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Development Policies and Guidelines

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This document was developed by the Baywide Population Growth and Development Commitment Team in response to a commitment made in the 1987 Chesapeake Bay Agreement. It was reviewed by state agencies, local governments, regional planning agencies, the Local Government Advisory Committee, and private groups. It was originally printed as an Agreement Commitment Report from the Chesapeake Executive Council with funding provided through Virginia's Coastal Resources Management Program (VCRMP). VCRMP funding comes from the Coastal Zone Management Act of 1972, as amended, and administered by the Office of Ocean and Coastal Resources Management, National Oceanic and Atmospheric Administration. (Grant Number NA87AA-D-CZ092).

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COMMONWEALTH of VIRGINIA

Council on the Environment

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To the Reader:

This document was created jointly by the Commonwealths of Virginia and Pennsylvania, the State of Maryland, the District of Columbia, and the Federal Government to provide guidance to their agencies in the development of projects which they undertake or fund. The Chesapeake Executive Council, recognizing the ever increasing consequences of population growth and development on the environment of their jurisdictions, wanted a method for assuring that their governments would provide leadership in this important arena.

Virginia has provided copies of these Policies and Guidelines to all state agencies and is institutionalizing them statewide into the Commonwealth's construction procedures. They are available upon request by calling the Council on the Environment at (804) 786-4500.

Sincerely,

Keith J. Buttleman

Keith J. Buttleman

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CHESAPEAKE BAY WATERSHED DEVELOPMENT POLICIES AND GUIDELINES

INTRODUCTION

Background

Population projections prepared by Pennsylvania, Maryland, Virginia, and the District of Columbia indicate that the Chesapeake Bay watershed will experience a 20 percent population increase amounting to more than 2.6 million new residents in the next 30 years. Further, the majority of this population will settle in areas on or near the Bay or its more important tributaries and their sub-basins. The provision of housing, places to work and shop, and the water, waste treatment, roads, power, and landfills to support this growth will bring enormous change to the landscape. The housing, employment, infrastructure, and recreational facilities needed to accommodate this new population must be accomplished with far greater sensitivity to the environment than has been the case in recent decades. Otherwise our air, land, water, and wildlife resources will suffer increasing degradation, and our costs will continue to accelerate. For both environmental and economic reasons, we must build on what is already in place before disturbing new land. When new areas are developed, it must be with much greater efficiency and forethought than is reflected in our present practices.

To protect the water quality and living resources of the Bay, selection of the most suitable location for development is of utmost importance. Some areas are more conducive to development than others, and some lands are not conducive to development at all. It is critical that land use change and economic development take place only within suitable locations. In addition, the appropriate siting, design, construction, and operation and maintenance of devel-opment and its associated utilities, and facilities are critical to protect the Bay's resources. This must take place not just along major tributaries and the Bay shoreline but upstream and in the smaller watersheds of the region. These actions are essential to prevent direct, indirect and cumulative adverse impacts on the environment from land use change. If this is done, not only will the Bay benefit but every community throughout the watershed will have improved its streams and rivers, protected its habitat areas, and enhanced its quality of life.

Without an increased commitment to undertaking development in an environmentally responsible manner, the hundreds of millions of dollars that have been and will be spent to restore and protect the Bay will not accomplish their purpose. Furthermore, future residents of the watershed will experience a vastly reduced quality of life. *The Chesapeake Executive Council is firmly convinced that prevention of environmental degradation is a far more successful strategy than the mitigation of adverse impacts and the reclamation of resources.*

Therefore, in drafting the 1987 Chesapeake Bay Agreement the Council expanded considerably upon previous interstate Bay restoration activities and recognized the significant impacts that population growth and development have on the water quality and

living resources of the Bay. The Population Growth and Development section of the Agreement mandates that state and federal governments "assert the full measure of their authority to mitigate the potential adverse effects of continued growth" while recognizing that local jurisdictions are responsible for many of the day-to-day decisions affecting the Bay. Further, local governments must be given the support of state and federal resources and the benefit of a state/local partnership in the implementation of environmentally sensitive development.

The goal of the Population Growth and Development section of the Agreement is to: "Plan for and manage the adverse environmental effects of human population growth and land development in the Chesapeake Bay Watershed." This document is a response to that commitment of the Agreement which promises:

> *By January 1989, to adopt development policies and guidelines designed to reduce adverse impacts on the water quality and living resources of the Bay, including minimum best management practices for development and to cooperatively assist local governments in evaluating land use and devel- opment decisions within their purview, consistent with the policies and guidelines.*

In response to this Commitment, the Chesapeake Executive Council adopts this document and agrees that these Chesapeake Bay Development Policies and Guidelines:

- will be required for all development projects undertaken by their governments' agencies and institutions and for all projects receiving their governments' financial support;
- will be applied throughout the Chesapeake Bay watershed of their jurisdictions; and
- will be considered by state and federal regulatory agencies in their decision making, as they are able under law.

Further, the Chesapeake Executive Council members agree that they must:

- encourage local governments to use these Policies and Guidelines in reviewing and evaluating public and private projects within their jurisdictions;
- provide technical assistance and financial support for this purpose; and
- disseminate this document and additional educational materials to private sector development interests and others and assist them in understanding its contents in order that they might better contribute to improving the Bay.

Finally, given the differing legal histories of the several participating jurisdictions, barriers to the use of some of these Policies and Guidelines may exist. The Chesapeake Executive Council members agree to identify barriers that hinder the initiation of an effective development strategy within their jurisdictions and to act to remove them.

