**WATER RESOURCES MANAGEMENT**
**23829 NE Greens Crossing Road**
**Redmond, WA 98053-6287**



January 2, 2015

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
P.O. Box 100
Sacramento, CA 95814

Subject: Comments to A-2236(a)-(kk)

Dear Ms. Townsend,

The Los Angeles RWQCB and municipalities are to be commended for the development and implementation of storm water management programs that address the impacts of discharges from the MS4s. The State Board's proposed order will clarify and further strengthen those programs. The other regional boards and municipalities in California need to take advantage of the lessons learned in the Los Angeles area in developing and implementing their storm water management programs.

Following are comments on and recommendations to further strengthen the provisions in the WMP/EWMP by ensuring that regional and distributed BMPs are functional and effective for the ***Life of the Project*** served by the BMPs. The critical elements of an effective long-term storm water management program were best expressed by Eric Livingston in 2002:

**If you aren't willing to establish the institutional framework needed to assure that storm water BMPs are properly designed, constructed, inspected, maintained, and operated, DON'T REQUIRE THE USE OF BMPs.**

Eric Livingston, Florida DEP

The Los Angeles RWQCB in Order No. R4-2012-0175 established Bioretention/Biofiltration Design Criteria in Attachment H and in Attachment I required permittees to provide the development community reference information and guidelines to assist in the selection and design of BMPs. The Attachments are a good start towards implementing BMPs that are effective in reducing pollutants in storm water runoff; however, they do not provide documentation that the regional and distributed BMPs are functional and effective for the ***Life of the Project*** served by the BMPs. In many cases the projects served by the BMPs have a life greater than 50 years.

The Enhanced Watershed Management Program (EWMP) Final Work Plan submitted by the Ballona Creek Watershed Management Group in response to the Los Angeles RWQCB NPDES permit listed a number of Regional and Distributed BMPs in Table 3-1 that are vulnerable to failure or accumulate pollutants that can reach hazardous levels unless effectively maintained, rehabilitated and/or replaced during the ***Life of the Project***. The BMPs that are most vulnerable include surface infiltration basins and subsurface infiltration galleries, bioretention and biofiltration practices, permeable pavements, infiltration BMPs, bioswales, etc.

The Los Angeles RWQCB to address the problem of trash discharged from MS4s required municipalities to prioritize catch basins that are in areas that generate high, moderate and low volumes of trash and/or debris and required inspections at a frequency depending on generation rates. The RWQCB also requires that catch basins be cleaned out when reaching 25% of capacity and that solid and liquid material removed during maintenance is not allowed to enter the storm drainage system. The RWQCB implemented a monitoring program requiring municipalities to report on devices installed, catch basin owner, location with cross streets, date of installation, catch basin ID number, catch basin type, who performed maintenance, frequency of maintenance, amount of material removed during maintenance and other O&M comments. Municipalities annual reports include information on 10s of thousands catch basin devices.

A similar level of effort must be established to ensure the sustainability of other Regional and Distributed BMPs for the ***Life of the Project*** they serve.

Various studies and monitoring of infiltration/biotreatment BMPs have found that the longevity and effectiveness of engineered soil is decreased by clogging, reduced cation exchange capacity (CEC) with failure as early as the initial year of operation with very high rate failure rates within 5-7 years. Plugging of the infiltration surface and loss of percolation capacity by fine and coarse sediments, reduced CEC resulting in the breakthrough of heavy metals, accumulation of toxic and hazardous pollutants on the infiltration surface will require replacement and rehabilitation of infiltration/biotreatment BMPs multiple times during the *"**Life of the Project**"* which in many cases will be in excess of 50-years. This will require the rehabilitation and/or replacement of the facility's infiltration/biotreatment media or construction of new or additional treatment BMPs during the *"**Life of the Project**"*.

WERF did an extensive study and field survey on the performance and whole life costs of BMPs[1]. It found a wide variation in levels of maintenance of these systems and the systems tend to fail within a period of 2 to 7 years. WERF reported that even the best storm water agencies lack funding for BMP maintenance and that inadequate and deferred maintenance results in expensive rehabilitation or reconstruction of the BMPs.

