

Summary of Existing Research

to Encourage Smart Growth and Reduce Nutrients in Baltimore City



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Table of Contents

| | |
|---|----|
| Introduction | 1 |
| Stormwater Offset and Banking System Background | 1 |
| Eligibility to Access Off-Site Options | 3 |
| Demand for Off-Site Compliance versus Site Availability | 4 |
| Complying With The Baseline..... | 6 |
| Currency of Trade | 6 |
| Trading Ratios..... | 7 |
| Scale of Trading | 7 |
| Kick Out Criteria..... | 8 |
| Allowable Practices..... | 8 |
| Private Sector Involvement and Additional Partners..... | 9 |
| Rates | 10 |
| Administration | 11 |
| Summary and Next Steps..... | 13 |
| Reference Documents | 15 |
| Appendix A. | 17 |

Introduction

The City of Baltimore's Surface Water Management Division (SWMD) will develop an updated stormwater offset and banking system. A stormwater offset and banking system can improve options for stormwater management in the urban environment, promote a market based system for development or redevelopment, convert vacant lots and other abandoned areas to provide ecosystem services such as stormwater management and community improvements, and provide a template for additional Chesapeake Bay municipalities. This report summarizes existing information and similar programs as a first step to develop guiding principles for the program. The Center for Watershed Protection and SWMD will use this information to identify research gaps and outline next steps to support a successful City of Baltimore stormwater offset and banking system.

Stormwater Offset and Banking System Background

Stormwater offsets and trading are emerging as important strategies to help meet increasingly stringent stormwater load requirements within MS4 permits, local TMDLs, and the Bay TMDL. The concept of trading is not new, and has been implemented through the Clean Air Act, Clean Water Act (e.g., wetland banks), and in response to other regulatory drivers. However, successful offset and trading programs administered at the local government level are not widespread, and there are many factors that determine the success of such a program.

The type of trading with the greatest relevance to the Chesapeake Bay is a voluntary market-driven mechanism that has the potential to promote cost-effective approaches to meeting environmental outcomes (e.g., TMDLs). A nutrient trading market allows sources that reduce their nutrient loadings below target levels to sell their surplus reductions or "credits" to other sources that cannot meet their target levels. In some cases, this approach can allow nutrient sources that can reduce nutrients at relatively low cost to sell credits to those facing higher-cost nutrient reduction options (e.g., small or tricky development/redevelopment sites). However, cost-effectiveness is only one of the drivers for a trading program.

A stormwater offset and banking system uses a market based system which is guided, in part, by estimated costs for implementing various stormwater management strategies. The fees are either paid to the credit provider or can be placed in a fund used to construct stormwater management projects. There are few municipalities or communities that are using stormwater offset and banking systems. Each system is unique to the geography, policy, regulation, market, and additional qualifiers. To date, the research indicates six areas with stormwater offset and banking systems: (1) Washington, D.C., (2) Saint Paul, Minnesota, (3) City of Fredericksburg, Virginia, (4) Neuse River, North Carolina, (5) Maryland Critical Area, and (6) Maine sensitive lakes. Additional areas, such as West Virginia, have incorporated some form of the concept into regulations and general permits for MS4s.

In the Chesapeake Bay region, nutrient trading programs have similar obstacles and opportunities to stormwater offset and banking systems. In fact, stormwater pollution can play a major role in nutrient trading programs. The Nutrient Trading Subcommittee and the "Proposed Expansion of the Use of Nutrient Credits in Virginia pursuant to Senate Joint Resolution 334 (2011)" provide a basis for nutrient trading programs research and policy. In Virginia, a system

of stormwater offsets is in place for wastewater and some nonpoint sources through the Nutrient Credit Exchange through ongoing legislative and regulatory initiatives. A recent initiative and study committee proposed to expand nutrient offsets for stormwater and MS4 permittees as a key strategy to implement the Bay TMDL and WIP commitments (Dennison et al., 2012).