Any endeavor of this kind must be evaluated regularly both as to compliance and effectiveness. It is critical that the activities undertaken as a result of this initiative be assessed as follows:

- the extent to which the signatory jurisdictions have implemented the adopted policies;
- the degree to which the Policies and Guidelines appear to be benefiting water quality and living resources; and
- the appropriateness of the recommended guidelines and practices, given advances in knowledge and changes in technology.

These evaluations will be undertaken and a report made to the Chesapeake Executive Council by December 1991.

IMPACTS OF DEVELOPMENT ON WATER QUALITY AND LIVING RESOURCES

The relationship between land and water is clear. By the natural forces of wind, rain, and gravity, what is on the land will enter the water unless barriers and filters are present. Within the Chesapeake Bay watershed, land uses therefore can be divided into two basic categories: those that tend to protect the Bay's waters and living resources and those that cause them to deteriorate. Forests, permanently vegetated fields, and wetlands are examples of the former; they retain or filter natural runoff. Most uses associated with human activities to some degree or another fall into the latter category. These activities (paving, digging, clearing, and grading, for example) can alter the natural water retention characteristics of the land, causing excessive amounts of polluted water to reach ground water, streams and rivers, and the Bay. The extent of degradation depends on many factors including proximity to the Bay or its water sources, type of activity, and the characteristics of the disturbed land.

Consequences of Development

Development projects, which include housing, shopping centers, office parks, street and highway projects, recreational facilities, and other activities, alter the natural vegetation, slope, and water retention characteristics of the land, and produce three major types of pollutants: sediments, nutrients, and toxics.

All too often, development practices strip the land of the absorbing capacity of its natural vegetative cover and replace it with impermeable surfaces which preclude water from seeping into the soil. This prevents the pollutants in the runoff from being filtered out before they enter the waterway. It also causes the water to flow in large volumes and with increased speed into storm sewers or streams. Fast moving water scours the surface of the land- scape, increasing stream bank erosion, gouging open gullies, and carrying along soils; it flushes toxics, decaying materials, and animal wastes from urban surfaces and may deposit these materials directly into water courses. In addition, when a large volume of storm water enters urban sewer systems, it may overwhelm the capacity of a facility causing the storm water to combine with the sewer water, bypass the sewage treatment facility, and overflow directly into rivers and the Bay.

Sediments

Sediments are eroded soils and other materials that are transported from the land into rivers and the Bay or which are subsequently resuspended in the water from river beds or the Bay bottom. It is the presence of sediments in the water that gives it an unclear (turbid) appearance. Turbid water blocks sunlight which is needed in the growth of submerged aquatic vegetation (SAV) whose beds constitute important habitat for young crabs and many finfish. In addition, the small pieces of material in such water (particulates) can clog the gills of small fish and invertebrates. Turbidity can also cause water temperature to rise to the point where it is no longer an appropriate environment for some sensitive

species. When sediment settles out of the water, it changes the character of the river bed or Bay bottom. By covering the natural bottom it can prevent adequate oxygen exchange or inhibit the movement of bottom dwelling species. Further, sediment deposited on oyster beds not only smothers the oysters, it also eliminates the hard, clean surfaces on which the young oysters (spat) set.

Toxics

Toxic substances--chemicals and heavy metals that are released into the Bay and its tributaries--can severely damage life forms, especially in their immature stages. Benthic diversity, abundance, and community structure are all harmed by toxic contamination in sediments. The concentration (bioaccumu-lation) of heavy metals and toxic organic compounds in the tissue of shellfish and finfish is closely related to the high concentration of those materials in Bay waters and sediments. This bioaccumulation increases in higher orders of the food chain and in older individuals within a species, thus posing a potential health hazard to those consuming them. In addition, toxic chemicals pose an additional localized threat to SAV beds. (A separate commitment of the 1987 Chesapeake Bay Agreement, the Toxics Reduction Strategy, addresses the overall issue of toxics in the Bay.)

Nutrients

Nutrients such as nitrogen and phosphorus are essential for plant growth. However, in excess, they can degrade water quality and destroy living resource habitats. This is just what occurs in a variety of direct and indirect ways when too many nutrients spur the growth of algae which interfere with light penetration of the water, contribute to low oxygen levels, and alter the food and resources available to other organisms. This in turn impacts submerged aquatic vegetation, fish, oysters, and waterfowl, among other organisms. Reducing these impacts through the control of nutrients into the Chesapeake Bay watershed is a major objective of The Baywide Nutrient Reduction Strategy, another commitment in the 1987 Chesapeake Bay Agreement.

Potentially Polluting Land Development Activities

Clearing Land

Increased nonpoint source pollution results from essentially all intense land uses, including development. The conversion of land from less intensive to more intensive uses can cause changes in soil stability and the contours of the land, vegetative cover, site hydrology and point source discharges.

Problems of soil erosion and compaction are often experienced on land cleared for development. Erosion causes loss of topsoil, sedimentation, and the transport of whatever nutrients and toxics cling to the soil. Further, the loss of topsoil leaves the ground less able to support new vegetation and increasingly subject to further erosion. Compaction, which

is frequently caused by construction equipment, compounds this problem by leaving the soil too dense for adequate water and oxygen supplies to support the growth of soil-stabilizing plants.

