Appendix

E

Applicability of Non-Low Impact Development Treatment Measures

As described in Section 5.2, since December 1, 2011, no underground vault systems have been allowed to be used as stand-alone stormwater treatment measures to meet the requirements of Provisions C.3.c and C.3.d of the MRP, except in certain types of "Special Projects," in which media filters may be allowed. Special Projects criteria are included in Appendix J. Three types of underground systems have been shown to have particular difficulty meeting the NPDES stormwater permit standard of removing pollutants to the maximum extent practicable (MEP) These three systems -- inlet filters (also called manufactured drain inserts), oil/water Separators (also called water quality inlets), and hydrodynamic separators – are described below. The Water Board staff's August 2004 letter that describes issues associated with these treatment measures is included at the end of this Appendix. A discussion of media filters precedes the attached letter.

As described below, some of these devices can be extremely effective in removing trash and other gross solid pollutants, as well as sediment and oil. While not adequate to meet the MEP standard alone, their use may be worth considering if used as part of a treatment train.

E.1 Inlet Filters

The California Stormwater Quality Association's (CASQA) New Development BMP Handbook describes storm drain inlet filters (which are also called manufactured drain inserts) as manufactured filters or fabric that are placed in a storm drain inlet to remove sediment and debris. In a letter dated August 5, 2004, the Water Board's Executive Officer described its assessment of studies and literature reviews for this type of treatment measure. The letter reported that these filters are subject to clogging, have very limited ability to remove dissolved pollutants, need very frequent maintenance, and are likely to receive inadequate maintenance. The following conclusion was made regarding inlet filters:

> "Based on our review of these references and experience in the Bay Area, it would be very unlikely for a proposal using inlet filters as the sole treatment measures to meet the MEP standard."[1]

Based on the Water Board staff's statements, the Clean Water Program's member agencies do not approve proposals for the use of inlet filters as permanent, post-construction treatment measures, unless they are part of a stormwater "treatment train" approach that includes other, more effective types of stormwater treatment measures. The use of treatment trains is discussed in Section 5.1.4. Long-term use of inlet filters can be problematic due to their need for frequent maintenance; however they may be used effectively as construction BMPs.

E.2 Oil/Water Separators

Oil/water separators, also called water quality inlets, are described in CASQA's New Development BMP Handbook as consisting of one or more chambers that promote sedimentation of coarse materials and separation of free oil (as opposed to emulsified or dissolved oil). The Water Board's August 5, 2004, letter described oil/water separators as originally developed for industrial uses and recognized as generally ineffective in removing the types of pollutants normally found in urban stormwater. The letter included the following summary statement regarding oil/water separators:

> "With the exception of projects where oil and grease concentrations are expected to be very high, and other measures are included in a 'treatment train' approach, Board staff is unlikely to consider oil/water separators as a means of meeting the MEP standard."

As with inlet filters, based on the Water Board staff's statements, Clean Water Program member agencies do not approve proposals for the use of oil/water separators to treat stormwater, unless they are used to treat high concentrations of oil and grease and the stormwater receives further treatment for fine-particulates associated with pollutants.

E.3 Hydrodynamic Separators

The US Environmental Protection Agency (USEPA) has described hydrodynamic separators as "flow-through structures with a settling or separation unit to remove sediments".[2] The energy from the flowing water allows sediments to settle, so no outside power source is needed.

In 2005 the Contra Costa Clean Water Program conducted a literature review that found that hydrodynamic separators were substantially less effective than various landscape-based treatment measures for removing pollutants that are associated with very fine particles and are

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[1] Letter from Bruce H. Wolfe, Executive Officer of the San Francisco Bay Regional Water Quality Control Board to the Bay Area Stormwater Management Agencies Association (BASMAA), dated August 5, 2004 (included in this appendix).

[2] USEPA, Hydrodynamic Separators Fact Sheet, 1999. http://www.epa.gov/owm/mtb/hydro.pdf.

identified as pollutants of concern in the Contra Costa Countywide NPDES municipal stormwater permit[3]. The technical memorandum also described local experience successfully applying a variety of landscape-based treatment measures to development projects in Contra Costa County, as well as operation and maintenance concerns and mosquito generation potential associated with hydrodynamic separators. Effective December 1, 2011, the stand-alone use of hydrodynamic separators is no longer allowed to meet stormwater treatment requirements.

Hydrodynamic separators can be very effective at removing trash and gross solids from runoff, and may be included as part of a treatment train in order to remove large solids before the stormwater is routed to a treatment measure that is more effective at removing fine particulates.

