NRMCA
NATIONAL READY MIXED CONCRETE ASSOCIATION

DC Zoning Commission Case No. 04-34.
Pervious Paving for Parking and Related Facilities
Edward Herbert, MS, REM, LEED AP
National Ready Mixed Concrete Association
June 16, 2005

The National Ready Mixed Concrete Association applauds the Zoning Commission for having this hearing to consider steps to change regulations and permit the use of pervious surfaces for parking lots and other surfaces in the District of Columbia This action shows great forward thinking and a commitment to environmental protection, especially the conservation of the precious waterways that flow through and provide water supply for the city The Zoning Advisory Committee is also to be commended for their efforts to research and advise the Commission on the environmental benefits of pervious pavements

Significant development and urban sprawl in the Washington Metropolitan area has placed a strain on waterways such as the Anacostia River, Rock Creek, the Potomac River and the Chesapeake Bay The increase of impervious surfaces results in excess stormwater flow that carries contaminants into the waterways and results in erosion to stream and river banks Increased development requires stormwater management measures that are costly, require maintenance and occupy valuable real property Encouraging the use of simple options like the use of pervious surfaces for parking areas and road surfaces, will help to minimize the need for stormwater management measures, while protecting the city's waterways The current infrastructure of the combined storm water and sanitary sewer lines in the District of Columbia is already overloaded with constant potential for significant pollution of the rivers and streams from heavy rains This problem was documented in an article written by Lisa Rein in the May 23, 2005 issue of the Washington Post

Pervious concrete pavements have been used for many years in the United States This technology presents a proven solution for managing stormwater runoff In a well designed system, a pervious concrete parking lot functions like a stormwater retention pond while functioning as a parking area Three to eight gallons of water or more can pass through a square foot of pervious concrete in one minute The pervious systems provide for stormwater storage during a heavy rain and allow for percolation into the ground to recharge aquifers Pervious pavements can also filter water and provide natural purification of pollutants, preventing them from entering the region's waterways Pervious concrete offers a simple construction process, low cost and is simple to maintain or rehabilitate By the way, porous pavement is recognized as a best management practice for stormwater management by the USEPA Other environmental benefits gained by using light colored pervious concrete are reduced lighting requirements of parking areas, reduced absorption of solar heat and reduced heating of stormwater that can affect aquatic life

Your approval of pervious concrete in Washington will be a win-win for the environment and the citizens of this great city I have provided material on pervious concrete in your information packages I am happy to answer any questions for you

ZONING COMMISSION
District of Columbia
CASE NO.04-34
EXHIBIT NO.17

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As See[illegible]he Spring 2005 Issue of Concrete in Focus

feature



Concrete Parking Areas Aren't White, They're GREEN

By A. Vance Pool, National Resource Director, NRMCA

You know concrete parking lots are more attractive. You know they provide lower life cycle costs than higher maintenance cost alternatives (which means more money in owners' pockets). You know they provide higher levels of curb appeal. But did you know concrete parking areas are a much greener alternative than the black stuff? This article is going to outline some of the many ways concrete parking areas are GREEN.

Sustainable building and LEED (Leadership in Energy and Environmental Design) are hot topics today among owners, engineers, architects and everyone else involved in creating our built environment. A number of cities and municipalities have taken active positions requiring that buildings be built under the LEED rating system. The sustainability trend will continue to grow and encompass an ever-growing percentage of the new structures being designed and built. Concrete, which has a strong history of providing environmental benefits, doesn't always get recognized for its valuable place as a tool in sustainable design.

Parking areas are one place where concrete is quickly being recognized for its tremendous environmental benefits. Concrete parking areas provide sustainable attributes like:

- Reduced energy demand for lighting
- Reduction in energies required for maintenance and repair
- Reduced heat island effect
- Reduced cooling loads on nearby structures
- Can contain recycled material
- Concrete is manufactured locally
- Concrete doesn't waste packaging materials

Let's take a look at those attributes.

