CONSENSUS PROPOSAL
CORE ENVIRONMENTAL SITE DESIGN PRINCIPLES
For the implementation of the Maryland Stormwater Management Act of 2007
August 2007

Endorsed By:

1000 Friends of Maryland * Alliance for Sustainable Communities * Anacostia Watershed Society * Assateague Coastal Trust, Assateague Coastkeeper * Audubon Naturalist Society * Baltimore Harbor Waterkeeper * Chesapeake Bay Foundation * Chesapeake Environmental Protection Association * Chesapeake Stormwater Network * Chesapeake Sustainable Business Alliance * Clean Water Action * Coalition for Smarter Growth * Deer Creek Watershed Association * Environment Maryland * Friends of Harford * Green Building Institute * Herring Run Watershed Association * Jones Falls Watershed Association * Lower Western Shore Tributary Team * Magothy River Association * Maryland Aquatic Resources Coalition * MD League of Conservation Voters * Mid-Atlantic Council of Trout Unlimited * Natural Resources Defense Council * Octoraro Watershed Association * Patapsco River Conservation Association * Patuxent Riverkeeper * Port Tobacco River Conservancy * Potomac Conservancy * Potomac River Association * Severn Riverkeeper * Sierra Club, Maryland Chapter * South River Federation South Riverkeeper * St Mary's River Watershed Association Waterkeeper Alliance West/Rhode Riverkeeper

SUMMARY OF CORE PRINCIPLES

Maryland has been a national leader in stormwater management over the last two decades. We have sought to protect our streams that discharge to distinctly different waters: the Chesapeake Bay, the Atlantic Coastal Bays, and the waters of the Ohio River in Garrett County. Recent research, however, indicates that the job is not done, and a more aggressive stormwater approach is urgently needed to protect our streams from the impacts of expected future land development in the State[1]. Research and experience has also proven that widespread use of environmental site design (ESD) practices is an effective and economical way to mitigate the many impacts of land development [2]. The regulations should not become a barrier to smart growth or redevelopment of urban areas, but to the contrary should be compatible with these objectives and projects and enhance the benefits they provide. Regrettably, local progress in adopting ESD practices has been painfully slow across Maryland.

A consortium of watershed, environmental and advocacy groups in Maryland has worked together to craft a core list of principles to effectively implement the intent of the Stormwater Management Act of 2007 (HB 786). The recurring theme among the principles is to create accountability at the site, local and state level to increase the speed by which ESD practices are applied at development sites across the State. While the implementation of the principles will require a major shift in how land is developed, the consortium believes the principles to be scientifically sound, cost-effective and workable on the ground. ESD practices lend themselves to creative tailoring to site-specific conditions, including Maryland's wide variation in soils, vegetation and hydrology. The consortium challenges local elected officials and planners, stormwater managers, design engineers and state regulators to embrace these core principles and provide leadership to adopt and implement them at the state and local level. The consortium also actively seeks opportunities to review and discuss the core principles with the various local governmental agencies who will have direct responsibility for applying them.

Principle 1. Develop an ESD Ordinance that Truly Changes Local Codes and Culture:

The model Environmental Site Design ordinance should provide specific benchmarks as to what constitutes effective environmental site design practices as defined in Table1. The ordinance should require local governments to define the individual environmental site design practices they can currently offer and the specific development and redevelopment conditions where they apply within 90 days of passage. Local governments that fail to make systematic code changes within two years would lose their delegated authority for local stormwater and erosion and sediment control programs

Principle 2. Establish Increased Onsite Recharge and Runoff Reduction Volumes:

Both the regulations and the manual should define increased recharge requirements and define an operational runoff reduction volume to ensure that ESD practices must be used first to solve stormwater problems.

Principle 3. Require a Unified Early ESD Map:

Require a unified ESD map and plan at time of earliest development plan concept design to ensure they are incorporated into initial site layout.

Principle 4. Devise an Enforceable Design Process to Require ESD:

Both the regulations and the manual should require ESD as the first step in site design, promote the use of a treatment train and discourage the needless use of curb and gutter and large diameter storm drain pipes.