E.4 Media Filters

A technical description of media filters is provided in Section 6.10. Effective December 1, 2011, the stand-alone use of media filters to meet stormwater treatment requirements is no longer allowed, except for use in Special Projects, as described in Appendix J. While media filters have been demonstrated to remove suspended solids more effectively that the manufactured treatment systems described above, concerns remain about the maintenance of these systems. Media filters have more intensive maintenance requirements than low impact development treatment measures, and, since they are located underground, tend to be "out of sight, out of mind," and often do not receive the maintenance required to function properly. When used in Special Projects, it will be important for municipal staff to conduct regular maintenance verification inspections to verify that these systems are maintained properly and operating as designed.

E.5 Water Board Staff's Letter

A copy of the Water Board staff's August 2004 letter is included in the following pages.

[3] Contra Costa Clean Water Program, November 16, 2005. Policy on the Use of Hydrodynamic Separators to Achieve Compliance with NPDES Provision C.3.

California Regional Water Quality Control Board
San Francisco Bay Region

Terry Tamminen
Secretary for Environmental Protection

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
http://www.swrcb.ca.gov/rwqcb2

Arnold Schwarzenegger
Governor

Date: August 5, 2004
File No. 1538.09 (KHL, JBO)

BASMAA Managers
c/o Geoff Brosseau
BASMAA Executive Director
1515 Clay Street,
Suite 1400
Oakland, CA 94612

Subject: Use of Storm Drain Inlet Filters and Oil/Water Separators to Meet the Requirements of NPDES Municipal Stormwater Permits

Dear BASMAA Managers:

This letter responds to your requests to clarify the Water Board's review of an aspect of municipal stormwater permittee compliance with requirements to include treatment controls in new development and significant redevelopment projects. Please assist us in distribution of this letter to BASMAA member agencies and other interested parties.

The Board regularly receives inquiries regarding the inclusion of stormwater treatment control measures to remove pollutants from new development and redevelopment project runoff. As a state agency, the Board does not endorse specific treatment control products. Also, there is currently no State certification program that would certify the effectiveness of a particular product.

However, the Board's role does include determining permittees' compliance with their NPDES stormwater permits. This includes determining that municipalities have reduced the discharge of pollutants in storm water to the Maximum Extent Practicable (MEP). While not specifically defined within federal clean water law, MEP refers to implementing best management practices (BMPs) that are effective in addressing pollutants, generally accepted by the public, of reasonable cost, and technically feasible.

When reviewing compliance with permit requirements for new development and redevelopment projects, Board staff looks to see that permittees have required projects to incorporate appropriate source controls to prevent the discharge of pollutants, design measures to reduce impervious surface, and treatment controls to remove pollutants from runoff. We review whether these measures have been appropriately designed to be effective, given the existing state

of knowledge. For example, is a vegetated swale designed within parameters specified in existing literature as being effective? Such parameters include minimum residence times, maximum flow depths and velocities, limits on swale longitudinal and side slopes, inclusion of a subdrain if in very tight soils, and similar considerations.

Oil/Water Separators

Another example, vault-based oil-water separators, also known as water quality inlets, was originally designed for industrial use. These have been recognized to be generally ineffective at removing pollutants at concentrations seen in urban stormwater runoff, because removal rates are low and those pollutants that are removed are often flushed out by subsequent storms, especially when a separator is not frequently maintained. With the exception of projects where oil and grease concentrations are expected to be very high, and other controls are included in a "treatment train" approach, Board staff is unlikely to consider oil/water separators as a means of meeting the MEP standard.

Storm Drain Inlet Filters

Storm drain inlet filters, also known as drain inlet inserts, also have been shown to have limited effectiveness in removing pollutants from urban stormwater runoff, due to the nature of their design. Inlet filters are typically either bags or trays of filter media that are designed to catch and treat runoff as it enters the storm drain. They are manufactured stormwater treatment controls, and are typically popular because they have a low capital cost relative to other controls and can be placed into a traditional engineered storm drain design without altering that design.

In determining whether drain inlet filters meet the MEP standard, we reviewed the existing state of knowledge. Board staff's assessment of studies and literature reviews for this class of controls has found the following:

- Filters are subject to clogging and/or blinding by sediment, trash, and vegetation, resulting in runoff bypassing the filter and/or flooding;
- Maintaining filter performance requires very frequent maintenance (as often as during and after every storm). Manufacturers in practice understate the maintenance requirements for this class of devices. In practice, maintenance is not completed at an effective frequency, particularly to avoid bypass of the filter element clogged with debris;
- Inlet filters, by virtue of their location below a storm drain grate, are out of sight. This can lead to reduced maintenance resulting from the filters being out-of-sight, and thus out-of-mind;
- Filter performance may decay rapidly over a time frame that is significantly shorter than typically recommended replacement or maintenance intervals;
- Filters appear to have very limited ability to remove dissolved pollutants, smaller particulates, and emulsified oil and grease, and may have a limited ability to remove

oil and grease as it is found in urban runoff. The filter element in inlet filters is small and easily bypassed if fouled to prevent flooding.

