



URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

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MEMORANDUM

FROM: Ken A. MacKenzie, PE, CFM
Manager, Master Planning Program

SUBJECT: UDFCD position on the use of porous asphalt pavement

DATE: January 24, 2013

In April 2008, UDFCD worked with the Colorado Asphalt Pavement Association (CAPA) and several pavement contractors to install a porous asphalt demonstration pad in front of the City and County of Denver's Wastewater Management building. This site has been monitored regularly to determine if porous asphalt can maintain the minimally acceptable infiltration rate for any permeable pavement in the UDFCD region, which we have determined to be:

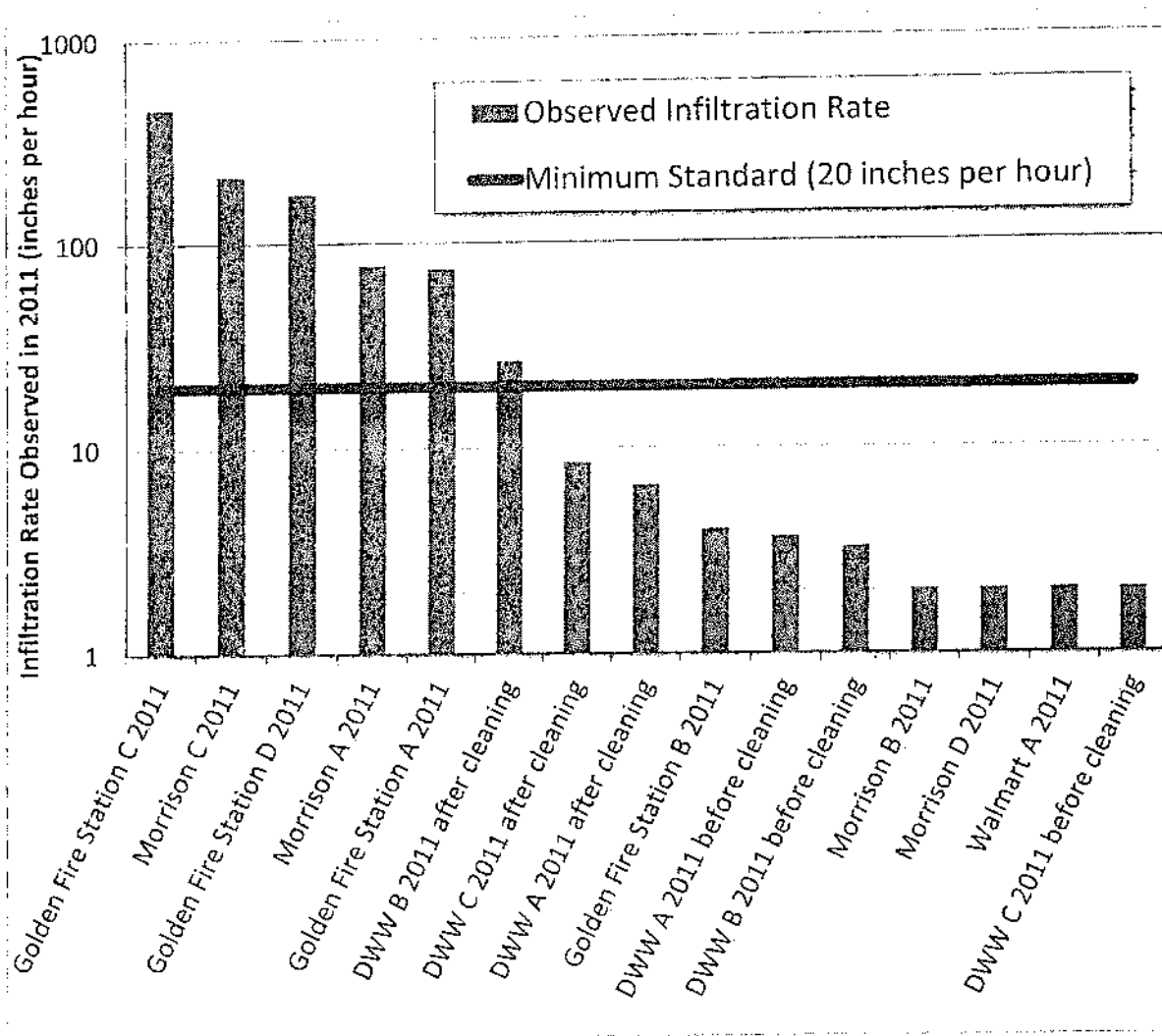
$$6.7 \text{ inches per hour} \left(\frac{\text{Impervious Tributary Area}}{\text{Permeable Pavement Area}} + 1 \right)$$