Principle 5. Establish Nutrient- Based Stormwater Loading Criteria:

The stormwater regulations should contain specific and numeric performance criteria to assure the aggregate nutrient load delivered to the Chesapeake Bay, the Atlantic Coastal Bays, and the Ohio River Basin waters from urban development is actually reduced over time. The regulations should establish a post-development phosphorus load limit of 0.25 lb/ac/yr for residential development and a 2.5 lbs/ac/year on total nitrogen load for all other forms of development.

Principle 6. Strengthen Performance Standards for ESD and Stormwater Practices:

Both the regulations and manual should contain stringent performance criteria for the design, installation and maintenance of all stormwater and ESD practices

Principle 7. Establish the Primacy of a Non-structural Approach to Erosion and Sediment Control and Post-Construction Stormwater Management:

Both the regulations and the manual should establish specific triggers to promote non-structural controls for permanent stormwater management and for construction. For permanent stormwater management, the regulations and manual need to maximize absorption of stormwater on-site through non-structural, planning-based methods including clustering, site fingerprinting, and sheet flow to forested buffers. For construction, the regulations and manual need to maximize use of: phasing, avoidance of work on steep slopes, clearing and grading restrictions, preservation of soils, retaining natural vegetative cover and trees and rapidly stabilizing soils during

construction. These measures are considered an integral element of environmental site design. .

Principle 8. Turbidity Standards for Construction Sites:

Streams in Maryland need more effective protections from construction site sediment pollution. The protections needed are of both a narrative and a numeric nature. The regulations should establish numeric turbidity standards for runoff leaving construction sites and should also prohibit visible off-site discharges of sediment. The regulations should also define a maximum three-day time frame for local governments to respond to citizen reports of erosion and sediment control problems and take appropriate enforcement action to correct them. Failure to adhere to the three-day time frame would constitute an actionable offense.

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Principle 9. Special Criteria for Sensitive and Impaired Waters of the State:

Both the regulations and the manual should define more stringent stormwater criteria to protect special watersheds and maintain the biotic integrity of sensitive aquatic resources in the State, including stormwater criteria to prevent thermal damage to the State's trout streams. In addition, the manual should contain more stringent criteria to reduce pollutant loads to 303(d) listed impaired waters of the State.

Principle 10. ESD Training, Certification and Enforcement:

The regulations should establish a mandatory system of professional training and certification for ESD practices by the end of 2008 to ensure that both designers and plan reviewers fully understand and correctly apply the new techniques. Existing Green Card training programs should be enhanced to provide training on installation and maintenance of ESD practices during and after construction. State and local enforcement training levels and staff sizes should be increased. Third-party private inspectors should be trained and certified to inspect construction sites for full compliance with erosion, sediment, turbidity, and ESD requirements.

Principle 11: Financing Implementation of the Act

The transition to ESD will require considerable financial and staff resources at the local and State level. We encourage the state to review the existing stormwater fee system as outlined in Title 2 of the Act to ensure that fees are updated to fully recover the costs of implementing the changes, including costs for expanded stormwater research, establishing an ESD training and certification program, and increasing compliance and enforcement staffing

SCIENTIFIC AND ENGINEERING RATIONALE FOR THE PRINCIPLES

Principle 1. Develop an ESD Ordinance that Truly Changes Local Codes and Culture

The model ESD ordinance should provide specific benchmarks as to what constitutes effective environmental site design practices, as defined in Table 1. The ordinance should also chart a pathway by which local governments are required to define the individual environmental site design practices they can currently offer and the specific development and redevelopment conditions where they apply within 90 days of passage. Further, communities should identify

the environmental site design practices they cannot currently offer because they would require a change in local codes, and embark on a process to change the codes within the first year. Failure to make code changes by this time would result in loss of delegation of the local stormwater and erosion and sediment control program. The ordinance should also specify incentives to encourage early adopters by granting faster permit review or reduced permit application fees for projects that maximize the use of ESD practices.

The community will annually submit the list of ESD practices it offers as part of its required municipal stormwater NPDES report, and report on progress made in changing local codes to add more. The ordinance (and the regulations) shall also state that stormwater and ESD practices must be fully considered at the earliest stage at which development plans are submitted or reviewed. If a community currently does not require concept design review, it shall modify its development review process to provide it in a timely manner.