The Nutrient Subcommittee of the Senior Scientists and Policymakers for the Bay reported a lack of evidence, lack of common terminology, and lack of case studies to demonstrate success. These obstacles reflect on the current state of knowledge for stormwater offset and banking systems (Senior Scientists and Policymakers for the Bay, 2012). The Subcommittee pointed to the following obstacles and issues with nutrient trading:

(1) There are a variety of different definitions for nutrient trading being used by the Environmental Protection Agency and the different jurisdictional agencies implementing nutrient trading. These differences in definitions could lead to difficulties in administering nutrient trading programs and many of these comments and recommendations are designed to ensure that a rigorous and credible nutrient trading program would be achieved for the Chesapeake Bay watershed. (2) Nutrient trading is an emotive issue, and highly charged terms are often used to describe the virtues or the problems associated with nutrient trading, and (3) The use of nutrient trading for water quality issues is not well developed and there is a lack of data and case studies to support or refute assertions about nutrient trading. The fact that nutrient trading is complicated, emotive and data poor leads to the strategy in this document of beginning a process of creating an informed debate (Dennison et al., 2012, p. 3)."

Stormwater offset and banking systems have data gaps where research is needed to overcome common obstacles that include market value, stormwater crediting, level of community involvement, costs, stakeholder understanding and subsequent use of the program, and additional obstacles. This report identifies existing programs across the country as well as programmatic building blocks and next steps needed to support the City of Baltimore's program. A successful program can help municipalities and developers meet regulatory thresholds and also can serve as a community revitalization tool by selecting desirable implementation projects. For example, Cleveland, Ohio produced a vacant land re-use pattern book, "Re-Imaging Cleveland," (Kent State University's Cleveland Urban Design Collaborative and McKnight Associates Ltd., 2009) that ties together the Cleveland City Planning Commission's efforts, urban design, and stormwater management in a "how to" guide for the community. The City of Baltimore's Office of Sustainability is currently working on a local pattern book aimed at vacant lot revitalization.

The Center's research included gathering related information and documents from Center staff and experts in the field, reviewing available policy documents, interviewing key points of contact, and asking web forums for programs to research (e.g., Linked In groups). Based on this research the major building blocks were summarized for available programs:

- Eligibility to access off-site options
- Demand versus off-site availability
- Establishing the baseline
- Currency of trade
- Trading ratios

- Scale of trading
- Kick-out criteria
- Allowable practices
- Private sector involvement
- Rates
- Program administration

The following sections of the report review each of these building blocks.

Eligibility to Access Off-Site Options

Based on the available programs and research, off-site compliance may not be an automatic option for stormwater management for new development, redevelopment, and/or municipal projects, and most projects must implement a certain degree of on-site management (sometimes referred to as the “baseline;” however, that term has a different meaning in this report, as explained below). A policy, such as the general permit, may guide the technical justification for on-site compliance and outline the criteria for documenting that on-site management is infeasible. Furthermore, research indicates that defining the procedure and documentation for on-site infeasibility is an important program element. It is important to develop clear guidance and tools, such as checklists, to support management decisions, track sites wishing to access off-site options, and provide a standard, predictable decision tree for on-site versus off-site management.

| Table 1. Eligibility to access off-site options research summary. | |
|--|--|
| Location | Research Summary |
| Washington, DC (Note: program is currently under development) | <ul style="list-style-type: none"> • Goal: market based not state regulation based system • Retention on-site minimum is “to be determined” • Regulated site above the on-site minimum retention can: (1) use Stormwater Retention Credits (SRCs) from the private market or SRCs certified by DDOE or (2) pay in-lieu fee to DDOE. • Must have designed and approved Stormwater Management Plan (SWMP) • Must have current maintenance agreement or contract for off-site practice |
| Saint Paul, MN | <ul style="list-style-type: none"> • Document why standard compliance is not feasible • Document what other compliance steps were done • Special cases for “linear” development • On-site rate control for 2, 10, and 100- year storms • Alternative compliance for 1-inch volume reduction when (1) on-site compliance is achieved to extent possible; (2) off-site project or using qualified mitigation bank credit; or (3) pay a fee to fund that will implement elsewhere • Most used option is payment into the mitigation bank • Private developers have not participated in the alternative compliance program (fee-in-lieu) because it is cheaper to buy |