Another form of disturbance caused by development is the recontouring or filling of land. From a water quality perspective, this activity is especially serious when the land which is filled is a wetland or marsh. Such lands, while frequently thought of as worthless, are in reality rich habitats for a wide variety of living resources. They nurture finfish and shellfish and are an important source of food for waterfowl. Decaying wetland vegetation provides food for aquatic organisms, and wetland communities serve as buffers to wave action against the shoreline. Wetlands are especially important below areas of upland ground disturbance as they slow rushing waters, allowing sediments to fall out, and their soils and vegetation filter draining waters before they reach water courses. It should be recognized, of course, that wetlands are limited in their assimilative capacity; they, too, can be degraded by too much sedimentation and too many nutrients.

Vegetation helps to protect water quality in a variety of ways. By dispersing and slowing water flow, vegetation limits soil erosion and the movement of sediments down slope. Its removal for purposes of development aggravates this erosion. In addition, it alters habitat. New vegetation, generally lawns and transplanted trees and shrubs, often requires extensive use of fertilizers and pesticides. This vegetation is also less successful at retarding runoff than the natural vegetation which was there prior to development. This is especially true for forested cover, which is extremely important in regulating the movement of nutrients from the landscape into streams.

The removal of natural vegetation also alters habitat, and habitat loss changes the nature of the remaining habitat as well as its size. Forested areas and edges are eliminated, and the continuity of woodlands is lost; for some species, habitat range becomes too limited and the species can no longer survive in the area.

Impervious Surfaces

An increase in the amount of impervious surfaces---materials through which water will not pass---is a natural consequence of land development. Surfaces such as roofs, sidewalks, roads, and parking lots, collect water and speed its movement instead of permitting it to percolate through the earth, eliminating the filtering effect of naturally vegetated soil on water. Roads and parking areas accumulate nutrients, toxic materials such as lead, copper, zinc, asbestos, and deicing chemicals, oil and grease from the operation of motor vehicles, and decaying vegetation and animal wastes. Laden with these contaminants, water flows from impervious surfaces into nearby streams, contaminating both local water and, subsequently, the Bay.

Wastewater Treatment

The treatment of sewage is a necessary part of development. On-site systems, even when well designed and properly installed, can release nutrients to ground water that eventually drains to streams, rivers, and the Bay. Failing septic systems, a fairly common problem, can contaminate shellfish grounds, closing them to productive uses. Off-site sewage systems, while preferred to on-site treatment, may fail to remove all nutrients prior to discharging wastewater. In addition, many chemical substances are not removed by treatment and some, chlorine, for instance, may be added to the discharge.

Toxic Materials

In addition to automobile-related toxic pollution, development provides many other opportunities for toxic contamination; pesticide use, accidental chemical spills from industrial and commercial sources, and paints, solvents, and fuel often are disposed of in sewers and frequently end up in local water courses causing their contamination. Construction and maintenance activities associated with changing land uses are a source of pesticides used to control weeds and insects. Whether accidentally spilled or intentionally applied to the land's surface, these substances can attach to soil particles or drain into local ground and surface water, making them unfit for many local uses and increasing the contamination of the Bay's water as well.

Given the anticipated development within the watershed, improving development practices is a critical element in protecting the future of the Chesapeake Bay. Both water quality and living resources will suffer if we continue to assume that we can build nearly anywhere and in almost any manner. Moreover, it is important to make clear in encouraging the use of these Policies and Guidelines that not only will they protect the Bay, they also will provide an improved environment throughout the watershed, especially if they are used consistently across jurisdictions.

Therefore, the Chesapeake Executive Council has adopted the following development and resource protection Policies and Guidelines to accommodate land use change and development while protecting the water quality and living resources of the Chesapeake Bay watershed.

DEVELOPMENT POLICIES AND GUIDELINES FOR THE CHESAPEAKE BAY WATERSHED

The policies and guidelines that follow are intended to guide the location, design, construction, operation, and maintenance of new developments in such a manner as to preserve the quality of the Chesapeake Bay and its tributaries. Each policy is accompanied by guidelines and representative practices from which an effective strategy for implementing the policy may be developed. Not all guidelines and practices will be appropriate for every construction project, and use of alternatives to accomplish the desired environmental objectives is certainly warranted.

Evaluation measures, printed in italics, have been suggested for each policy in order that design and construction strategies can be tailored to the preferences of each jurisdiction and the characteristics of specific projects.

Policy 1 - Design, locate, and construct new developments in a manner that controls the amount of sediment entering the Chesapeake Bay and its tributaries.

The control of sediments is central to strategies for maintaining water quality and the plant and animal life of the Bay and its tributaries. Effective control of sediments is accomplished through the careful location of land disturbing activities in order to avoid steep slopes and those soils having a high potential for erosion. Careful design of projects is also necessary to prevent erosion and block sediments from entering surface waters.

Forests and other types of vegetation are effective in controlling erosion and should be incorporated into project designs. The leaves of trees, shrubs and ground covers combine with the decaying litter on the ground reducing the impact of rainfall and storing the water for gradual release. In addition, roots bind soil particles making them harder to dislodge, and decaying vegetation contributes to open, porous soils.

Floodplains and wetlands adjacent to streams and rivers are natural sediment traps. By allowing storm water to spread out and slow down, these areas can settle out suspended materials washed off upland areas. Effective project design can incorporate on site the same principles to reduce erosion and minimize the transport of sediments into the Bay and its tributaries.