The ability to reduce the energy demand needed to light outdoor areas is simple physics that is often overlooked. When you think about it, the light colored surface of a concrete parking area reflecting more light than its black-colored alternative is common sense. In 1986, R. E. Stark of the Portland Cement Association did a study, "Road Surface's Reflectance Influences Lighting Design," which quantified the dramatic difference in the two pavement types as varying between 33- and 50-percent reflectance. This means you may be able to eliminate three out of 10 light fixtures in a parking lot and have the same levels of lighting. It also means you don't consume the electricity for the three lights or replace the bulbs in them for the life of the parking area!

When you build a concrete parking area, the typical maintenance required is sealing of joints every few years. While most people recognize the money saved by not having to seal, reseal, re-stripe or add additional top coats on asphalt, there are other environmental benefits. All the mechanical equipment used in doing the maintenance work on the asphalt is using energy. The energy to make the products being used, the energy to distribute them, the energy to lay the asphalt and the energy to refine the asphalt all have environmental impact. All this energy is not consumed when you use concrete.

The heat island effect is a dramatic con-

sequence of urban sprawl. It has been studied by NASA. Its website, www.nasa.gov, has numerous articles on the amount of heat being created by growth. We cannot expect growth to stop so the question becomes what can we do about it? NASA mentions using light-colored roads and roofs as one of the significant ways to help mitigate the situation. The MIT Technology Review states, "Blacktopping should be discontinued..." Georgia Tech's College of Architecture newsletter writes, "While using lighter roofing materials can provide some impact, replacing the dark pavement represents the single largest market opportunity to address the urban heat island effect." These are pretty compelling sources of the same point.

There is another impact that is secondary to the heat island effect. If the pavement and air around a building are warmer in the summer because of the reflectance, then the cooling load the HVAC system has to offset is logically higher. Those extra degrees of temperature amount to a significant amount of energy (and money) over the life of a building. Once again we see a concrete advantage.



Another green feature of concrete used in parking areas is that it can contain a number of recycled materials. Fly ash, blast furnace slag and silica fume are all byproducts of other industries that can enhance the properties of concrete when used in appropriate amounts. We also see aggregates and water being recycled in ever-increasing amounts during the production of concrete. These products benefit our landfill space and our environment.

An often-overlooked fact in the use of concrete is that it is generally produced locally. Even if you choose to ignore the positive local economic benefits, you have to consider the ecological ones. Transportation distances being reduced means less trucking and resultant air pollution. This fact is important enough for the U.S. Green Building Council to recognize a point for it in its LEED certification program.

Another often-overlooked benefit in using concrete is that you don't send a lot of packing materials to the landfill. Most products used in construction today arrive on pallets, in boxes, shrink wrapped, tied, taped and sealed together. All of those packing materials either end up in a landfill or buried on the site or burned. With concrete, the product arrives in a ready mixed truck, which serves as the packaging material, is unloaded and the truck returns to carry more concrete. It is a simple benefit that is rarely recognized.

Concrete parking areas not only provide life cycle cost benefits to owners versus competing materials, they also provide real environmental benefits that are rarely recognized. Unfortunately, we don't always get this message in front of the people who are making decisions on what kind of pavements to use in parking areas. That is changing. As more and more people hear the message the word continues to spread. Concrete has a large role to play in future discussions on sustainability. Its performance in the past assures its place in the future. n

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As Pressure Increases, So Do Ways to Curb Polluted Runoff

By Lisa Rein
Washington Post Staff Writer
Monday, May 23, 2005; Page A01

Hopewell's Landing isn't just another subdivision paving over a forest of red cedars and pine trees at the reaches of suburbia.

Most of the back yards being graded for the luxury homes off Route 29 in Gainesville will have sunken gardens filled with moisture-loving plants and mulch to absorb rain. The streets will be five feet narrower than usual, to reduce paved surfaces. The 155 homes will be flush with the road, resulting in shorter driveways. And instead of the curbs and gutters that usually carry rain to a nearby stream, deep trenches full of shrubs and stones will line the road to slow and filter the water.

The design mimics a time when Hopewell's Landing was 53 wooded acres. Rain naturally soaked into the forest floor, instead of rushing -- as it does in most of today's suburbs -- over parking lots and roofs and streets, into streams that overflow easily. The residue of daily suburban life is swept along -- fertilizer, brake fluid, oil from gas lawnmowers -- until it flows into the Chesapeake Bay.