| Table 1. Eligibility to access off-site options research summary. | |
|--|---|
| Location | Research Summary |
| | bank credits |
| City of Fredericksburg, VA (Note: not currently up and running) | <ul style="list-style-type: none"> • Volume target is infiltration of the first ½ inch runoff • Off-site volume offset if retrofit in same watershed |
| Neuse River, NC | <ul style="list-style-type: none"> • If N export > baseline conditions, must use BMPs or regional stormwater strategy to reduce N to baseline conditions • Nutrient offset eligibility when a portion of load treated on-site and varies based on watershed strategies • Example: Tar-Pamlico strategy requires on-site control for 4 lbs/ac/yr N and 0.4 lbs/ac/yr P or less. Offset payment option eligibility if on-site N pollutant load is 6 lbs/ac/yr (residential) or 10 lbs/ac/yr (commercial, industrial, and institutional) |
| MD Critical Area | <p>Offsets are a last resort and can be used when:</p> <ul style="list-style-type: none"> • Baseline when development reduces pollutant load $\geq 10\%$ from prior on-site pollutant load, AKA 10% Rule • Onsite BMP construction not feasible • Current minimum on-site requirement is 0.3 lbs/ac for new development annual P load, and offsets allowed if designer shows a reasonable effort to install ESD practices on-site to reduce the load required • Spreadsheet available to evaluate ESD compliance and P removal |
| Maine sensitive lakes | <ul style="list-style-type: none"> • Off-site compliance limited to development in eligible lake watersheds • On-site project P reduction requirement is 60% • Compensation fee option available for $\geq 60\%$ on-site P reduction • P export based on P budget for lake per acre |

Demand for Off-Site Compliance versus Site Availability

As a market approach, an offset, trading, or banking program should produce a functioning market where demand for offsite offsets/credits is balanced with sites available to provide the offsets/credits. Some programs set up a regulatory structure, but do not attend to these basics of supply and demand. For instance, a program may over or underestimate demand for offsets/credits in the local development community, or, on the other hand, may not have enough feasible restoration sites to meet the demand. The scale of trading (addressed below) is a contributing factor. If the scale is too small (e.g., restoration must take place within the same small watershed as the site needing the credits), then there may not be enough feasible sites to

address the demand. Existing programs utilize some sort of retrofit or restoration inventory, watershed plan, or other document that identifies specific candidate restoration projects.

Moving off-site compliance to the private market may avoid common pitfalls for demand, administrative costs, site availability, and other factors. The research indicates that determining the marketplace and market value are important steps. Planning and program flexibility can avoid common pitfalls that overwhelm some parts of a program (e.g., fee in lieu) while other program components may see little use (e.g., mitigation banking). Off-site mitigation calls for either the developer to choose a suitable site and the overseeing agency to verify the process, or the overseeing agency can maintain a list of candidate sites. Factoring in the demand for off-site compliance is an important step to anticipate the number of sites needed and where the sites should be located. A program pitfall can be avoided when off-site projects have viable implementation timelines, an adequate fee structure to fund design, construction, and maintenance, and documented water quality benefit.

| Table 2. Demand for off-site compliance versus site availability research summary. | |
|---|--|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • Changed approach based on market study projections • Prioritized list of retrofit sites that can generate SRCs • May do design work for retrofits and developers install for SRC • WIPs with potential retrofit sites • Looking for more retrofit sites via outreach • In public comment stage |
| Saint Paul, MN | <ul style="list-style-type: none"> • No study done to determine demand • Interview found a high demand for banking credits |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Based on feedback from the local development and building industry, the City worked collaboratively to allow for an off-site volume offset if retrofits are in the same watershed |
| Neuse River, NC | <ul style="list-style-type: none"> • N.C. Ecosystem Enhancement Program (NCEEP) identifies eligible projects from Restoration Priority Plans that are updated at least every 5 years • Analyzed problems and opportunities using GIS, field work, and stakeholder input • A Project Atlas for potential implementation projects was developed • Interview found the market difficult to judge; payments and mitigation projects occur where development is highest |
| MD Critical Area | <p>Draft update researched</p> <ul style="list-style-type: none"> • Offset program should have current watershed restoration inventory identifying priority retrofits for implementation • Locality should develop and maintain a retrofit registry for tracking • Registry tracks implementation status and P load reduction |
| Maine sensitive lakes | <ul style="list-style-type: none"> • Compensation fund for projects in the watershed • State will review inactive funds |

Table 2. Demand for off-site compliance versus site availability research summary.

| Location | Research Summary |
|----------|--|
| | <ul style="list-style-type: none">• Administrators encouraged to find additional funding, cost share, and in-kind or leveraging sources• Interview found low participation due to low development, difficult to find acceptable mitigation sites, and refund requests impacted state implementation ability |

Complying With the Baseline

Before a trading recipient is allowed to purchase credits or offsets, some programs require some baseline or minimum treatment level to be maintained on both the site generating and the site receiving the offset (the latter is addressed in the “Eligibility” section). Baseline requirements provide assurance that all participants achieve a minimum level of pollutant load reduction and are not currently impacting local water quality.