In general, new development should be undertaken in a manner that limits erosion and sediment transport to quantities that would be expected if the site were maintained in a naturally vegetated state. This suggests that the following guidelines should be considered in project planning:

Guideline 1.1. Use location, design, and construction practices that prevent or minimize erosion.

Design projects to avoid grading, clearing, or building on highly erodable soils and steep slopes, in order to avoid exposing soil to the impact of rain water, removing topsoil, and breaking up the root mat that holds soil in place. For instance,

Use vegetated slopes as buffers between dissimilar uses.

Cluster structures on existing flat areas.

Design road networks in new developments to run with the natural topography rather than running across steep slopes.

Design subdivisions to use natural contours and site topography in order to reduce the need for massive grading.

Plan for future needs in order to reduce dredging. For example,

Identify sites that are appropriate for boat access by virtue of proximity to deeper waters, among other factors, and reserve those sites for that purpose.

Designate those areas on local comprehensive plans and plan for compatible uses on surrounding parcels, thus avoiding the development of conflicting activities that may prevent the use of suitable sites for marine access.

Reserve those areas through public acquisition and appropriate zoning.

Maintain vegetation wherever possible. The root mat binds soil particles while leaves and forest litter help reduce the impact of rain water. As vegetation decays, it maintains porous soils to absorb storm water runoff. For instance,

Leave forest litter and underbrush on densely shaded slopes.

Limit the use of lawns and newly established ground covers to areas with good exposure to the sun.

Keep machinery away from slopes, trees, and forested areas during construction to avoid compacting roots.

Limit clearing of forested areas.

Avoid development in floodplains and tidal and non-tidal wetlands.

Reduce the velocity of storm runoff to prevent scouring of soils. For example,

Avoid development on steep slopes. If such slopes must be cleared, incorporate terraces or gradual slopes to stabilize soils for revegetation.

If slopes are cleared, revegetate immediately.

Build access roads at an angle to slopes.

Avoid concentrating runoff into channels if sheet-flow can be maintained or developed.

Maintain forest fringes to act as forested buffer strips.

Direct sheet-flow through vegetation.

Use velocity reducers at the end of pipes.

Reinforce steep channels. For instance,

Use baffles to interrupt flows.

Where baffles alone are impractical, use stabilizing mechanisms to prevent scouring if this will not increase downstream erosion.

Restore or preserve aquatic and shoreline vegetation to help dissipate the energy of waves breaking against the shore. For instance,

Insure effective erosion and nutrient control throughout the watershed to prevent adverse effects on submerged aquatic vegetation

Avoid dredging, filling, diking, ditching, excavating, clearing, or other practices that destroy wetlands.

Encourage non-structural shoreline erosion control practices.

Locate marinas and other water dependent activities adjacent to areas of deeper water which are less suitable for aquatic vegetation.

Regrade and replant eroded banks to allow sunlight to reach shallow inshore areas and to reduce the angle at which waves strike the bank.

Guideline 1.2. Where prevention of erosion is not completely effective, trap and remove sediments before they reach rivers, streams, or the Bay.

Install erosion and sediment control measures prior to land clearing.

Design sites with features that reduce the velocity of runoff to allow soil particles to settle out. For example,

Interrupt drainage channels with baffles, and direct flows to wetlands created expressly for storm water management purposes where particles can settle out before the runoff enters streams and rivers.

Incorporate settling basins in project designs.

Locate and design settling basins to insure that scouring does not occur during heavy storm flows.

Direct sheet flow runoff across vegetated areas.

Designate and maintain streamside management zones on either side of perennial streams to filter out sediment and nutrient runoff.

Guideline 1.3. Reduce activities that alter the natural transport and deposition of sediments to the Bay and its tributaries.

Build docks and marine facilities in areas which minimize the need for dredging.

Discourage the construction of private piers and docks in areas that require dredging in order to gain access.

Reduce the need for shore hardening by siting new structures and infrastructure where they are safe from historic rates of erosion.

Where shore erosion must be controlled in order to protect valuable capital assets, design solutions for entire reaches of shoreline rather than single parcels. Construct or establish those solutions prior to subdivision and sale of property, and provide for their maintenance by future property owners.

Where structural shore-erosion measures must be used, promote the use of rip-rap rather than bulkheads because it limits bottom scouring and provides aquatic habitat.

For existing sites, use homeowner associations to recommend uniform protection measures.

Guideline 1.4. Plan for future needs in order to reduce sedimentation.

Identify sites that are suitable for water dependent uses by virtue of proximity to deeper waters, among other factors, and reserve those sites for that purpose. For example,

Designate those areas on local comprehensive plans and plan for compatible uses on surrounding parcels, in order to avoid the development of conflicting activities.

Reserve those areas through public acquisition and appropriate zoning.

In areas where some dredging will be necessary, identify suitable sites for disposal of dredged material and acquire or reserve those sites.

Guideline 1.5. Protect sand, gravel and other mineral deposits and provide for their use in an environmentally sensitive manner.

Identify important deposits of minerals such as sand, gravel, and other non-renewable resources, and give priority to the use of those deposits that are outside of floodplains.

Undertake mining practices in ways that present the least potential for sedimentation or the degradation of wildlife habitats and water quality both during and following extraction. Stripping existing natural vegetation always degrades existing habitat.

Reclaim mined sites so that erosion and sediment transport is no greater than that which took place before mining occurred.