Rationale: Progress in actually changing local codes to promote ESD has been extremely slow, despite consensus achieved in Baltimore, Harford, Frederick, Worcester and Cecil counties that they should be changed [3]. This principle would require communities to identify ESD practices that can be used right away, and the ones that require local code changes in order to enable their use later on.

Table 1 Environmental Site Design Benchmarks for the Model Ordinance

All Forms of Development

- Forest conservation planning
- Protect drainage features and zero order streams, and provide minimum-width buffers for perennial streams, wetlands, and shorelines
- Maximum clearing limits
- Construction phasing
- Site fingerprinting
- Mapping and preservation of the most permeable soil zones on the site
- Decompaction and reaeration of soils following clearing, grading and building phases
- Linear bioretention for transportation rights-of-way
- Other ESC measures as outlined in Principle 7

Lower Density Development

- Allow for cluster or open space designs that reduce lot size or setbacks in exchange for conservation of natural areas
- Reforest turf areas to maximize tree canopy
- Conserve forests, wetlands and other natural areas at the site with a target of 65% of site acreage to be covered with forest and/or other natural vegetation.
- Utilize clearing and grading restrictions, filter strips and native vegetation to disconnect impervious surfaces
- If used, storm drain pipes must not exceed a minimum pipe diameter for the prevailing land use
- Provide for controlled sheet flow to naturally-vegetated areas
- Maximum residential street width of 22 feet

- Maximum street right of way width of 45 feet
- Swales and other stormwater practices can be located within the right of way
- Maximum cul-de-sac radius of 70 feet with a bioretention island in the center
- Alternative turnaround options such as hammerheads are acceptable if they reduce impervious cover
- Grass swales or dry swales are preferred over curb, gutter and storm drain pipes over a range of slope and soil conditions
- Narrow sidewalks (or move pedestrian pathways away from the street entirely)
- Disconnect rooftops from the storm drain systems and treat roof and driveway runoff in dry wells, rain gardens or rain tanks
- Minimize driveway length, width and utilize permeable surfaces
- Keep total site imperviousness below 10% and design drainage so that there are no direct connections between impervious areas and storm drains and streams

Higher Density Development

- Design buildings and parking to have multiple levels
- Use rooftop runoff to irrigate landscaping or for water use
- Store rooftop runoff in green roofs, foundation planters, bioretention areas or cisterns
- Reduce parking lot size by reducing parking demand ratios and stall dimensions
- Use landscaping areas, tree pits and planters for stormwater treatment
- Use permeable pavers or porous concrete on spill-over parking areas, plazas and courtyards
- Filter or infiltrate parking lot runoff using bioretention areas.

Principle 2. Establish Increased Onsite Recharge and Runoff Reduction Volumes

Both the regulations and the manual should define increased recharge requirements and define an operational runoff reduction volume to ensure that ESD practices must be used first to solve stormwater problems. The current recharge volume (Re_v) in the 2000 manual should be tripled, and new criteria should be included that requires that 100% of the Water Quality Volume (WQv) must be treated by runoff reduction techniques capable of reducing the annual runoff volume from a site through a combination of infiltration, evaporation, water reuse, extended filtration or evapotranspiration.

Rationale: More stringent recharge and runoff reduction requirements are needed to force designers and plan reviewers to maximize use of ESD practices. Also, a higher recharge requirement can reduce reliance on extended detention ponds for downstream channel protection. While the 2000 regulations instituted a modest recharge requirement, it is not enough to meet predevelopment hydrological objectives. The existing manual also gives insufficient attention to the role of vegetation and intact, natural soils in absorbing and attenuating stormwater through a range of hydrologic functions.

It is proposed that recharge requirements be tied to development intensity and not just soils (i.e., greater recharge requirements be imposed for low and moderate density residential development where it works best.). Also, the regulations should clearly specify vegetation and soil protection and restoration measures to maintain soil recharge rates, by using vegetation to anchor natural soils, and by reducing soil compaction and disturbance during construction[4]. The manual should also provide guidance on remediation of compacted soils after construction by soil amendments within lawns and landscaping areas.

Since recharge techniques are often not practical or applicable to urban redevelopment zones, these portions of the regulations should be more flexible when applied to urban redevelopment; however, other, non-infiltration on-site runoff reduction techniques including bioretention, evapotranspiration, filtration and reuse can and should generally apply to urban redevelopment projects.

