate discussions with regulatory agencies to determine how their operations may support this data reporting, with a goal of not increasing the burden on regulatory agencies.

7. *Initial Verification of Stream Restoration Installation.* The installing agency will need to provide a post-construction certification that the stream restoration project was installed properly, meets or exceeds its functional restoration objectives, and is hydraulically and vegetatively stable, prior to submitting the project for credit in the state tracking database. This includes non-conforming projects as well. To receive sediment and nutrient reduction credit for stream restoration projects that involve the restoration of riparian wetlands, the installing agency will need to verify that the riparian area associated with the project meets the state's legal definition of a wetland (e.g., hydrophytic vegetation, hydric soils) as well as the guidance for wetland verification (Habitat GIT, 2014)

8. *Recommended Cycle for Field Verification of Stream Restoration Projects.* The installing agency needs to conduct inspections two years after initial construction, as this is the most critical period, especially for assurance that vegetative practices are surviving. After this initial three year period, the frequency of inspections should be once every 5 years to ensure that individual projects are still capable of removing nutrients and sediments. The installing agency should consider more frequent inspections after large flood producing storms as defined by local or state agencies. The routine maintenance and inspection frameworks referenced in #3 are a critical component to assure that stream restoration projects are functioning between the verification periods.

9. *Suggested Process for Stream Restoration Project Downgrades.* If a field inspection indicates that a project is not performing to its original design criteria, the locality would have up to one year to take corrective maintenance or rehabilitation actions to bring it back into compliance. If a project is not fixed after one year, the pollutant reduction rate for the project would be eliminated, and the locality would report this to the state in its annual MS4 report. Non-permitted municipalities would be expected to submit annual progress reports. The load reduction can be renewed, however, if evidence is provided that corrective maintenance actions have restored its performance.

10. *Special Procedures for Stream Restoration Projects Used for Offsets, Mitigation and Trading.* Some stream restoration projects are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. In other cases, stream restoration projects may be built for purposes of trading nutrient credits within a community or a state. Special procedures need to be developed in both cases to prevent double counting of practices.

11. *State Oversight of Local Stream Restoration Reporting.* The installing agency must submit basic documentation to the appropriate state agency to document the nutrient and sediment reduction claimed for each individual stream restoration project installed. Localities should check with their state agency on the specific data to report for individual projects. Some typical reporting information includes:

    a. Type, length and width of stream restoration project
    b. Location coordinates

c. Year of installation and maximum duration of credit
d. 12 digit watershed in which it is located
e. Protocol(s) used
f. Projected sediment, nitrogen, and phosphorus load reduction

For non-conforming projects that use the interim rate to estimate nutrient and sediment load reduction, only a – d would apply. Projects that involve the restoration of riparian wetlands will need to provide basic information, such as wetland area and drainage area and will also need to address guidance for riparian wetlands as developed by the Habitat GIT. In addition, the installing agency should maintain an extensive project file for each stream restoration project installed (i.e., construction drawings, as-build survey, credit calculations, digital photos, post construction monitoring, inspection records, and maintenance agreement). The file should be maintained for the lifetime for which the load reduction will be claimed.

To provide accountability, Bay states will be asked to use their existing MS4 regulatory authority that could include periodic field inspections review of local maintenance inspection records, to verify performance of local stream restoration practices. The state oversight process should be transparent and publicly accessible so that NGOs, watershed groups, and other stakeholders can be confident that BMP implementation is real.

12. *EPA Review of State Verification Oversight.* So as to not create an additional regulatory burden, the Habitat GIT will discuss with EPA Region 3 the feasibility of using its existing NPDES MS4 permit review process to provide periodic reviews the implementation of state BMP verification protocols to ensure they are being effectively implemented.

13. *Review and Verification of CBP BMP Accounting.* The accounting methods and verification procedures used by the Bay Program for stream restoration projects must be clear and transparent so that local governments and the states can readily understand how the projects they report are being used to calculate pollutant reductions in the Chesapeake Bay Watershed Model. Better communication among the Bay Program and its state and local government partners will help to improve BMP reporting and ensure a fair representation of state and local program implementation.

References:

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