Site future development well away from economically important deposits of minerals and other resources to assure that those deposits can be used without adverse impact on neighboring activities. This will reduce pressures to use deposits which may be located on sensitive lands.

Policy 2 - Design, locate, and construct new developments in a manner that controls the introduction of toxic compounds into the Chesapeake Bay and its tributaries.

The benefits of eliminating toxic compounds from the the Bay, its tributaries, and local water bodies are clear. Living resources are protected, as are the consumers of those resources. Control of toxics requires a three part program which includes minimizing the use of toxic compounds, removing them from proximity to Bay waters and pathways to those waters, and providing for effective control of spills resulting from accidents and natural disasters.

Manufacturing and production processes that support modern styles of living depend on the use and manufacture of compounds that are toxic to living organisms. Maintenance of the quality of the Chesapeake Bay and its tributaries cannot be based on the premise that production and use of these substances will be eliminated. Rather, emphasis will be placed on using them efficiently and responsibly. Point source emissions of toxic compounds are regulated under the authorities of the various jurisdictions and the Federal government. The emphasis of the Development Policies and Guidelines is on controlling non-point toxic sources that are influenced by the manner in which communities are developed.

Many persistent compounds are already present in the waters of the Bay and will be eliminated gradually through its natural flushing action. Other toxics, however, will be deposited on the bottom of the Bay and its tributaries and subsequently covered by clean sediment. Practices such as dredging that cause the resuspension of sediments from these deposits should be avoided. In this regard, the control of erosion and sedimentation is important to the control of toxic substances because it reduces the need to dredge existing channels or open new ones.

Jurisdictions should strive to accomplish new development in a manner that prevents the introduction of toxic compounds through the movement of water across the surface or under the ground. Practices that result in transport by air or precipitation should be minimized. Guidelines for achieving this include the following:

Guideline 2.1. Reduce the use of toxic compounds in the construction, operation, and maintenance of new development.

Select building sites that minimize the need for certain pesticides and fungicides. For instance,

Select dry, well-drained sites for structures in order to reduce the potential for termite infestation and prolong the life of termiticide and other pesticide applications.

Locate residential structures well away from wetlands since concentrations of

mosquitoes and other insects may be prevalent in those areas, resulting in pressure for chemical controls.

Minimize and control the use of toxic substances in construction. For example,

Construct buildings using sheet or batten rather than foaming or spray-on insulation, since the latter pose a higher risk of introducing toxics into the atmosphere.

Avoid careless disposal of construction materials. Separate toxic substances from general building debris and dispose of toxic substances in a legally approved manner.

Design and construct landscaping for new development that is adapted to local conditions. For instance,

Use native plants in landscaping since they are usually better adapted to local growing conditions and require fewer applications of pesticides to maintain a healthy condition.

Substitute degradable materials for persistent ones.

Guideline 2.2. Site new activities that use, store, or manufacture significant quantities of toxic substances away from proximity to the Bay and its tributaries.

Reserve specific waterfront locations for those potentially polluting activities that must be near water to accomplish their basic purpose. For example,

Locate port facilities and large marinas in already urbanized areas.

Locate uses that do not require a waterfront location for proper operation, such as fuel and material storage facilities, well away from the waterside.

Locate transportation facilities, such as major arterial roads and large parking lots, away from the shorefront and floodplains.

Select sites that minimize the risks of transport through ground water. For example,

Evaluate the suitability of septic systems on the basis of wet season percolation rates.

Locate storage facilities for fuels, pesticides, and other toxic substances on clay or other impermeable soils, and as far away from the water as possible.

Avoid karst and seismic zones where accidental releases may be transported rapidly through subsurface channels.

Site landfills on dense soils, well above the existing water-table to avoid both short- and long-term ground water contamination.

Avoid sites where steep slopes, rapid erosion, and proximity to rivers, streams, and drainage channels present high risks for transport of accidental releases or spills.

Guideline 2.3. Trap spills before they reach the Bay or its tributaries.

Where groundwater levels and soils are appropriate, detain or infiltrate the first flush of storm water, containing the most contaminants, on site. For instance,

Infiltrate the first flush of storm water from small parking lots and other impervious surfaces where large contaminant loads are not present.

Where heavy concentrations of contaminants may be present, channel the first flush of storm water to detention basins where it may be cleaned prior to release.

Establish vegetated areas above storm water management measures to trip sediments and contaminants.

Control the movement of toxic substances to provide opportunities for clean-up and treatment. For example,

Avoid the location of septic systems on very porous soils. When they must be used, maintain adequate space to assure sufficient time for binding or decomposition of substances.

Install pavement with curbing and channeling devices wherever large quantities of toxic substances are handled or stored, such as in industrial areas.

Construct containment structures around areas where toxic substances are stored or used.

Policy 3 - Design, locate, and construct new developments in a manner that controls the introduction of nutrients into the Bay and its tributaries.

The lowering of current levels of nutrients in the Bay watershed is essential if the effort to restore the abundance of the Bay's living resources is to succeed. In a naturally functioning system, the primary sources of nutrients are decaying plant and animal tissue, deposits from the atmosphere, and the wastes of animals and micro-organisms. Erosion adds trace elements as well. Nutrient movement off the land is best managed by maintaining a natural vegetative cover to reduce soil and water flow and to increase the nutrient uptake by plants.