Manual Improvements: The manual will need to include a model or computational procedure to document compliance with the proposed new recharge and runoff volume reduction requirements, outline minimum site soil testing requirements and present minimum specifications for vegetation and soil protection and recovery practices. These specifications should include details on infiltration, filtration, and evapotranspiration rates, bioretention, water storage capacities, and other details of a wide range of vegetation types and species, natural and engineered soils, and standard and proprietary on-site stormwater management techniques and devices.

Principle 3. Require a Unified Early ESD Map

Require a unified ESD map and plan at time of earliest development plan concept design to ensure they are incorporated into initial site layout.

Rationale: ESD can only work if it is considered early in the design process and is fully integrated with site design and protected environmental features. The basic idea is to integrate all state and local environmental development regulations into a single ESD package (stormwater, ESC, forest conservation, buffers) and add new site mapping requirements to delineate soils suitable for recharge and zero order streams. The goal is to ensure every site planning, resource protection and environmental site design opportunity is considered before any serious stormwater engineering begins.

Regulatory Language: Regulations would include specific language requiring submittal and review and approval of the ESD plan at the earliest stage of local development approval and that it would be binding throughout the remaining design and approval process. The ESD plan and map would be publicly available throughout the design review process, and any amendments or changes would constitute a special exception.

The regulations would outline the specific minimum features to be shown on the plan and map, including:

- Site footprint including impervious cover, turf cover and forest cover [5]

- Mapping of existing topography and the drainage and stream network including zero-order streams
- On-site soil testing to identify priority infiltration, recharge and soil conservation areas
- Designation of whether the site is located in a special watershed or receiving water, or is designated as a stormwater hotspot
- Location of any stream, shoreline or wetland buffers, wetlands, steep slopes, forest conservation areas and proposed reforestation areas
- Initial nutrient load reduction computations for the treatment train used at the site
- Certification that the full list of locally approved ESD practices have been explored at the development site
- A decision tree that outlines that ESD practices were thoroughly evaluated and maximized at the site
- Decision tree to require that if specific ESD practices are rejected as inapplicable, a specific rationale for failure to employ them would be required and would be subject to review and approval or disapproval.

The ESD plan should also specify whether the proposed land use or operation contained in a development plan will be designated as a stormwater hotspot and merit special stormwater treatment and pollution prevention measures [13]. Stormwater hotspots produce higher pollutant concentrations that other sites and have a greater risk of spills, leaks or illicit discharges**.** The regulations should also delegate the authority to local communities to take enforcement actions to identify and correct existing stormwater hotspots.

Local plan reviewers would conduct a coordinated review of both the stormwater and erosion and sediment control concept plans at this early stage of development review.

Manual Improvements: Include a sample ESD plan and several site design examples that show how the various elements of ESD can be integrated to comply with regulations.

Principle 4. Devise an Enforceable Design Process to require ESD

Both the regulations and the manual should require ESD as the first step in site design including a decision tree that outlines that ESD practices were thoroughly evaluated and maximized at the site, promote the use of a treatment train and discourage the needless use of curb and gutter and large diameter storm drain pipes.

Rationale: The 2000 manual introduced limited stormwater credits to promote the use of better site design and LID practices, but very few communities in the State have encouraged their use. Under the proposed ordinance described in Principle 1, communities will need to define within 90 days the suite of ESD practices that will presumptively apply to development and redevelopment projects. In addition, the regulations should prohibit use of large storm drain pipes that exceed a threshold pipe diameter for the prevailing land use, and should prohibit or at least discourage curb and gutter designs for new greenfield developments.

Manual Improvements: Provide more detail on existing and new ESD practices such as green roofs, soil amendments, buffer expansion, dual use rain tanks, permeable pavers, expanded tree pits, linear bioretention swales in road rights-of-way, etc.

Principle 5. Establish Nutrient- Based Stormwater Loading Criteria

The stormwater regulations should contain specific and numeric performance criteria to assure the aggregate nutrient load delivered to the Chesapeake Bay and Atlantic Coastal Bays from urban development is actually reduced over time. Current and future nutrient loading reduction requirements pertaining to the Ohio River basin waters of Garrett County should also be examined, and numeric performance criteria derived pertaining to this geographic region. The regulations should establish a post-development phosphorus load limit of 0.25 lb/acre/yr for low and moderate density residential development and a 2.5 lbs/acre/year limit on total nitrogen load for all other forms of development.