For the credit generator, credits are typically only given for documented reductions that would not have occurred in absence of the trade. In other words, the credits go above and beyond baseline compliance measures which otherwise are required through permits and regulations. This concept would, for instance, prevent a locality from claiming a credit for a practice that is required in its MS4 permit or through a TMDL. The argument is that the reduction is not offsetting a new load if it is supposed to happen anyway to meet waste load allocations or other numeric targets.

Examples of the application of a baseline are for Neuse River and MD Critical Area programs where mitigation project cannot be a regulatory nutrient removal requirement. The Chesapeake Bay TMDL, local TMDLs, and MS4 permit conditions may influence the baseline in the future.

Currency of Trade

Programs must establish the currency of trade, and this is likely dictated by the nature of the stormwater standards. For instance, many programs regulate export of nutrients or TSS and a growing number regulate the volume of runoff that must be managed (e.g., retention of the first 1-inch of rainfall). If enough is known about the costs of various practices, both nutrients and volume could conceivably be converted to dollars as a basis for a trade.

Table 3. Trading ratios research summary.

| Location | Research Summary |
|--|---|
| Washington, DC (program being developed) | <ul style="list-style-type: none">• Runoff volume |
| Saint Paul, MN | <ul style="list-style-type: none">• Runoff volume & TSS |
| City of Fredericksburg, VA (proposed) | <ul style="list-style-type: none">• Runoff volume |
| Neuse River, NC | <ul style="list-style-type: none">• Pounds of TP and/or TN |
| MD Critical Area | <ul style="list-style-type: none">• Pounds of TP |
| Maine sensitive lakes | <ul style="list-style-type: none">• Pounds of TP |

Trading Ratios

Some MS4 permit guidance exists for trading ratios. For instance, the WV MS4 General Permit specifies that, for the 1-inch retention standard, off-site compliance must achieve 1.5 X the volume reduction for the first 0.6 inches, and 2.0 X for the remaining 0.4 inches.

The research indicates that trading ratios build in a margin of safety based on factors such as performance of the offsite practice and lag times for realizing environmental benefits (e.g., planting trees for riparian restoration) Dennison et al. (2012) recommends a trading ratio of 2:1 or 3:1 for units of nutrient gained to units of nutrient needed.

| Table 4. Trading ratios research summary. | |
|--|---|
| Location | Research Summary |
| Washington, DC (program being developed) | <ul style="list-style-type: none"> • 1:1; 1 Stormwater Retention Credit = 1 gallon of retention for 1 year |
| Saint Paul, MN | <ul style="list-style-type: none"> • 1:1 for mitigation bank volume reduction (ft³) • 70% credit for off-site volume reduction (i.e., for the 1-inch on-site volume reduction standard, off-site projects must achieve an equivalent reduction of 1.3” inches) |
| City of Fredericksburg, VA (proposed) | <ul style="list-style-type: none"> • 1.5:1 for new development or 1.25:1 for redevelopment off-site volume offsets |
| Neuse River, NC | <ul style="list-style-type: none"> • None |
| MD Critical Area | <ul style="list-style-type: none"> • N/A |
| Maine sensitive lakes | <ul style="list-style-type: none"> • None |

Scale of Trading

Most guidance on the scale of trading uses terms such as “within the same watershed.” Some requirements are more specific, such that the mitigation practice must be within the same 12-digit hydrologic unit. Research indicates that the scale for the target area where the off-site practice is allowed varies. Target areas are often watersheds, river-basins, local jurisdictional boundaries (e.g., county or city), or determined by local regulations. There is a balance to having a scale of trading small enough to provide environmental benefit to the impacted area and large enough to provide suitable options (e.g., BMPs) to implement.