As development activity increases in the Bay watershed, many additional nutrient sources are introduced. At the same time, the changes which take place on the land surface, particularly soil disturbance, the removal of natural vegetation, and the creation of impervious surfaces, take up nutrients and carry them to local streams and rivers. Both additional nutrient sources and changes in the landscape contribute significantly to increasing nutrient loads from development.

Human wastes may be a major additional nutrient source in developing areas. They may be handled as point sources in centralized treatment plants, or through on-site disposal, which represents a nutrient source to the developed landscape. Animal wastes and fertilizers can be managed through a variety of management practices.

Appropriate development strategies can greatly reduce the overabundance of nutrients, especially those that are introduced from non-point sources such as storm water and ground water. Fortunately, the process is enhanced by the ability of plants and micro-organisms to absorb nitrogen and phosphorous, and indeed, some of the strategies for control are based on this fact.

In general new developments should be undertaken in a manner that restricts the introduction of nutrients to levels that would be expected from the site if it were in its naturally vegetated state. Guidelines for development include the following:

Guideline 3.1. Preserve and re-establish wetlands, both inland and adjacent to the shore, to intercept nutrient and sediment inputs from upland sources thereby reducing the amount of these materials released into the Bay and its tributaries.

Maintain or re-establish tidal and non-tidal wetlands in and adjacent to developed areas. For example,

Incorporate protection of tidal and non-tidal wetlands as elements of site design.

Preserve a buffer of naturally vegetated land between wetlands and developed areas, including lawns and impervious surfaces to prevent wetland degradation.

Where water dependent activities are constructed in or adjacent to wetlands, minimize dredging, impervious surfaces, filling, and the release of sediments and toxic substances.

Minimize the rate and volume of runoff entering wetlands from developed areas to provide effective pollution retention in the wetlands and preserve the wetland biological community. For instance,

Limit the extent of impervious cover and lawn area near wetlands while retaining vegetative cover.

Avoid consolidation of channelized runoff into wetlands.

Guideline 3.2. Design landscapes that restrict the need for chemical fertilizers.

Incorporate forested areas into landscape designs, and allow the normal cycle of leaf fall and decay to maintain nutrient balances. This is especially important in buffers and along shorelines and slopes.

Avoid extensive plantings of grasses and other groundcovers that require frequent applications of fertilizers and intensive maintenance.

Guideline 3.3. Provide for the uptake of fertilizers and animal wastes through the use of best management practice before they are washed into local waterways.

Allow storm water from fields, lawns, and other areas where broadcast fertilizers may be used to filter through vegetated areas before it reaches the bay and its tributaries.

Install filter strips adjacent to fields where broadcast chemical fertilizers may be applied in order to control water containing dissolved nutrients.

Avoid excessive application of fertilizers by soil testing to determine appropriate amounts needed

Manage land application of sewage sludge to obtain the least risk of contamination to water quality.

Guideline 3.4. Establish and use a set of priorities for storm water quality management on development sites.

Do not limit storm water quality management to on-line facilities designed to control peak storm discharges.

Preserve or establish forested buffer strips on freshwater streams and other water bodies.

Where erosion and sediment movement is anticipated, provide for sediment removal upgradient of water quality management facilities.

To the extent possible, control infiltration of rainfall on-site, upgradient of forested buffers, wetlands, and artificial storm water marshes.

Encourage sheet-flow of storm water into artificial storm water marshes to increase retention time and vegetative uptake, and to reduce channel scouring.

Avoid the use of natural wetlands for the management of high rates or volumes of runoff, relative to pre-development conditions.

Use retention and extended detention basins as on-line facilities where management of runoff, volume, and water quality occurs within a single facility.

Guideline 3.5. Incorporate storm water quality management considerations in the earliest stages of project design.

Consider on-site space requirements for water quality management before establishing the overall distribution and number of building units, their floor area, and the extent of impervious surfaces on the site. For example,

Reserve space for necessary structural water management facilities, avoiding their placement in environmentally critical areas.

Incorporate forested and other natural vegetative covers into initial landscape designs.

Guideline 3.6. Properly treat human wastes before they are introduced into the Bay and its tributaries.

Upgrade existing waste treatment plants and collection systems before demands equal or exceed their capacity.

Locate conventional and innovative on-site disposal systems and potable water supplies according to a set of criteria designed to maximize their effectiveness and nutrient retention. For instance,

Test and evaluate soils to determine their ability to transmit and clean effluent from on-site disposal areas.

Use only unsaturated, unconsolidated soils beneath disposal trenches or pits, to insure containment of effluent.

Insure that proposed on-site systems are sized and located in designated and approved sewage disposal areas.

Develop and use innovative technologies to enhance treatment of effluent where water table conditions do not permit adequate treatment in the soil.

Do not locate septic fields near the crown of slopes, where the potential for system failure and surface water contamination is increased.

Where shore erosion rates are high, site fields where they will remain at an acceptable distance from the water throughout their expected life.

Insure adequate spacing and water flows for proper dilution of effluent from small, on-site treatment systems.

Locate septic tanks and wells in areas with good soils and provide adequate space between septic systems and the seasonal high water table.

Consider using two compartment septic tanks and alternating drain fields

Develop guidelines to prevent the failure of on-site sewage treatment facilities. For example,

Regularly review operation and maintenance of septic systems and other on-site treatment facilities to minimize introduction of nutrients or toxic substances.

Investigate the long-term maintenance and effectiveness of package treatment plants before allowing such systems to be used.