Rationale: The current approach does not contain an accountability mechanism to ensure development projects really meet watershed objectives to protect the Chesapeake Bay, Atlantic Coastal Bays, Garrett County's waters of the Ohio, and their network of tributary streams. Stormwater science has evolved enough in recent years so that numeric stringent performance standards can be defended and achieved [6].

This requirement effectively does four things. First, it directly links performance at development sites to the Chesapeake Bay, Atlantic Coastal Bays, and waters of the Ohio. Second, the nutrient load requirement is so stringent that it cannot be met unless a maximum effort is made to incorporate ESD at most sites. Third, it sets forth a defensible and scientific standard for the performance of ESD and stormwater practices, which until now has been lacking. Lastly, it meets the intent of HB 786 to "minimize pollutants in stormwater runoff" and to encourage "watershed-wide analysis to prevent undesirable downstream effects of increased runoff."

Operationally, developers would have to compute their excess nutrient load after development, demonstrate how ESD practices would reduce these loads and demonstrate compliance with an on-site stormwater treatment train. The computational method for determining nutrient removal rates would be outlined in the stormwater manual, and would be reviewed and verified by the local stormwater plan reviewer.

A phosphorus load reduction requirement has been in place in the MD Critical Area for nearly a decade [7] (0.45 lbs/acre/year). The proposed new requirement would apply statewide, and is similar to proposed nutrient stormwater regulations under consideration in the State of Virginia. The phosphorus limit would also greatly strengthen the current Critical Area stormwater requirements.

Manual Improvements: Create a simple and verifiable computational system for nutrient reduction to document compliance at every development site. Such a system is under development in the State of Virginia [8], and with some modification, could be quickly implemented in Maryland.

Principle 6. Strengthen Performance Standards for ESD and Stormwater Practices

Both the regulations and manual should contain stringent performance criteria for the design, installation and maintenance of all ESD and stormwater practices.

Rationale: Although the 2000 manual advanced the design of many practices, it does not reflect new research and experience on what makes them function effectively. Extensive revisions are immediately needed to improve the performance and longevity of all existing practices (with some practices to be dropped) and include new ESD practices. The regulations should:

- Establish a specific deadline to update the manual by June 2008
- Reference the most current edition of the design manual as the authoritative version
- Require the design manual be updated every three years to reflect new research and field experience
- Establish an ongoing and independent technical committee that will actively seek public comment and input and recommend specific changes in the design manual

Manual Improvements: Numerous changes are needed to bring the manual up to date. Among them are:

- Enhanced design specifications for small infiltration, green roofs, expanded stream buffers, permeable pavers, reforestation, bioretention, wooded wetland and coastal plain outfall practices [9]
- Expand bioretention specifications and standards including upgrades to the existing general bioretention standard, and also a separate, linear bioretention standard for application to transportation rights-of-way
- Incorporating the design point method to award or deduct points to adjust individual BMP removal rates to account for design features and site conditions [10]
- Manual should be re-ordered to present ESD practices first, on-site practices next, and put ponds last
- Provide more specific maintenance requirements for on-site practices

Principle 7. Establish the Primacy of a Non-structural Approach to Erosion and Sediment Control and Post-Construction Stormwater Management

Both the regulations and the manual should establish specific triggers to promote non-structural controls for permanent stormwater management and for construction. For permanent stormwater management, the regulations and manual need to maximize absorption of stormwater on-site through non-structural, planning-based methods including clustering, site fingerprinting, and sheet flow to forested buffers. For construction, the regulations and manual need to maximize use of: phasing, avoidance of work on steep slopes, clearing and grading restrictions, preservation of soils, retaining natural vegetative cover and rapidly stabilizing soils during construction. These measures are considered an integral element of environmental site design, and are aimed primarily at new development in greenfield settings, though certain rural

or suburban redevelopment settings (such as conversion of a golf course to a residential subdivision) also can utilize non-structural approaches.