| Table 5. Scale of trading research summary. | |
|--|---|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • Within D.C. (62 mi²) • Interview found analysis done in DC’s 8 Wards using the highest land value and lowest value land use to prioritize practice implementation |
| Saint Paul, MN | <ul style="list-style-type: none"> • Same drainage/subwatershed area as project site • Funds spent within the local jurisdiction, to extent possible • If project site is in a Special Interest subwatershed, then on-site management required but off-site in the same Special Interest |

| Table 5. Scale of trading research summary. | |
|--|---|
| Location | Research Summary |
| | subwatershed considered |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Same watershed |
| Neuse River, NC | <ul style="list-style-type: none"> • Same 8-digit USGS cataloguing unit • If in Jordan and Fall nutrient strategy, then as required in their strategy • If in area where there will be concentrated loading increases, nutrient offset within 10-digit hydrologic unit |
| MD Critical Area | <ul style="list-style-type: none"> • Same subwatershed, which is the USGS 12-digit hydrologic unit code (i.e., about 15 to 65 mi²) |
| Maine sensitive lakes | <ul style="list-style-type: none"> • In drainage of eligible impacted lake watershed |

Kick Out Criteria

There may be some situations or sites where the offset or off-site mitigation option is not available due to regulatory requirements. This may apply within certain watersheds or pollutants (TMDLs, especially if the target pollutant is difficult to trade) or locations where there is concern that relaxing on-site controls would compromise local water quality and exacerbate downstream flooding (e.g., industrial facilities that must also receive a discharge permit). Based on the research, not all programs have kick-outs, but these are likely to develop as the programs mature.

Allowable Practices

Research for existing trading, credit, or offset programs outlines the management practice type allowed to take the place of the on-site stormwater management deficit by the “Tradee.” Several programs link the allowable practices to the regulatory manual associated with stormwater management in their area.

| Table 6. Allowable practices research summary. | |
|---|--|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • Practices or land cover changes must be DDOE-approved Stormwater Management Plan as per the Stormwater Management Guidebook for eligibility |
| Saint Paul, MN | <ul style="list-style-type: none"> • Money from fund goes to these options <ul style="list-style-type: none"> • project planning and engineering for construction of projects • construction of projects • Board evaluates projects as funds are available and prioritizes by the following criteria <ul style="list-style-type: none"> • In same watershed • Identified in watershed or planning documents • Includes multiple funders and collaborators |

| Table 6. Allowable practices research summary. | |
|---|--|
| Location | Research Summary |
| | <ul style="list-style-type: none"> • Quantity of stormwater treated • Cost per ft³ volume removed • Specific BMPs in the 2005 Minnesota Stormwater Manual • Interview found most common practice is street reconstruction projects where the City adds infiltration |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Unknown |
| Neuse River, NC | <ul style="list-style-type: none"> • BMPs, stream and wetland restoration, enhancement, and preservation allowed • Prioritize projects using watershed planning • Use feasibility and opportunity for watershed improvements • Use Project Atlas and link project restoration attributes to local watershed plan goals and objectives • Interview found that most projects are riparian buffers due to the low comparative cost • Interview found the least costly options were required (see also <i>Rates</i>) |
| MD Critical Area | <ul style="list-style-type: none"> • Appropriate local groups should review and select best offset opportunities. These include but are not limited to the following: <ul style="list-style-type: none"> • BMP construction • Retrofit BMP for improved pollutant removal • Reduce existing property IC • Additional innovative offset options (e.g., stream restoration, trash interception, wetland restoration, etc.) |
| Maine sensitive lakes | <ul style="list-style-type: none"> • Preferred practices are those that provide the following: <ul style="list-style-type: none"> • BMPs that permanently change from high to low P export in the land use • BMPs that treat runoff from high P export land use and preferably have low maintenance costs • Interview found projects to date are small, treat P in runoff (e.g., road repairs with stormwater management), buffers, and small LID practices |

Private Sector Involvement and Additional Partners

Using public private partnerships to set up a stormwater offset and banking program can leverage private investments for public benefits. The responsible regulatory program can establish guidelines for the private sector involvement using a standard operating program to establish successful criteria, practices, and protocols, similar to the standards that apply to wetland banks. Tracking the intended benefit to the actual benefit can provide a “checks and balances” for nutrient management. The research indicates that relating performance to financial incentives and disincentives can support compliance from the public sector as well.