Policy 4 - Design, locate, and construct new developments to minimize alterations of the natural hydrologic cycle.

Alterations in hydrology resulting from development impair water quality and affect the stability of stream habitats. Extensive development has the potential to alter the characteristics of freshwater in-flow by increasing peak storm flows, aggravating low flows during periods of drought, and changing the circulation pattern of water in the system.

Salinity in parts of the estuary is a direct function of the quantity of fresh water flowing into the system through rivers and streams, ground water, and rain water. If the development involves the removal or alteration of forested areas or non-tidal wetlands, these changes to the hydrologic cycle will be greatly increased.

The natural hydraulic cycle for any area is a function of soils, groundwater conditions, vegetative cover, and topography. It will usually involve both percolation of rain into the soil and direct runoff into streams. Water that enters the soil emerges in surface channels at different times and places depending on local conditions.

Strategies for development should focus on maintaining and, where necessary, replicating natural hydrologic conditions. Effective site designs emphasize retention of natural vegetative cover and uses storm water management measures that produce a flow similar to pre-construction runoff characteristics. *In general, new development should be designed to minimize the amount of the rainfall on a site that is shed as surface runoff. Remaining storm water should be infiltrated to maintain ground water or should be returned to the atmosphere by evaporation and transpiration. As well, the movement of tides, streams, and rivers should not be impeded by new structures.* Development guidelines that can help to achieve these standards include:

Guideline 4.1. Incorporate storm water management practices into design and location criteria for new development.

Infiltrate storm water runoff from impervious surfaces close to where it falls as rain in order to reduce the need for expensive control and channeling structures and to avoid concentrating impurities to levels that overwhelm the ability of natural systems to assimilate those impurities. For example,

Break large areas of impervious surface into several smaller areas.

Maintain natural vegetation as open space buffers between adjacent uses and to provide privacy where desirable.

Direct runoff from impervious surfaces across filter strips and through naturally vegetated areas.

Avoid concentrating storm water into channels, favoring sheet-flow instead.

Use porous surfaces to allow direct infiltration of storm water.

Where immediate infiltration is impractical, direct storm water runoff to detention or retention facilities. In this way, excess runoff can be detained long enough to percolate into the ground or can be released at a rate that more nearly approximates natural release rates. This helps to maintain normal, cyclic high and low flow characteristics. For instance,

Use storm water extended retention and detention structures to accomplish both sediment control and toxics removal objectives.

Create storm water management wetlands, and employ them to slow the movement of storm water and provide nutrient uptake.

Regularly inspect and maintain infiltration structures to insure their effectiveness.

Guideline 4.2. Avoid locating new structures where they will alter the flow of tides, streams, and rivers.

Elevate roads on bridges rather than on compacted fill material that blocks or channels water flows.

Do not construct instream structures that block or impede the movement of migratory fish.

Avoid constructing, expanding, and rebuilding structures in flood plains and wetlands.

Avoid the use of bulkheads and riprap for control of shorelines where biological or nonstructural means (such as beach nourishment or grass planting) are appropriate.

Policy 5 - Design, locate, and construct new developments in a manner that minimizes destruction and degradation of important habitats for plants and animals.

Aquatic and terrestrial plants and animals are integral elements of the Chesapeake Bay watershed. Plant and animal communities play essential roles in maintaining the quality of water in the system and are valued resources in their own right. By its very nature, development alters and destroys habitat, and therefore it is essential that a priority be placed on assuring that the impacts that do occur are limited to those habitats of least economic and biological importance.

Rare and endangered species present a special problem in that their preservation often precludes any alteration of their habitats and in some instances may require reversal of previous actions that place stress on those habitats. Location and design criteria can often contribute to efforts to preserve habitats.

It should be recognized as well that while some species are not sufficiently rare on a statewide basis to warrant official designation as threatened or endangered, they may be considered worthy of protection by a local jurisdiction because they are locally uncommon.

The protection of high quality habitats and the inter-relationships between biological communities can be incorporated into location and design criteria for new development. Appropriate site-related criteria are important, as are regional approaches that consider protection strategies for entire biotic communities.

New development in the Bay watershed should restore or preserve the habitats of rare or endangered species and should avoid the disruption of economically and biologically important habitats. Guidelines for new development include the following:

Guideline 5.1. Design, locate, and construct new development in a manner that preserves rare and endangered species.

Locate new development where it will not affect rare biological communities. For instance,

Survey sites prior to acquisition for development to identify rare and endangered plants and animals and to determine if the site is suitable for the proposed use.

Acquire sufficient land for proposed projects so that important habitats can be preserved without precluding the achievement of development objectives.

Design sites to preserve rare biological communities. For example,

Isolate noise-generating activities and areas of intense activity from sensitive habitats using buffers, open space, and less intense activities.

Avoid subdividing sites in a manner that fragments important habitats or that creates parcels that cannot be developed without altering important habitats.

Maintain corridors of natural vegetation linking habitat areas in order to avoid genetic isolation of species in those areas, and to provide for the free movement of wildlife between habitat areas.

Use construction practices that prevent impacts on sensitive habitats. For instance,

Keep machinery out of sensitive areas.

Clearly mark sensitive areas before and during construction.

Do not use sensitive areas for disposal of debris from construction or site preparation.

Preserve a vegetated buffer around sensitive areas.

Prevent sediments, silts, and toxic substances from being washed into sensitive areas.