Prince William County persuaded developer D.R. Horton to test the new environmental features to help turn back a little-addressed cost of a half-century of suburban sprawl: polluted runoff.

For decades, the federal government has overlooked the dangers of such a dispersed pollution source, instead targeting sewage treatment plants for cleanup. But now, its attention is turning to storm-water control to protect streams and rivers across the country, including that jewel of the Washington region, the Chesapeake Bay.

The Environmental Protection Agency, prodded by lawsuits from environmental groups, is enforcing a 30-year-old provision of the Clean Water Act, ordering state and local governments across the nation to remove pollution from rainwater before it fouls waterways.

"In the old days, we paved everything, and the attitude was, 'Let's put a pipe underground to get rid of the water as fast as we can,' " said Carl Bouchard, director of storm water management for Fairfax County.

Faced with stricter federal enforcement, local governments are scrambling to find affordable ways to meet their obligations. Public works departments are rebuilding streams to stop erosion, replacing leaky pipes and retrofitting storm-water ponds. And planners are encouraging "low-impact" techniques, such as the rain gardens in Hopewell's Landing -- mini-wetlands planted with native vegetation to intercept runoff.

The consequences of doing nothing loom. In the Washington area, pollution limits could become much stricter if they are not met by 2010, the deadline for the multibillion-dollar federal and state effort to restore the bay to its once-pristine condition.

Dozens of tributaries in the bay's 64,000-square-mile watershed are assigned limits on nitrogen, phosphorus and other nutrients that, in high concentrations, can choke waterways with oxygen-depleting algae and endanger fish. The EPA has threatened to impose new pollution limits for the bay, which would add a potentially onerous burden to state and local governments.

Remedies carry exorbitant costs -- especially, for example, in older neighborhoods inside the Capital Beltway that were built with no storm-water controls. A recent report by state environmental agencies on the Chesapeake Bay estimated new cleanup costs at $30 billion, much of it to control storm water. That reportedly will mean a total of about $12 billion in Maryland, Virginia and the District.

Businesses and homeowners eventually will pay the expense through new or increased fees on their property tax or water bills. Prince William's annual fee of $21.76 for single-family homes, for instance, will cover county inspections to ensure new Gainesville homeowners maintain their boggy gardens.

"It's major maintenance the county is taking on, just like trash collection," said Wade Hugh, Prince William's chief of watershed management.

Fairfax County is nearly doubling its spending on storm-water cleanup, allocating $18 million in next year's budget. Bouchard estimates that the county will need to spend $800 million in the next 20 years.

As antipollution efforts increase, the field of municipal engineering has sprung up -- as have such terms as bioswales, pervious surfaces, soakage trenches, green roofs, French drains, porous pavers and bioretention facilities. Those techniques create mini-treatment plants that store surging runoff as they filter pollutants, then let the water soak into the ground.

In the District, several hundred modern buildings -- including MCI Center, the Washington Convention Center and the Mandarin Hotel -- have installed labyrinths deep beneath the street: vaults of sand the sizes of small apartments to filter rainwater.

Even tiny cities such as Falls Church (population 10,400) face new costs.

The standard technique for handling storm-water runoff is the drainage pond, a man-made lake built in subdivisions and office parks that releases water slowly into drainpipes and streams. But the ponds are becoming unpopular. They do not filter pollutants and, if not properly maintained, can collect sediment. Homeowner groups complain that the ponds are ugly, are breeding grounds for mosquitoes and are unsafe for children.

But of greater concern to local officials and environmentalists are such older neighborhoods as Alexandria, Silver Spring and areas of the District that were built with no storm-water controls.

"To rein in that situation, you have to go back and try to retrofit buildings," said Doug Siglin, director of the Anacostia River Initiative, an environmental group. He said the District has a "huge stake" in cleaning up storm water flowing into the Anacostia since so much economic development, including a new baseball stadium, is planned for the riverfront.