In some cases (e.g., NC Neuse River), legislation mandates that private mitigation credits be purchased before publicly-generated credits. This prevents undermining of private initiatives, but can also hobble public mitigation programs.

| Table 7. Private sector involvement and additional partners research summary. | |
|--|---|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • Regulatory agency (DDOE) aims for the market to drive the credits, fee in lieu, and ultimately the majority of retrofit design and construction |
| Saint Paul, MN | <ul style="list-style-type: none"> • No private sector involvement • District administers the banking credits |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Unknown |
| Neuse River, NC | <ul style="list-style-type: none"> • Regulation promotes private sector to operate mitigation banks (S.L. 2009-337) • Regulation guides government entities seeking mitigation credits to purchase from private mitigation banks (S.L. 2009-334) • Interview found mitigation banking operable in some of the watershed and regulations undermines the Ecosystem Enhancement System (NC EEP) ability to direct mitigation projects |
| MD Critical Area | <ul style="list-style-type: none"> • Varies based on local jurisdiction |
| Maine sensitive lakes | <ul style="list-style-type: none"> • Private sector not involved • Seven Stormwater Administrators manage the fee program |

Rates

Determining the rate for the stormwater credit is an essential piece to all programs researched. Involving the private sector in buying and selling credits can allow the market to influence rates. For other programs, rates are set through models or computations that establish to cost to design, build, and maintain mitigation projects. In some cases, land costs must also be figured into the calculation. Rates can cover administration costs and other level of effort burdens determined in the offset and banking program. Programs such as NC and Washington DC have flexibility built into their program to re-assess rates on a regular basis. Building flexibility into a program can serve as safeguards for changes in the market or policy and unforeseen obstacles of the program.

| Table 8. Rates research summary. | |
|---|---|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • 1 SRC = 1 gallon of retention for one year (rate not determined yet) • In lieu fee based on 80 year obligation for 1.2 inch retention • Determined using national building data, capital maintenance costs, rates of interest, etc. |

| Table 8. Rates research summary. | |
|---|--|
| Location | Research Summary |
| | <ul style="list-style-type: none"> • Annual in lieu fee based on inflation and can be re-based |
| Saint Paul, MN | <ul style="list-style-type: none"> • Interview found that \$40,000 per impervious acre is the Stormwater Impact Fund's (SIF's) current rate, which is based on cost study for meeting the volume reduction standard • Interview found that to date no payments were made to the SIF • Board sets SIF contribution level annually • Cost cap for linear project's design, construction, and other associated costs |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Unknown |
| Neuse River, NC | <ul style="list-style-type: none"> • Use actual costs that are updated by EEP annually by 7/1 or as often as quarterly if actual cost rates increase $\geq 10\%$ • Special offset rates in select watersheds • Nutrient offset fees as of 7/1/11 are the following: <ul style="list-style-type: none"> • \$134.23/lb of P (Jordan Lake, Tar-Pamlico, and Neuse-Falls Lake watersheds) • \$21.64/lb of N (Jordan Lake, Neuse-Falls Lake, and Neuse-outside of Falls Lake) • \$13.38/lb of N (Tar-Pamlico) • \$12.28/lb of N (Neuse - 03020202, 03020203 and 03020204 8-digit watersheds) • Interview found that rates are based on relatively low-cost practices, such as riparian buffers on agricultural land. However, the rates are not adequate to cover costs for stormwater retrofits and BMPs, so few of these have been constructed. |
| MD Critical Area | <ul style="list-style-type: none"> • \$32,500/lb P • Offset fee should include construction inflation without re-enacting ordinance • Developer can find off-site retrofit project that achieves equivalent P removal |
| Maine sensitive lakes | <ul style="list-style-type: none"> • \$25,000/lb P export • Interview found cost was based on average cost to administer representative BMP that removes 1 lb/P from runoff |

Administration

A stormwater offset or banking system considers not only the environmental and community benefits but also considers the administration costs in dollars and level of effort. Based on the research, the administration duties include tracking and record-keeping associated with the following: (1) site selection list(s); (2) application (Tradee); (3) site or BMP selection; (4) appropriate BMP design, construction, and function; (5) fee or credit collection; (6) policy and

regulation changes or updates; (7) post construction compliance; (8) maintenance; (9) inspection and enforcement; (10) potential legal situations; and (11) additional considerations.