Rationale: Current stormwater and sediment regulations and manual tend to emphasize structural solutions at the expense of non-structural ones. These need updating to make sure site planning opportunities are exhausted before designing an engineering solution. Currently, the State ESC regulations and erosion control manual are separate from the stormwater regulations and manual. It is also suggested that a new chapter be added to the stormwater manual on integrating erosion and sediment controls. The updated regulations and manual should contain the following provisions:

- Ensure that the limits of disturbance shown on ESC and stormwater management (SWM) plans are inclusive and consistent, and prevent construction equipment from entering within15 feet of the limits of disturbance around streams, natural drainage features, stream buffers, soil recharge areas, wetlands, and forest conservation areas.
- Allowing clearing only within 15 to 25 feet of the building and transportation footprint for low-density development. Set numeric limits on the maximum percentage of clearing allowed at low density development
- Minimum site area where construction phasing or sequencing must be used
- Minimum 24 hour period of time to protect exposed soils through hydro-seeding or straw mulch w/ tackifiers (non-growing season)
- Require advanced stabilization techniques such as geotextile erosion control mats and blankets, mulch and turf reinforcement for soils at high risk for erosion
- Maximum slope of 15% that can be graded
- Limit the maximum drainage area to individual sediment basins or traps to no more than 3 acres
- Prohibit direct discharge to streams by sediment traps and basins, and require that discharges to stream buffers be modified by level spreader or other device to filter runoff prior to the stream
- Prohibit disturbance of more than 5 acres of a site during the non-growing season
- Establish an upper limit on the percentage of soils that can be exposed to erosion at any one time during the growing season.
- Limit total site imperviousness for development sites to less than 10% of total site acreage.
- Reduce total site imperviousness, or increase stormwater quality treatment, for redevelopment sites by at least 50%.[*]

Principle 8. Turbidity Standards for Construction Sites

[*] If a developer can demonstrate that it is not technically feasible to reduce imperviousness or increase stormwater quality treatment by at least 50% for a given redevelopment site, MDE may allow the attainment of an alternative standard not less than 30%.

Streams in Maryland need more effective protections from construction site sediment pollution. The protections needed are of both a narrative and a numeric nature. The regulations should establish numeric turbidity standards for runoff leaving construction sites and should also prohibit visible off-site discharge of sediment. The regulations should also define a maximum three day time-frame for local governments to respond to citizen reports of erosion and sediment control problems and take appropriate enforcement action to correct them. Failure to adhere to this time frame would constitute an actionable offense.

Rationale: Numeric enforcement criteria are needed to define what constitutes an egregious water quality violation at construction sites and provide a technical criterion to measure the effectiveness of erosion and sediment control practices. Erosion and sediment control continues to be extremely variable in communities across the state. This section of the regulations would finally establish definitive criteria as to what constitutes a direct sediment control violation and a maximum complaint response time for both the developer and the local government to correct it.

The regulatory language would establish simple thresholds to define a sediment control violation at construction sites (e.g., digital photos and numeric turbidity reading greater than 200 NTUs –dropping to 100 NTUs by 2012 and 25 NTUs by 2015 [11].limit of 150 NTUs (Nephelometric Turbidity Units) as an instantaneous maximum and 50 NTUs as a monthly average and would prohibit visible sediment in water discharged from the site.[11] The regulations should also define a maximum three-day time frame for local government response and resolution of sediment control complaints, after which failure by a local government to take effective enforcement action would constitute an actionable offense.

Principle 9. Special Criteria for Sensitive and Impaired Waters of the State

Both the regulations and the manual should define more stringent stormwater criteria to protect special receiving waters and maintain the biotic integrity of sensitive aquatic resources in the State. In addition, the manual should contain more stringent criteria to reduce pollutant loads to 303(d) listed impaired waters of the State. Temperature criteria to protect Maryland's Eastern, Central, and Western trout streams must be a high priority for this effort. Trout streams are highly vulnerable to heat pollution from inadequately-controlled stormwater discharges. Much more stringent, infiltration-based ESD stormwater practice selection, sizing and performance criteria should be developed by MDE and required for application to all Use III (Natural Trout) and Use IV (Recreational Trout) waters in Maryland.