The District bears the extra burden of having its storm-water runoff and sanitary sewers in the same pipes. After a heavy rain, sewage flows into streams and rivers. This spring, a judge ordered the city to separate its combined system over 20 years -- an expense estimated at $1.9 billion, on top of storm-water costs.

Environmental groups are pushing the D.C. Council to increase a small storm-water utility fee, which the city has levied since 2000, to fund the water system costs. D.C. households pay $7 a year on average, generating $3 million a year, but Siglin said that is not nearly enough.

Montgomery County tacked its first storm-water fee onto property tax bills two years ago. Arlington County and Alexandria officials said they are considering similar policies, and an advisory group in Fairfax has recommended adding a fee to water or tax bills, starting in 2007, that would be safe from budget cuts.

New bureaucracies are forming to measure the area of paved or impervious surfaces on commercial properties so governments can tax them accordingly. And as counties weigh fees for homeowners, they debate the fairness issue: Should everyone pay the same rate, or be taxed based how much of their property is soil and how much is asphalt?

Prince George's became a pioneer by levying the region's first storm-water fee in the early 1950s to address chronic flooding. Today, some experts call it a national model for promoting low-impact systems.

Builders in Stafford must apply for a waiver if they do not want to put in rain gardens or other water filters. The District requires developers renovating old properties to install storm-water systems on site if the paved surface around the new building exceeds 5,000 square feet.

Anne Arundel makes the same demands of builders and owners of single-family homes. And the county plans to invest millions of dollars in experimental "green roofs" on six county buildings, including a police station and a library. Green roofs are covered with soil, grass and plants.

Arlington went a step further 18 months ago, rebuilding Langston Brown, a school and community center complex off Lee Highway, with three-story high cisterns that collect

rainwater from the roof, then become giant watering cans for the lawn. The building has a rain garden next to the playground. And the parking lot was dug to a depth of 12 feet, filled with sand, gravel and dirt and topped with asphalt that looks like a mosaic of tiles, which are separated just enough to let rainwater seep through.

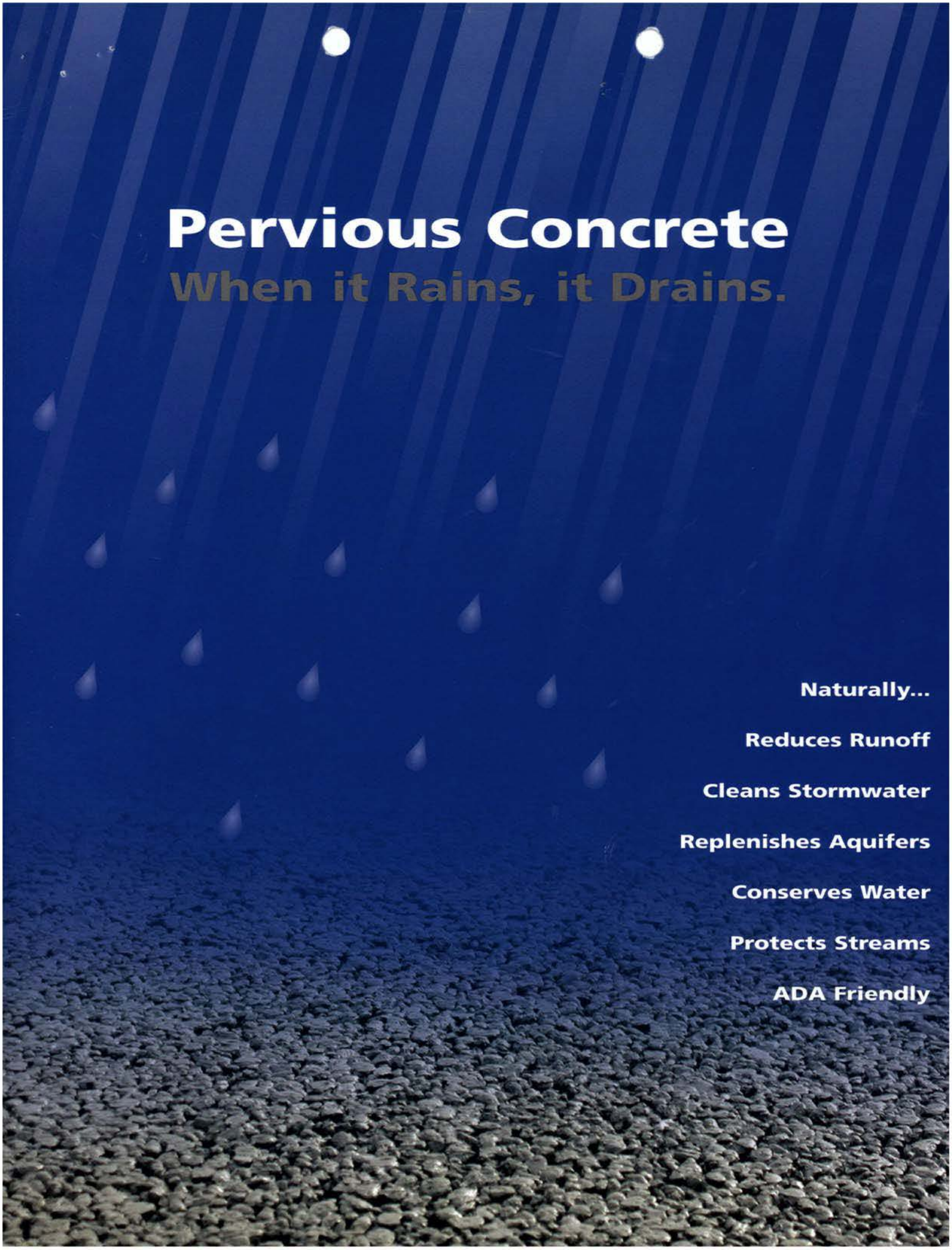
But there are downsides to these marvels of municipal engineering. The caverns of sand under dozens of office buildings in Washington have been monitored poorly, environmental advocates have said, reducing their effectiveness as filters. In Fairfax, the county recently built rain gardens at the county courthouse and in a Centreville park, only to create soggy wetlands that must be torn up and replaced because the original soil mix wasn't porous enough.