The limited space within a storm drain inlet appears to preclude highly effective treatment. To the extent that treatment is accomplished, it appears that these controls require an intensive maintenance regime—one that is expensive and which, based on our experience in the Bay Area, is ultimately not completed once the controls have been installed.

A list of references reviewed is attached and includes reports prepared by Bay Area municipal stormwater programs that found the effectiveness of existing inlet filter products to be very limited. Based on our review of these references and experience in the Bay Area, it would be very unlikely for a proposal using inlet filters as the sole treatment measures to meet the MEP standard.

Fortunately, there are a variety of effective controls available to project proponents and designers as alternatives to inlet inserts. These include a range of landscape-based controls (e.g., vegetated swales, bioretention areas, planter/tree boxes, ponds, and stormwater wetlands) and a series of manufactured controls (e.g., vault-based hydrodynamic separators, vault-based media filters, and other solids removal devices). With few exceptions, these controls appear to function more reliably to remove pollutants, and thus would better represent "MEP."

Each type of BMP should be used in situations for which it is appropriate. For example, the City of Oakland is working to limit trash discharged into Lake Merritt. For that project, controls that primarily remove trash may be most appropriate. For most new development projects, however, BMPs that address the broad spectrum of urban runoff pollutants, from trash to fine particulates and soluble pollutants, are needed.

We recognize that inlet filter products with substantially improved performance may be developed in the future. Also, certification programs like Washington State's "Evaluation of Emerging Stormwater Treatment Technologies," which reviews technologies to determine whether they are at least as good as existing non-proprietary measures, may establish viable treatment measures. As with any aspect of the NPDES stormwater program, we anticipate that the municipal stormwater programs and the Board will continue to review information as it is developed so as to best determine what constitutes MEP, and to help ensure the reasonable cost in implementation of effective BMPs.

If you have any questions or further comments, please contact Dale Bowyer at (510) 622-2323 or via email to dcb@rb2.swrcb.ca.gov, or Keith Lichten via email to khl@rb2.swrcb.ca.gov, or at (510) 622-2380.

Sincerely,

--original signed by--

Bruce H. Wolfe
Executive Officer

Attachment: References Reviewed

ATTACHMENT: REFERENCES REVIEWED

Author	Title	Date	Notes
McDonald, Jonathan / Kristar	Letter & Attachments	September 19, 2003	
Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)	Application of Water-Quality Engineering Fundamentals to the Assessment of Stormwater Treatment Devices	August 28, 2002	
SCVURPPP	An Update of the 1999 Catch Basin Retrofit Feasibility Study Technical Memorandum	June 26, 2002	
SCVURPPP	Catch Basin Retrofit Feasibility Study Technical Memorandum	July 12, 1999	
Woodward-Clyde for SCVURPPP	Parking Lot Monitoring Report	June 11, 1996	
Woodward-Clyde for SCVURPPP	Parking Lot BMP Manual	June 11, 1996	
Minton, Gary R./Abtech Industries	Technical Review of the AbTech Ultra-Urban Filter	January 4, 2002	
URS Greiner Woodward Clyde (now URS) / Alameda County Urban Runoff Clean Water Program (now ACCWP)	Stormwater Inlet Insert Devices Literature Review	April 2, 1999	
USEPA/NSF International	ETV Joint Verification Statement: Hydro-Kleen Filtration System	September 2003	
USEPA/NSF International	Environmental Technology Verification Report; In-Drain Treatment Technologies Equipment Verification; Hydro Compliance Management, Inc., Hydro-Kleen Filtration System	September 2003	

Othmer, Friedman, Borroum, and Currier / Caltrans	Performance Evaluation of Structural BMPs: Drain Inlet Inserts (Fossil Filter and StreamGuard) and Oil/Water Separator	2001	
Woodward-Clyde Consultants / Alameda County Urban Runoff Clean Water Program	Street Sweeping/Storm Inlet Modification Literature Review	December 21, 1994	
Woodward-Clyde in association with UCLA and Psomas & Associates.	Santa Monica Bay Municipal Storm Water/Urban Runoff Pilot Project—Evaluation of Potential Catchbasin Retrofits	September 24, 1998	Prepared for Santa Monica Cities Consortium
Interagency Catch Basin Insert Committee	Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites	October 1995	ICBIC is comprised of: King County Surface Water Mgmt. Div.; King County Dept. of Metropolitan Svcs.; Snohomish County Surface Water Mgmt. Div.; Seattle Drainage and Wastewater Utility; and Port of Seattle.
Caltrans	BMP Retrofit Pilot Program: Final Report (Report ID CTSW-RT-01-050)	January 2004	
Elizabeth Miller Jennings, Senior Staff Counsel, Office of Chief Counsel, State Water Resources Control Board	Memorandum on Maximum Extent Practicable	February 11, 1993	