

# ASPHALT

## The Sustainable Pavement



ENERGY & RECYCLING



PERFORMANCE



WATER QUALITY



CLEAN AIR & COOL CITIES



## Better Water Quality

### Porous asphalt...

- Conserves water
- Allows for better use of land
- Reduces runoff
- Promotes infiltration
- Cleans stormwater
- Replenishes aquifers
- Protects streams



### Porous asphalt offers a powerful tool in the toolbox for storm-water management.

In the natural environment, rainfall sinks into soil, filters through it, and eventually finds its way to streams, ponds, lakes, and underground aquifers. The built environment, by way of contrast, seals the surface. Rainwater and snowmelt become runoff which may contribute to flooding. Contaminants are washed from surfaces directly into waterways without undergoing the filtration that nature intended.<sup>1</sup>

For these reasons, managing stormwater is a significant issue in land use planning and development. Stormwater management tools can serve to mitigate the impact of the built environment on natural hydrology. Unfortunately, however,

they also can lead to unsound solutions such as cutting down stands of trees in order to build detention ponds.

Porous asphalt pavements allow for land development plans that are more thoughtful, harmonious with natural processes, and sustainable. They conserve water, reduce runoff, promote infiltration which cleanses stormwater, replenish aquifers, and protect streams.

A typical porous pavement has an open-graded surface over an underlying stone recharge bed.<sup>2</sup> The water drains through the porous asphalt and into the stone bed, then, slowly, infiltrates into the soil. If contaminants were on the surface at the time of the storm, they are swept along with the rainfall through the stone bed. From there they infiltrate into the subbase so that they are subjected to the natural processes that cleanse water.

### Construction and performance

Porous asphalt pavements are fast and easy to construct. With the proper information, most asphalt plants can easily prepare the mix and general paving contractors can install it.

The stone bed, often eighteen to thirty-six inches in depth, provides a tremendous subbase for the pavement. As a result, porous asphalt pavements tend not to exhibit cracking and pothole formation problems. The surface wears well. Under the stone bed is a geotextile which keeps fine particles from moving into the stone bed from below and filling in the spaces.

Porous asphalt has been proven to last for decades, even in extreme climates, and even in areas with many freeze-thaw cycles.<sup>3</sup>

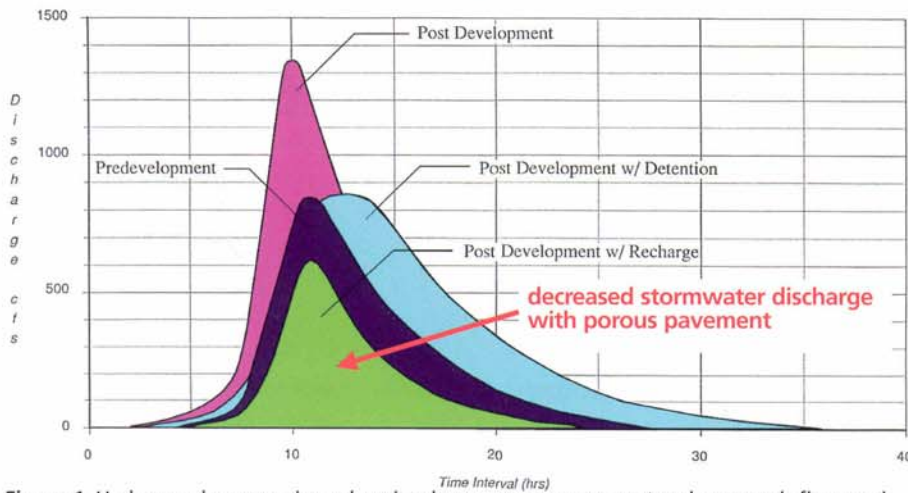
The underlying stone bed can also provide stormwater management for adjacent impervious areas such as roofs and roads. To achieve this, stormwater is conveyed directly into the stone bed, where perforated pipes distribute the water evenly.

### Economics

Porous pavement is a sound choice on economics alone. A porous asphalt pavement surface costs approximately the same as conventional asphalt. Because porous pavement is designed to “fit into” the topography of a site, there is generally less earthwork. The underlying stone bed is usually more expensive than a conventional compacted sub-base, but this cost difference is offset by eliminating the detention basin and other components of stormwater management systems. On projects where unit costs have been compared, the porous pavement has been the less expensive option. Porous pavements are therefore attractive on both environmental and economic grounds.<sup>1</sup>

An installation at the University of North Carolina in Chapel Hill included parking lots where some sections were constructed from porous asphalt and others used porous concrete. The cost differential was approximately 4:1 – that is, the porous concrete pavement cost four times as much as the porous asphalt pavement.<sup>1</sup>

# Better Water Quality



**Figure 1:** Hydrograph comparison showing how porous pavement reduces peak flow and total volume of runoff

Source: Cahill Associates

## Impact on groundwater

Asphalt pavements are compatible with clean water. Studies show that asphalt pavements and stockpiles of reclaimed asphalt pavement do not leach.<sup>4,5</sup>

Contaminants on the surface of pavements tend to become part of runoff, but with a porous pavement, they are washed into the stone bed. From there they flow down into the soil, where beneficial bacteria and other natural processes cleanse them. Data are limited, but indicate a very high removal rate for total suspended solids, metals, and oil and grease.<sup>1</sup>

Figure 1 shows the effect of a porous asphalt pavement on the hydrology of a developed site.

## Cooler cities

Porous asphalt pavements have been shown to mitigate the urban heat island effect. Open-graded asphalt roads and highways—which use the same surface material as porous parking lots—have been shown to lower nighttime surface temperatures as compared to impervious pavements. In at least one city, the hottest heat signature is at the airport, with its thick, dense, impervious runways.<sup>6</sup>

## Comparisons to other asphalt pavements

The surface of a porous asphalt pavement wears well. While slightly coarser than some pavements, it is attractive and acceptable. Most people driving or

walking on the pavement will not notice (or believe) that it is porous.

Like all asphalt pavements, porous pavements are ADA-friendly.

## Environmental applications

Asphalt pavements have been used for many years to enhance water quality. At landfills, asphalt liners and caps keep contaminants from leaking into groundwater. Drinking water reservoirs lined with asphalt pavement have been used in California since the 1950s. Salmon hatcheries and fish rearing ponds in the Pacific Northwest use asphalt liners.<sup>7</sup>

## Variations on the theme

Porous asphalt can be used successfully in parking lots, walkways, and playgrounds. Several current suburban projects are exploring its use in subdivision roads. A few porous highways and city streets have been constructed, both in the U.S. and in Europe, and have performed well.

The open-graded asphalt surface used for porous pavements has been used extensively to surface high-volume highways that carry heavy trucks. Its benefits include noise reduction, a decrease in splash and spray kicked up by vehicles in heavy downpours, and mitigation of the urban heat island effect.

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