And employing the anti-pollution techniques can be pricey.

"On a per-lot basis, all of these regulations are getting very expensive," said Bill Zink, an engineer and president of the Fairfax chapter of the Northern Virginia Building Industry Association.

Homeowners are signing on for much more than lawn mowing and azalea pruning. Prince William officials said they worry that the new residents of Hopewell's Landing will not keep up their rain gardens -- and they wonder how, if at all, to penalize them if they don't. They also acknowledge that not everyone will enjoy the sight of a bog next to the backyard barbecue after a rain.

"When water comes in, it does stand for a certain time period," said Hugh, the storm water chief. "People will have to get over the perception that they have a drainage problem."


Pervious Concrete
When it Rains, it Drains.
Naturally...
Reduces Runoff
Cleans Stormwater
Replenishes Aquifers
Conserves Water
Protects Streams
ADA Friendly









Pervious Concrete: The Natural Choice

It's tough to balance the demand for development with the need to preserve our natural resources. However, this balance becomes easy to achieve when you construct parking lots using pervious concrete.

Pervious concrete is a mix of coarse aggregate, cement, water, and little to no sand. Also known as "no-fines" or porous concrete, this mixture creates an open-cell structure, allowing rainwater to filter through to underlying soil. By modeling natural ground cover, pervious concrete is an excellent choice for stormwater management.

Pervious Concrete: The Environmentally Sound Choice

According to the United States Environmental Protection Agency (EPA), stormwater runoff can send as much as 90% of the pollutants—such as oil and other hydrocarbon liquids found on the surface of traditional parking lots—directly into our rivers and streams. The EPA now requires state and local governments to implement measures to reduce and improve the overall quality of stormwater runoff in an effort to address this important pollution problem. Pervious concrete has been recognized by the EPA as a best management practice (BMP) to address this most vital environmental concern. The open-cell structure of pervious concrete provides a medium for aerobic bacteria that break down many of the pollutants that seep from parked cars.