Rationale: The current regulations and manual only contains limited provisions to protect sensitive receiving waters. It is proposed that the regulations contain more specific criteria that govern the sizing, selection and restrictions for stormwater practices in watersheds that drain to sensitive receiving waters.

These include, but go beyond the quantitative and qualitative ESD recharge and on-site volume reduction requirements that apply to all development and redevelopment sites. Specifically, the regulations or manual would include new sections that outline specific design requirements for each of following sensitive receiving waters:

- Eastern and central brook trout streams
- Western brook trout streams
- Discharges to tidal and non-tidal wetlands
- Drinking water reservoirs
- Coastal creeks and tidal guts
- Swimming beaches and shellfish harvesting areas

In addition, the regulations or manual should outline the procedures for no net increase of specific pollutants for any impaired waters defined under the MDE 303(d) list. In many cases, the nutrient-based stormwater criteria described in Principle 5 should be sufficient to meet the no-net increase for the impaired water, but the regulations should require that an analysis be done to confirm it.

Documented scientific studies indicate that brook trout will die with short exposure to water at 72 degrees Fahrenheit and brown and rainbow trout die with short exposure to water at 82 degrees Fahrenheit.[2] Current stormwater management regulations allow for 12 hour extended detention in Use III waters even though the states own studies show that this technique violates temperature standards for both Use III and Use IV waters. Infiltration of the hot runoff that occurs at the onset of summer storms is necessary to protect trout streams from thermal impacts. Impervious surfaces that become heated in the summer will superheat the first flush of runoff that flows off these surfaces.

Manual Improvements: Several state stormwater manuals and other design resources outline the needed design criteria for each of the watershed receiving water conditions noted above [12]. The other key concern is developing better stormwater criteria and practices that work in the varying regions of Maryland, including the western Maryland brook trout streams as well as the flat terrain and high water table conditions of the Maryland coastal plain (the existing manual is biased toward practices that work best in the piedmont region).

MDE needs to promulgate a scientifically-based minimum infiltration requirement to protect trout streams from the thermal impacts of stormwater discharges. Scientific literature reviews need to examine whether a requirement to infiltrate the first full inch of rainfall from each storm would be adequate statewide to protect Use III and IV waters. Also, to the extent that ponds continue to be used as part of stormwater management plans, they can cause thermal exceedances particularly in the summer months. Some of these impacts can be mitigated to some extent by shading impervious surfaces. Thermal pollution is a lethal problem for trout waters in Maryland and some serious research and monitoring of potential solutions is urgently needed.

[2] Maryland's water quality criteria for temperature are: 90 degrees F for Use I (general aquatic life protection); 68 degrees F for Use III and 75 degrees for Use IV.

Principle 10. ESD Training, Certification and Enforcement

The regulations should establish a mandatory system of professional training, certification and enforcement for ESD practices by the end of 2008 to ensure that both designers and plan reviewers fully understand and correctly apply the new techniques. In addition, existing Green Card training programs should be enhanced to provide training on installation and maintenance of ESD practices during and after construction. The training and staffing of inspection and enforcement staffs should be expanded and enhanced at the state and local levels.

Rationale: A new stormwater system cannot be implemented until local plan reviewers and design consultants fully understand it and are confident on how to apply it to real world sites. Certification is now required for stream restoration, agricultural nutrient management plans, erosion and sediment control and even forest conservation plans…but not for environmental site design or stormwater treatment. The regulations should specify by 2008 that all plan reviewers and design consultants successfully attend a minimum number of hours of professional training to be certified to submit or review proposals. The regulations should set a time-table for developing the training and certification program, and allow it to be administered by a third party. Integration of construction sediment control and ESD, with all other site-level environmental requirements should also be addressed within this certification program.

Enforcement activities will need to be expanded under these new stormwater regulations, and upgrades are needed in both the governmental and the private sectors. On the governmental side, adequate, ongoing training of additional enforcement staff at the state and local level needs to happen and be built into annual operating budgets. On the private side, MDE should explore innovative ways to provide additional inspection and enforcement authority for third-party inspectors, as is done under the Certified Construction Reviewer program in Delaware. MDE should certify consultants for enforcement under a rigorous new program that they should develop**.** The developers should be required to hire their own third-party inspectors who are trained and certified by MDE. Inspectors will be required to send written reports of inspections to MDE. Any inspector who doesn't do an adequate job can lose his/her certification. This new system gives MDE the "hammer" to maintain the quality of enforcement, creates jobs in the private sector, and remedies a significant part of MDE's perennial staffing shortfall.

