

Tree Root Protection Using Cellweb TRP®

Fact Sheet 3: How the Cellweb TRP® System Deals With Oil and Other Pollution



Pollution in Urban Runoff

It has been suggested that pollution from run-off could damage tree health in certain concentrations. Pollution is present in runoff from car parks, roads and even roofs. There are a wide variety of pollutants including heavy metals, oil, fertilisers, pesticides, salts, pathogens and sediment that can cause environmental damage if discharged into rivers or groundwater (CIRIA 2007).

Where permeable pavements are constructed over the Cellweb TRP® the pavement construction will filter out and retain most pollutants. This fact sheet will discuss the extensive evidence base that demonstrates how effective permeable surfaces are at removing pollution. It will explain how they remove pollution from runoff before it reaches the soil below and how robust trees are to the levels of pollution found in runoff.

The effects of de-icing salt on trees are discussed in a separate Fact Sheet No 5.

There is research available which reveals that the pollutant loads from small areas of car park or small roads, where the majority of no-dig installations are used, are much less than for main roads or larger car parks (CIRIA 2003). Such low levels are unlikely to damage tree health. Sustainable drainage systems positively encourage the use of trees and other plants to treat the pollution that is present in run-off from hard surfaces.

Pollution Removal in Permeable Pavements

The effective removal of pollution from runoff by permeable surfaces has been well known since the late 1990s. This early work is summarised in CIRIA Report C582 (CIRIA 2002) and it showed that permeable pavements filter out sediment and act as bio reactors to degrade oil based pollutants. The sediment is filtered as it passes through the fine pores in the surface (either in porous asphalt or in the grit jointing material between blocks) which is where the majority of pollution is trapped (Legret and Colandini 1999, Shackel and Pearson 2005). If it passes this surface filtration layer it will be trapped on geotextiles either within or at the base of the construction. The Cellweb TRP® system will always have a Treetex™ geotextile at the base over the subgrade. This has properties that make it robust enough to survive in contact with the clean angular aggregate.

Worldwide research has generally shown that runoff that has passed through permeable pavements has low concentrations of pollutants, especially metals, oils and bacteria (Wilson 2007). This includes research in countries where the geotextile is generally only provided at the base of the construction. The percentage removal of various contaminants from a permeable pavement is shown in Figure 1. In this case the pavement was sealed and the water collected from a manhole at the outfall. It did not have an upper geotextile in the pavement. Similar findings have been reported by Mullaney and Jefferies (2011).

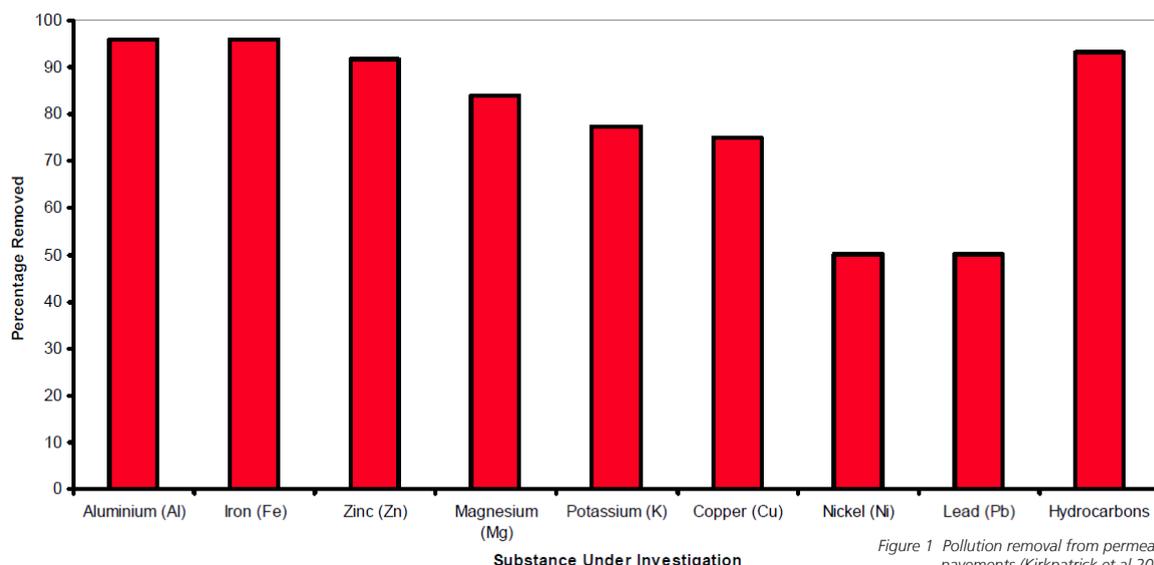


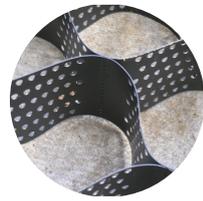
Figure 1 Pollution removal from permeable pavements (Kirkpatrick et al 2009)