Pervious concrete also contributes to enhanced air quality by lowering atmospheric heating through lighter color and lower density, decreasing the impact of heat island effects. The heat island effect occurs when tree-covered areas are replaced with dark pavement surfaces, and is characterized by up to a 12-degree average temperature increase between an urban area and its surrounding countryside. This heat island effect increases ground level ozone production by as much as 30%.

Concrete surfaces, both pervious and conventional, have a much higher albedo—a measure of reflectance—than competitive paving materials. Specifications requiring a minimum surface albedo are becoming increasingly popular. The inherently light color of concrete naturally reflects heat and light. *Studies have shown as much as a 30% savings in lighting costs over other pavement types due to concrete pavement's reflectivity.*

Pervious Concrete: The Smart Business Choice

Using pervious concrete pavement in your parking lot can reduce the need for large detention ponds because the pavement acts as a detention area. Parking lot owners will spend fewer dollars on labor, construction and maintenance of detention ponds, skimmers, pumps, drainage pipes, and other stormwater management systems. Expensive irrigation systems can also be downsized or eliminated.

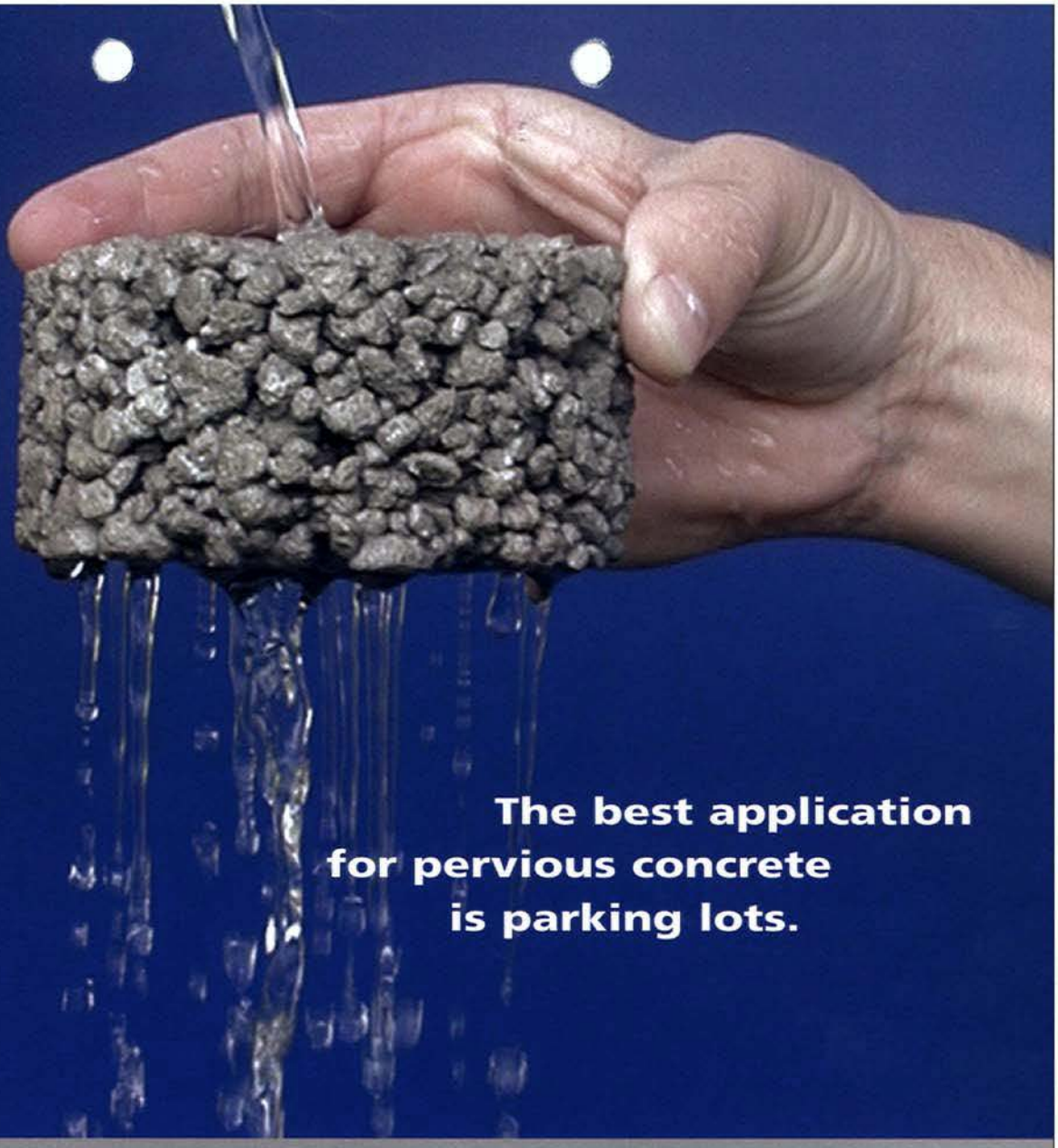
A pervious concrete parking lot will help reduce demands upon sewer systems. Today, many government agencies are now implementing stormwater impact fees for all impervious areas. Pervious concrete can reduce these fees for the property owner.