Livingston reported that only 50% of infiltration practices surveyed in Maryland were considered to be working[2]. Studies on the performance and maintenance of swales found that over 75% of the 33 biofiltration swales surveyed in King County in1995 to be in fair to poor condition having little or no vegetation or extensive channelization. Dr. Gary Minton in 1996 performed an extensive survey of swales in the Pacific Northwest and reported "These results raise concerns about bioswales as a viable treatment BMP"[3].

The City of Portland conducted a performance evaluation of a number of its storm water BMPs including eco roofs, street planters (green streets) and vegetated infiltration (bioretention) basins[4]. The City conducted five types of monitoring: infiltration testing, flow metering, flow testing, water quality

[1] Water Environment Research Foundation, Performance and Whole Life Costs of Best Management Practices and Sustainable Urban Drainage Systems, Final Report 2005

[2] Management Institute, Inc. Eric Livingston, August 1997, Operation, Maintenance & Management of Stormwater Management, Watershed

[3] Stormwater Treatment Northwest© Vol. 12, No. 3, August 2006

[4] Bureau of Environmental Services, City of Portland, 2006 Stormwater Management Facility Monitoring Report, Sustainable Stormwater Management Program, September 2006 and Bureau of Environmental Services, City of Portland, 2008 Stormwater Management Facility Monitoring Report, Sustainable Stormwater Management Program, December 2008

sampling and sediment/soil sampling. Portland found significant sediment accumulation in street planters and rain gardens requiring temporary removal of vegetation to remove sediments, frequent maintenance and clogged drain fields. They also found soil clogging due to formation of hard crusts on the soil, accumulation of large amounts of soil, leaves and debris from streets requiring cleanout up to six times per year. Initial sediment/soil sampling found PAH levels that have exceeded California's human health exposure guidelines and levels of lead approaching California's TTLC. The City's program provides an excellent model for the monitoring needed to assess the long-term sustainability of storm water BMPs that have been installed in California.

The Portland/Vancouver Metropolitan of Governments in 2006 inspected 12 storm water BMPs including water gardens, bioswales, constructed wetlands and filtration devices that had received awards in 1996 and 1997 as "high quality innovative projects" and found several that appeared to be functional, but others silted, overgrown with invasive vegetation, and poorly or not maintained. The project concluded that BMPs must be designed and built with "sustainability" as an objective, but they must also be regularly inspected, maintained, and repaired/refined to be sure they will perform as intended for several decades.

Minton reports that soil gradually clogs decreasing infiltration and is due to accumulation of sediment, growth of bacteria, natural formation of crusts from chemical changes of the soil, growth of algae and impacts of raindrops (ref 3). He also observes that BMP manuals do not take into account this gradual clogging and that with the first storm event the actual infiltration rate immediately begins to decrease below design values and that infiltration systems should be sized using an infiltration rate that is truly "long term".

Wisconsin DNR indicates that use of bioretention systems for infiltration should consider that the longevity of engineered soil is decreased by clogging, reduced cation exchange capacity (CEC) and accumulation of sodium. The DNR reported that clogging problems can be reduced by limiting input of sediment (pretreatment) and cation exchange capacity be rejuvenated by replacement of the engineered soil.[5]

An inspection of five Bay Area swales cited in BASMAA's Start at the Source found that that two no longer existed subsequent to property transfers, two lacked maintenance and were bypassing and one in a parking lot at Santa Clara Valley Water District was constructed with multiple curb cuts that resulted in short circuiting storm water flows without treatment.

**"Life of Project" vs. "Life of BMP (Facility)" vs "Long-Term"** have been used in various design manuals to describe a project and quantify the minimum rate of infiltration for infiltration/biofiltration BMPs. The **Project** is the development served by a BMP /Facility and often is more than 50 years. The **"Life of BMP (Facility)"** is the period during which the BMP is operating in compliance with the BMPs design criteria. The phrase **Long-Term** should not be used unless it is made clear that the **Life of BMP (Facility)** equates to the long- term infiltration rate. Criteria and/or testing methods must be developed to determine when the infiltration/bioretention BMP no longer provides effective treatment i.e. reducing pollutants to the MEP standard, has become clogged and not maintaining the minimum infiltration rate and does not maintain the hydro modification requirements. Guidance and criteria for rehabilitation or replacement of infiltration/bioretention media and/ or reconstruction or replacement of the BMP must also be developed.