For the UDFCD-recommended impervious tributary area/pavement area ratio of 2:1, this minimally acceptable infiltration rate is equal to 20 inches per hour. Over a few years, the infiltration rate at this site and several other porous asphalt installations in the UDFCD region fell below this minimum standard and that cleaning with reasonably available methods and equipment were generally not successful in restoring infiltration rates to the minimum acceptable level. To properly clean porous asphalt on a commercial scale, regenerative air or vacuum sweepers are recommended. More intensive cleaning with power washers and higher efficiency vacuums was performed at some of these sites by CAPA and they were generally able to restore infiltration rates via these more extreme methods.

UDFCD considers porous asphalt an adequate BMP for use in locations where clogging sources are minimal, traffic volume is low, and maintenance is regular and intensive, but our experience indicates that such locations are rare. The intent of the USDCMV3 has always been to include only stormwater BMPs can be widely used throughout the UDFCD region and that have a good chance of success in capturing and treating the full design volume of stormwater over the life of the BMP with only reasonable maintenance practices and readily accessible equipment.

For this reason we will not at this time include porous asphalt pavement in the USDCMV3 and we further recommend both caution and realistic expectations in regard to performance and maintenance costs when implementing this particular permeable pavement.

This memorandum applies only to porous asphalt pavement. UDFCD continues to monitor and to recommend the use of other permeable pavement technologies found in the USDCMV3 such as permeable interlocking concrete pavement (PICP), concrete grid pavement, porous gravel pavement, and reinforced grass pavement. UDFCD will continue to monitor advances in porous asphalt composition, mixing and placing, and will update this position as appropriate.



Infiltration observations at four sites in the UDFCD region. These infiltration rates were observed by UDFCD staff in 2011 using ASTM method C-1701. The Walmart pavement was placed in 2006, the others in 2008.



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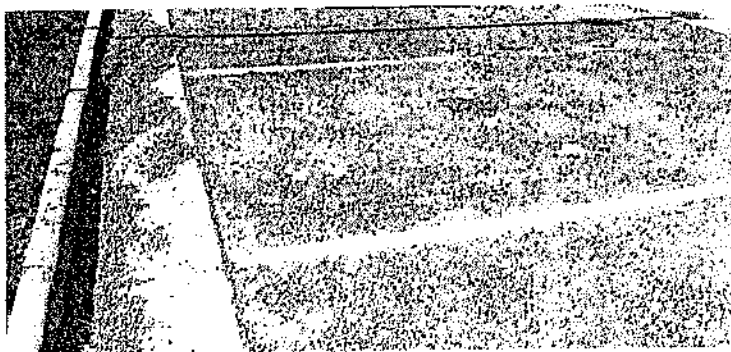
FROM: Ken A. MacKenzie, PE, CFM
Manager, Master Planning Program

SUBJECT: UDFCD position on the use of pervious concrete pavement

DATE: January 10, 2013

In June 2008 UDFCD called for a moratorium on pervious concrete pavement due to widespread surface raveling problems with this best management practice (BMP). Since that time we collaborated with the Colorado Ready Mixed Concrete Association (CRMCA) and others to develop a guidance document titled *The Specifier's Guide for Pervious Concrete Pavement Design*, which we believed would minimize, and hopefully prevent future failures. In 2010, The National Renewable Energy Laboratory (NREL) constructed a pervious concrete demonstration pad at its research laboratory in Golden, Colorado, to the new specifications and under the supervision of CRMCA. After only two years in service, the surface of this pervious concrete has heavily deteriorated. This, combined with several other premature failures and very few successes in Colorado, indicates to us that, until significant advances are made in pervious concrete composition, mixing and placing, successful implementation of this BMP is highly unlikely even under tight controls and ideal conditions.

For this reason, UDFCD does not at this time recommend the use of pervious concrete pavement as a sustainable stormwater quality best management practice in Colorado and we have removed it from the *Urban Storm Drainage Criteria Manual Volume 3: Best Management Practices (USDCMV3)*.



Golden, CO: The National Renewable Energy Laboratory's pervious concrete demonstration pad two years after construction. Note the large quantity of concrete surface aggregate in the gutter section.

This memorandum applies only to pervious concrete pavement. UDFCD continues to monitor and to recommend the use of other permeable pavement technologies found in the USDCMV3 such as permeable interlocking concrete pavement (PICP), concrete grid pavement, porous gravel pavement, and reinforced grass pavement. UDFCD will continue to monitor advances in pervious concrete composition, mixing and placing, and will update this position as appropriate.