Developers are using pervious concrete for parking lots to increase utilization of commercial properties. The land ordinarily devoted to costly stormwater management practices or compliance with maximum impervious area ordinances can now be developed or preserved, enhancing the bottom line.

Pervious concrete is a durable material—parking areas properly designed and constructed will last 20-40 years with little or no maintenance. Thus concrete, conventional or pervious, is widely recognized as the lowest life cycle cost option available for paving.

Benefits of Pervious Concrete

- Reduces stormwater runoff
- Eliminates the need for detention ponds and other costly stormwater management practices
- Replenishes water tables and aquifers
- Allows for more efficient land development
- Minimizes flash flooding and standing water
- Prevents warm and polluted water from entering our streams
- Mitigates surface pollutants



The best application for pervious concrete is parking lots.

When it Rains, it Drains.

Stormwater runoff occurs when rain falls. This runoff causes increased pollution in rivers and streams, flash floods, and loss of rainwater that could otherwise replenish water tables and aquifers. Pervious concrete has a 15-25% void structure and allows 3–8 gallons of water per minute to pass through each square foot—accounting for far more than is generated during most rain events. Pervious concrete puts rainwater back in the ground where it belongs.

Pervious Concrete
Frequently Asked Questions

Q: What about drainage issues in soils with high clay content?

A: Typically if a soil type has sufficient percolation to support a septic tank system it will be allowable for pervious concrete. If a soil is truly impervious, the pervious concrete system will still be useful for detention pond requirements. Soil percolation rates are most important if you must meet stormwater quality requirements. A typical parking lot design may have 5"–8" of pervious pavement on top of a 6"–12" sub-base of #57 stone (40% voids) on a geotextile fabric. In sandy areas pervious is placed directly above the sand.

Q: What about freeze-thaw issues?

A: Pervious concrete has been placed in freeze-thaw climates for over 15 years. Successful applications of pervious concrete in freeze-thaw environments have two common design features—the cement paste is air-entrained, and the pervious concrete is placed on 6–12 inches of drainable aggregate base (3/4" or larger clean gravel). For more information on pervious pavement in freeze-thaw applications go to www.concreteparking.org and view documents on pervious concrete, including "Freeze-Thaw Resistance of Pervious Concrete" and "Concrete in Practice #38–Pervious Concrete."

Q: What about clogging?

A: Clogging problems are mainly an issue of design. If a natural area with grass or exposed soil is allowed to drain stormwater across a pervious concrete pavement, fine material can be introduced into the system causing localized clogging. Vegetative matter can collect on the surface of the pervious concrete causing some clogging, but routine sweeping or vacuuming will restore porosity. Studies have been conducted that indicate pressure washing will restore most of the porosity of clogged pervious concrete to nearly new conditions.

Q: What other uses are there for pervious concrete?

A: Pervious concrete has been successfully used for low volume streets, driveways, sidewalks, golf cart paths, retaining walls, slope protection, and French drains. Pervious concrete can be utilized in a variety of paving applications to provide hardscape without altering hydrology of the land.

Concrete Delivers

Engineered concrete solutions for sustainability, durability and value.

For more information and contacts on pervious concrete, visit:

www.concreteparking.org

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Count on Concrete