[5] Wisconsin Department of Natural Resources, Bioretention for Infiltration, (1004), 07/06

The criteria must at least address loss of infiltration and percolation capacity due to clogging, reduced cation exchange capacity and accumulation of pollutants posing a human or watershed health risk. The performance of infiltration systems (swales, bioretention, infiltration basins, etc) degrades through normal operation as suspended and settleable solids in storm water runoff plug or clog the infiltration surface.

Infiltration/bioretention BMPs fail as early as the initial year of operation with very high failure rates within 5-7 years. Plugging of the infiltration surface and loss of percolation capacity by fine and coarse sediments, reduced CEC resulting in the breakthrough of heavy metals, accumulation of toxic and hazardous pollutants on the infiltration surface will require replacement and rehabilitation multiple times during the "**Life of the Project**".

Mulch or compost that is periodically added to vegetated BMPs and media used in construction and replacement of bioretention systems can result in the release of nutrients. Studies conducted in Redmond, Washington observed significant export of pollutants from a bioretenton system including TSS, total phosphorous and copper[6]. In certain water bodies like Lake Tahoe and San Francisco Bay this release has a high potential for creating damaging impacts to beneficial water uses because of changes in water clarity and depletion of dissolved oxygen. The RMP Update 2014[7] reported that on a Bay-wide annual average basis nitrogen and phosphorous loads 15% comes from storm water and 65% from wastewater treatment plant effluent 20% from inflow from the Delta.

The State Board should add to the draft order an attachment to the Regional Board's Order No. R4-2012-0175 that requires permittees to ensure the sustainability of BMPs for the **"Life of the Project".** The objective of this requirement is to determine whether the BMPs are designed, constructed, operated and maintained pursuant to established and approved criteria and that the BMPs are not creating hazards to humans, pets and wildlife. The proposed ATTACHMENT – VERIFICATION OF SUSTAINABILITY OF BMPs FOR THE LIFE OF THE PROJECT should have the following key elements that would require permittees to:

- Develop a program that will ensure that infiltration/bioretention BMPs are sustainable for the **"Life of Project".**
- Establish uniform criteria for operation and protocols and procedures for maintenance of similar types of BMPs and verify compliance with design criteria of Attachment H and that the BMP was constructed in compliance with that criteria.
- Provide an inventory including location and design criteria of all infiltration/bioretention BMPs that have been installed since the inception of the storm water programs and the installation of all future infiltration/bioretention BMPs. The inventory must include the date of installation and agency or party responsible for the operation and maintenance of the BMP.
- Require rehabilitation or replacement of the infiltration/bioretention media of BMPs that have been in operation for more than five years and every five years thereafter **OR** Implement a biannual monitoring program that documents compliance with the minimum infiltration rate and approved media specifications for cation exchange capacity.

[6] Herrera Environmental Consultants, Inc. Pollutant Export from Bioretention Soil Mix, 185th Avenue NE, Redmond, Washington, October15, 2012

[7] San Francisco Estuary Institute (SFEI), 2014, RMP Update 2014,

- During the rehabilitation or replacement of the infiltration/bioretention BMP media use media that complies with the current approved media specifications.
- Require all new and rehabilitation or replacement BMPs with underdrains include a storage area or alternative media to achieve reduction in discharges of nutrients in watersheds that have or have the potential to experience nutrient limitations.
- Monitor at five year intervals the accumulation of toxic and hazardous pollutants on the infiltration/biofiltration surfaces and require replacement of hazardous sediments.
- Inspect all Projects when there is a change of ownership and ensure that new owners are aware of and are providing the required maintenance of the BMP.
- Determine whether reclaimed or nonpotable water is used for the establishment and long term operation of the BMP.

If there are any questions regarding the above comments and recommendations please contact at roger.james1@comcast.net .

Sincerely,

Roger B. James
Senior Consultant