Some programs also specify that collected funds be spent within a certain timeframe, such as within 3 or 5 years or the current term of the MS4 permit. This is an important consideration because it is incumbent on the party responsible to construct BMPs to get them out on the ground in a timely fashion. While this sounds straight-forward, it involves administrative and fiscal finesse, as well as the ability to collect adequate funds from multiple sites to actually design and construct meaningful practices.

| Table 9. Administration availability research summary. | |
|---|--|
| Location | Research Summary |
| Washington, DC | <ul style="list-style-type: none"> • Currently drafting policy • Aim to streamline public and agency efforts • New policies and procedures will be needed • Altered fee in lieu program based on market projections that indicated fee in lieu may be predominate choice, therefore would have had the highest administrative burden |
| Saint Paul, MN | <ul style="list-style-type: none"> • District administers banking credits, provides list of qualified banking credits available, and keeps related records • Applicant and seller arrange buy/sell for volume reduction credits and provides District with form certifying sale • District has main permitting role but municipalities can assume more active role(s) |
| City of Fredericksburg, VA | <ul style="list-style-type: none"> • Unknown |
| Neuse River, NC | <ul style="list-style-type: none"> • NCEEP has a website interface for interested parties <ul style="list-style-type: none"> • http://portal.ncdenr.org/web/eep/online-financial-data • The NCEEP uses these mitigation procurement programs that are listed in order of preference: <ul style="list-style-type: none"> • Full Delivery/Bank Credit Purchase Program (private mitigation bank) • Existing Local Compensatory Mitigation Bank Credit Purchase Program • Design/Build Program – NCEEP contracts with a private entity to lead or implement the design, construction, and post-construction monitoring of mitigation at sites • Design-Bid-Build Program • Annual reports to the Interagency Review Team |
| MD Critical Area | <ul style="list-style-type: none"> • Local jurisdictions administer offset program that includes the following <ul style="list-style-type: none"> • Document why on-site compliance is not feasible • Tracking and reporting performance of offset program • Offset program should have the following accountability features: <ul style="list-style-type: none"> • Dedicated account |

| Table 9. Administration availability research summary. | |
|---|--|
| Location | Research Summary |
| | <ul style="list-style-type: none"> • Fiscal accountability • Watershed restoration inventory • Retrofit registry • Reversion clause: spend offset fees within 5 years |
| Maine sensitive lakes | <ul style="list-style-type: none"> • Stormwater Compensation Fee Administrators record and track the following criteria: <ul style="list-style-type: none"> • Receipts and procedure for fees • Annual reports to state (DEP) for work performed, administrative costs/year, and funds expended • Funds used in watershed received and spent within 3 years • Interview found that local agency has improved local knowledge compared to larger agency, can implement increased flexibility and efficiency, and provide funding more quickly |

Summary and Next Steps

This report highlights research from existing programs and information for the City of Baltimore’s Stormwater Offset and Banking System. Existing research points to a lack of programs that use offset programs relying on the private market to retrofit sites such as vacant lots and sell the credits to buyers such as the City of Baltimore. The proposed Stormwater Offset and Banking System is unique. The major program building blocks researched were eligibility to access off-site options, demand versus off-site availability, establishing a baseline, trading currency, trading ratios, scale of trading, kick out criteria, allowable practices, private sector involvement, rates, and administration. These considerations for the City of Baltimore can provide “lessons learned” so that common obstacles can be avoided.

In general, the research indicates that it is very challenging to establish a successful offset and banking program. Some of the common obstacles include:

- The regulatory structure authorizes offsets/trading, but the program does not pay adequate attention to actually establishing a functioning marketplace. Considerations such as ensuring adequate demand for credits and an adequate number of credit-generating sites are essential. Some programs may envision heavy private sector involvement, but the market signals to catalyze this involvement do not materialize.
- Setting the right rate is critical; too low a rate will disincentivize earnest attempts at on-site compliance, while high rates will discourage participation in the trading scheme. As a bottom line criteria, rates must be adequate to design, construct, and maintain mitigation practices, in addition to other potential costs, such as land acquisition.
- A major administrative challenge is the unpredictability of how quickly funds will accrue as related to the number of mitigation sites that can be constructed and the implementation timeline. A common programmatic and public relations issue occurs when the program accrues funds (one site at a time) but cannot demonstrate a suitable degree of project roll-out. In this regard, early successes are important, and it might be a

good practice to coordinate the trading program with the local government Capital Improvement Projects (CIP) for cost-sharing and quicker implementation of projects.