Principle 11. Financing Implementation of the Act

The transition to ESD will require considerable financial and staff resources at the local and State level. We encourage the state to review the existing stormwater fee system as outlined in Title 2 of the Act to ensure that fees are updated to fully recover the costs of implementing the changes, including costs for expanded stormwater research, establishing an ESD training and certification program, and increasing compliance and enforcement staffing

Rationale: There are still some data gaps about the performance of both innovative and traditional ESD practices that are partially the result of a funding gap for performance monitoring. Opponents are quick to seize on these gaps as an excuse to not accept new practices. No organized monitoring system currently exists in the state to conduct needed stormwater research and feed it back into the design process. Fees charged by the State should finance a monitoring program to evaluate the real world performance of innovative ESD practices, and the downstream, cumulative effects of such practices. The resulting performance monitoring data would then be used to revise future editions of the stormwater manual.

Similarly, the fee structure should be revised to provide full support for the ongoing ESD training and certification program and increased staffing needed for compliance monitoring and enforcement.

Notes:

[1] See Center for Watershed Protection. (2003). Impacts of impervious cover on aquatic ecosystems. *Watershed Protection Techniques Monograph No. 1*. Schueler, T. (2004). An integrated framework to restore small urban watersheds. Appendix A. Manual 1. *Small* W*atershed Restoration Manual Series*. Center for Watershed Protection. Ellicott City, MD. Cohn-Lee, R. and D. Cameron (1992) Urban Stormwater Runoff Contamination of the Chesapeake Bay: Sources and Mitigation. *The Environmental Professional*. Volume 14 pp. 10-27.

[2] Numerous reports have documented the cost effectiveness of ESD practices in comparison to conventional stormwater management systems utilizing large diameter storm drain pipes. See Alexander, D. and J. Heaney. (2002). Comparison of conventional and low impact development drainage designs. Final Report to the Sustainable Futures Society. University of Colorado, Boulder, CO. Center for Watershed Protection (1998a). Nutrient loading from conventional and innovative site development. Ellicott City, MD, Center for Watershed Protection (1998b). Better Site Design: A handbook for changing development rules in your community. Ellicott City, MD. Huber, W. L. Cannon and M. Stouder. (2006). *BMP Modeling Concepts and Simulation.* Oregon State University Corvallis, Oregon. U.S. Environmental Protection Agency. EPA/600/R-06/033. Kloss, C. and C. Calarusse. (2006). Rooftops to rivers: green strategies for controlling stormwater and combined sewer overflows. Natural Resources Defense Council. Washington, DC and Lloyd et al (2002). Water sensitive urban design: a stormwater management perspective. Cooperative Research Centre for Catchments. Monash University, Victoria 3800 Australia. Industry Report 02/10. Southwestern Illinois Resource Conservation & Development (2006) *Conservation Subdivision Design Handbook*. Conservation Research Institute (2005) *Changing Cost Perception*s – an analysis of conservation development. www.nipc.org/environment/sustainable/conservationdesign/cost_analysis/

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[10] see Appendix B for design point method in Schueler et al. (2007). Stormwater Retrofit Practices. Manual 3. *Small* W*atershed Restoration Manual Series*. Center for Watershed Protection. Ellicott City, MD.

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[14] See Winer, R. 2003. *Critical area 10% rule guidance manual: Maryland Chesapeake and Atlantic Coastal Bays.* Maryland Department of Natural Resources. Critical Area Commission, Annapolis, MD

[15] The technical backup for deriving a watershed-based stormwater fee-in lieu is described in Winer, R. (2003). *Critical area 10% rule guidance manual: Maryland Chesapeake and Atlantic Coastal Bays.* Maryland Department of Natural Resources. Critical Area Commission, Annapolis, MD. Some of the practical realities in administering a fee-in-lieu program are outlined in RTI International. (2007). A study of the costs associated with providing nutrient controls that are adequate to offset point and nonpoint discharges of nitrogen and other nutrients. Final report to the North Carolina Environmental Review Commission.

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