All permeable pavements tend to use an open graded sub-base that is similar to the clean angular aggregate used in the Cellweb TRP® and therefore this material will help remove pollution in a similar manner. More recent research has confirmed that day to day pollution removal does not depend on a geotextile at high level in the pavement (Mullaney and Jefferies 2011) but that geotextiles in the construction can be beneficial if there are larger spills of oil (Puehmeier and Newman 2008). The Treetex™ geotextile provided at the base of Cellweb TRP® pavements will reduce the risk of any excessive pollution passing through the system into the soil below. Because of the pollution load and treatment that clearly occurs within the pavement there will not be a significant build up of pollutants within the soil below it.



Tree Root Protection Using Cellweb TRP®

Fact Sheet 3: How the Cellweb TRP® System Deals With Oil and Other Pollution



Ability of Trees to Deal with Pollution

Many trees are able to remove a wide variety of pollutants from soil. One of the more recent developments is stormwater forestry (United States Department of Agriculture (USDA) 2006). The USDA states that 'Trees also show enormous potential to remove other pollutants, such as metals, pesticides, and organic compounds.' The report does go on to suggest that some tree species may be damaged by pollutants in stormwater and this will require consideration on a site-by-site basis. However, these adverse effects can be minimised by careful design of the pavement drainage; for example, by using no-dig permeable pavements that filter out most pollutants before they reach natural soils.

Contaminates in runoff are typically not at concentrations that can adversely affect most riparian tree species. Excess nitrogen and phosphorus in soils are quickly taken up by trees with oxygen rich rhizospheres, because osmosis can happen freely. When nutrients are available trees take advantage of the windfall. Additionally, robust resilient trees are able to metabolize contaminants (heavy metals, inorganic and organic compounds) into their carbon rich heartwoods.

Bioretention areas are widely used in North America to collect and treat runoff in landscaped areas. A study by Toronto and Region Conservation (2009) involved extracting and testing soil cores extracted from three bioretention facilities in the Greater Toronto Area. These varied in age from 2 to 5 years and showed metal and PAH levels comparable to nearby reference sites that were not affected by runoff. The pollution concentrations were below Ontario background concentrations. The testing was repeated at one facility after two years which showed no change in contamination levels. This tends to suggest that pollutant loads from small paved areas will not significantly affect trees.

Benefits of Permeable Paving with Cellweb TRP® Tree Root Protection

Research has clearly shown that the majority of pollution is removed from runoff within the permeable pavement structure (which will include the Cellweb TRP® tree root protection system). Thus the low levels of pollution that are realised from the base of a Cellweb TRP® tree root protection system are unlikely to damage tree health.

The reduced compaction and highly permeable nature of the Cellweb TRP® tree root protection system (see Fact Sheet 1) will help to preserve the health of trees within developments. In addition there are clear benefits in attenuating and treating rainfall runoff using permeable pavements combined with the Cellweb TRP®.

References

CIRIA (2002). Source control using constructed pervious surfaces. CIRIA Report C582. London, UK.

CIRIA (2007). The SUDS manual. CIRIA Report C697. London, UK.

Kirkpatrick R, Campbell R, Smyth J, Murtagh J and Knapton J (2009). Improvement in water quality by coarse graded aggregates in permeable pavements. 9th International Conference on Concrete Block Paving. Buenos Aires, Argentina, 2009.

Legret M and Colandini V (1999). Effects of a porous pavement with reservoir structure on runoff water: water quality and fate of heavy metals. Water Science and Technology, Vol 39 No 2 pp111-117.

Puehmeier T and Newman A (2008). Oil retention and treating geotextile for pavement applications. 11th International Conference on Urban Drainage, Edinburgh, 2008.

Toronto and Region Conservation (2009). Review of the Science and Practice of Stormwater Infiltration in Cold Climates. 2009

Shackel B and Pearson A (2005). Technologies and opportunities for permeable segmental paving in Australia. Adelaide International Public Works Conference, 2005, Adelaide, South Australia, Australia.