- These types of programs can quickly become very complex and it behooves a program to try to keep things simple and understandable for all involved parties. For instance, one-time payments may be easier to track and administer than annual payments. This is also related to accountability, as the program must be able to document that mitigation projects adequately offset unmet stormwater load/volume requirements for participating sites.
- To the extent possible, provide as much flexibility as possible on the mitigation strategies to employ, as long as “equivalency” with the trading currency can be established. Baltimore’s concept to restore vacant lots is a good one and mitigation may also include urban watershed forestry, riparian/stream restoration, and additional options.
- One important program step is to inventory, rank, and prioritize candidate restoration sites and compile these into a cogent plan, atlas, or registry. While GIS is a helpful tool to identify candidate sites, site visits are also important to verify that projects are feasible.

The Baltimore project should consider continuing this research as part of Task 1 of the project. The following research tasks should be considered:

- Research the cost of the range of mitigation practices to be included in the program. Costs can be researched from design and construction bids, program budgets (e.g., maintenance) and a literature search. Some type of costing tool (spreadsheet) should be considered to estimate costs for particular projects (including design, construction, and maintenance). This may be similar to performance bond worksheets currently used by many local governments.
- Establish scientifically-defensible equivalency between a range of mitigation practices and the trading units (e.g., cubic feet of water and/or pounds of P). This is straightforward for practices currently included in stormwater manuals that assign such performance values. However, “outside-the-box” practices should also be included and the methodology needs to be researched and developed.
- Dig a little deeper into the inner workings of a subset of the existing programs identified in this report (or other programs that emerge through subsequent research). This report identified common program elements, but does not fully vet the circumstances and policies that lead to either success or failure. It may be worthwhile to conduct several site visits to document program administration and mitigation practices that have actually been implemented.
- Conduct further research and meetings with the public and private parties that may be involved in generating and purchasing credits. It will be important to identify motivating factors and goals, and conditions by which each party would consider it advantageous (or even essential) to participate in the market. In some cases, it may be a good idea to include an economist that is familiar with this type of program in the discussions.
- Related to the bullet above, clarify regulatory program drivers and obstacles, both within City government and externally. Issues such as the baseline need to be explored, as well as possible collaboration with the CIP and other ongoing City programs (this item is already listed as Task 3 in the scope of work).

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Appendix A.

This list contains the professional contact for the researched areas. Additional experts and contacts exist for each area. This list is not exhaustive.

| Area | Contact Information |
|----------------------------|--|
| Washington, DC | <p><i>Program: District Department of the Environment: Stormwater Retention Credit (SRC) Trading Program</i> Brian Van Wye Environmental Protection Specialist District Department of the Environment Stormwater Management Division 1200 First St. NE, 5th Floor Washington, DC 20002 Phone: 202-741-2121 Brian.VanWye@dc.gov</p> |
| Saint Paul, MN | <p><i>Program: Capitol Region Watershed District Stormwater Management Alternative Compliance</i> Forrest J. Kelley EIT, Permit Program Coordinator Capitol Region Watershed District Office (651)-644-8888 forrest@capitolregionwd.org</p> |
| City of Fredericksburg, VA | <p><i>Program: City of Fredericksburg's Stormwater Management</i> Source: Tippet, J. 2010. "Two Cases: Changing Local Codes." Presentation at Rooftop to the Bay stormwater workshop. March 11, 2010. Staunton, VA.</p> |
| Neuse River, NC | <p><i>Program: NC EEP Nutrient Offset Payment Program (Neuse, Tar-Pamlico, Jordan, and Falls Lake watersheds)</i> Katie Merritt NC Department of Environment and Natural Resources Nutrient Offset Coordinator for Private Banks and EEP Katie.merritt@ncdenr.gov 919-807-6371</p> |
| MD Critical Area | <p><i>Program: MD Critical Area</i> Thomas R. Schueler Coordinator Chesapeake Stormwater Network 117 Ingleside Avenue Baltimore, MD 21228 410-608-7117 watershedguy@hotmail.com Visit the CSN website at www.chesapeakestormwater.net</p> |
| Maine sensitive lakes | <p><i>Program: Maine Lake Stormwater Compensation Fee (SCF) Program</i> Tony St. Peter Maine Lake Stormwater Compensation Fee (SCF) Program Maine DEP Division of Watershed Management 207-287-2116 tony.stpeter@maine.gov</p> |