Guideline 5.2. Design, locate, and construct new developments to avoid the loss of important habitats.

Design sites in a manner that preserves and restores native biological communities. For instance,

Cluster developments on less sensitive areas of a site.

Incorporate wetlands and other important habitat areas into site designs.

Protect common but nevertheless important habitat areas--such as wetlands and riparian forests.

Design landscaping plans that avoid large-scale, intensively managed plantings and favor preservation of natural vegetation.

Where agricultural sites are developed, preserve adjacent natural areas and replant cleared areas with native species.

Where forested areas are modified by development, locate construction along the edge and maintain a canopy cover wherever possible to maintain maximum habitat value.

Locate new development where it will have the least impact on existing habitats. For example,

Acquire and develop sites within and adjacent to areas of existing development in order to achieve compact development forms that minimize clearing and paving.

Avoid developing on prime agricultural soils in order to reduce clearing of less desirable areas for agricultural use.

Reserve shorelines for water dependent uses and set other activities back from the waterfront, particularly where shellfish beds, fish spawning areas, and other aquatic resources are present.

Policy 6 - Manage growth within the jurisdictions of the Chesapeake Bay watershed in a manner that protects important environmental resources.

The protection of the water quality and living resource habitats of the Bay requires care in the way we build communities that goes beyond simple questions of the design, location, and construction of individual developments. Through effective community design, we assure efficient use of land, energy, and physical and living resources. Management of the collective impact of multiple, individual development decisions is a proper function of government, and wise management by local, state, and federal authorities can do much to assure the future of the Bay and its tributaries.

Cooperative action by and among all levels of government is required in order to achieve effective community design. Action by elected officials of the towns, cities, and counties of the Bay watershed is an immediate and necessary part of effective governance, since it is at this level that individual development decisions may best be related to local conditions. As well, effective regional planning is necessary to address those impacts that transcend single jurisdictions. Finally, state and federal participation is warranted because of the jurisdiction and authorities that are incumbent within those levels of government.

Community development that includes the preservation of water quality and natural habitat can provide for efficient use of common resources and help balance resource use among competing demands. In addition, effective community design can help to prevent excess financial burdens on private individuals, developers, and local governments that may arise from incompatible or inappropriate developments in environmentally sensitive areas. In order for such management to be effective, governments should include preservation of the quality of the Bay and its tributaries as they prepare long-range plans, and they should employ a wide range of innovative implementation and management tools as they carry out those plans.

Federal, state, and local development decisions should preserve the water quality and living resources of the Chesapeake Bay. As well, new or existing regulatory techniques that provide incentives for development consistent with these goals should be used. Guidelines for action include:

Guideline 6.1. Reserve the waterfront for water-dependent uses.

Reserve the waterfront for activities that must be near water to accomplish their basic purpose. For example,

Locate port facilities and large marinas in urban areas and less intense water-dependent uses in less developed areas.

Encourage the cooperative use of docking, parking, cargo-handling, and storage facilities in waterfront industrial areas to limit waterfront demand.

Locate commercial and residential uses that are enhanced by, but not dependent on water access, close to the water, but maintain open spaces between those uses and the waterfront.

Locate uses that do not require a waterfront location for proper operation, such as fuel and material storage facilities, well away from the waterside.

Locate transportation systems and utility corridors serving ports and waterfront industries upland to reduce pressure on waterfront sites.

Restrict waterfront residential and commercial development in urban areas to sites where such historic development patterns have previously existed.

Encourage cluster development away from the water's edge in order to leave the land nearest to the water as common open space and to reduce the impacts of development on water quality and living resources of the Bay and its tributaries.

Guideline 6.2. Construct/extend infrastructure in areas most suited for development, rather than areas with high concentrations of wetlands, steep slopes, significant plant and wildlife habitat, valuable resources, or other environmentally sensitive characteristics.

Locate new development near or within the existing service areas of public sewage treatment plants in order to avoid the premature extension of infrastructure and to reduce new infrastructure needs.

Plan for and construct new treatment facilities to serve higher densities of development in suitable areas accessible to, but not directly on, the shore.

Guideline 6.3. Encourage compact development forms to minimize the amount of paved areas necessary to serve expected population growth.

Incorporate mixed uses within a development site to minimize the need for new roads, parking facilities, and other impervious surfaces. For example,

Incorporate a range of community and commercial services in the site design to limit the need for automobile trips.

Locate areas of residential development near employment centers to reduce commuting volumes and distances.

Develop high density housing near community centers and near high quality transportation facilities.

Develop sites adjacent to areas of existing development rather than leapfrogging into undeveloped areas.

Plan infrastructure improvements to encourage compact development. For example,

Encourage the development of infill sites where feasible to reduce the need for paving previously undisturbed areas or creating new infrastructure.

Redevelop or rehabilitate existing structures.

Develop on vacant parcels within cities, towns, and communities.

Guideline 6.4. Locate development away from sensitive resources.

Locate development to avoid the loss of important habitats. For example,

Reserve shorelines for water dependent uses and set other activities back from the waterfront, particularly where shellfish beds, fish spawning areas, and other aquatic resources are present.

Locate marinas and other water dependent activities adjacent to areas of deeper water, which are less suitable for the growth of aquatic vegetation.

Avoid developing on prime agricultural soils and in significant forested areas. Such development may result in the clearing of less desirable areas for agricultural use and the loss of important plant and wildlife habitat.