

**State Stormwater Quality Task Force  
Stormwater Science Workgroup Activities:  
A Proposed Program**

April 10, 1998

At the March 13, 1998 California Stormwater Quality Task Force Executive Committee meeting, a Stormwater Science Workgroup was organized to help the Task Force address a number of technical issues associated with developing technically valid, cost-effective regulation/management of urban area and highway stormwater runoff water quality impacts. The Task Force Executive Committee adopted the following goals and delineated the following work products for the Stormwater Science Workgroup.

**Goal: Promote the development and application of appropriate water quality standards to intermittent discharges from urban area and highway stormwater runoff conveyance systems.**

- Develop a position on application of water quality standards to wet weather discharges.
- Identify where there are problems meeting water quality standards.

*Products:*

- Report detailing alternate approaches to applying water quality standards.
- Report on constituents of concern relative to water quality standards compliance
- Cost Survey (to be finalized).

**Goal: Identify stormwater pollutants of concern.**

- Define pollutants of concern.
- Review monitoring findings.
- Compile "state of knowledge."
- Promote research on the transport and fate of pollutants.
- Facilitate improved understanding.

*Products:*

- Task Force presentation

**Background - Compilation of Issues to be Considered**

At the March 13, 1998 Executive Committee meeting, Dr. G. Fred Lee agreed to chair the Stormwater Science Workgroup. Presented below is an overview discussion of the issues pertinent to conducting the Stormwater Science Workgroup activities.

The US EPA and State WRCB have determined that the US EPA Phase I and Phase II stormwater discharges must ultimately meet water quality standards - not cause or contribute to water quality standards violations in receiving water more than once in three years.

The regulatory approach to achieve this requirement involves the use of a BMP ratcheting-down process until water quality standards are met in the discharged waters. While no time frame has been specified for achieving water quality standards, it will likely be from three to five or seven to ten years dependent primarily on litigation.

Non-structural stormwater BMPs, such as the six Minimum Control Measures set forth in the US EPA proposed Phase II regulations will not control chemical constituents, such as heavy metals and some organics, as well as pathogenic organism indicators to a sufficient extent in urban area and highway stormwater runoff so that the runoff waters do not cause violations of water quality standards in the receiving waters.

Conventional structural stormwater BMPs, such as retention basins, filters, etc., will not treat urban area and highway stormwater runoff to a sufficient extent so that the residual concentrations of regulated constituents and aquatic life toxicity in the treated stormwater runoff do not cause violations of water quality standards in the receiving waters with no more than one exceedance every three years.

Ultimately, there will be need to use advanced wastewater treatment processes to treat urban area and highway stormwater runoff to a sufficient extent to prevent runoff waters from causing exceedance of water quality standards in the receiving waters. This treatment will involve the construction, operation, and maintenance of massive stormwater collection, storage, and treatment works that will be very expensive and likely cause a significant economic burden to the public which must pay for these treatment systems.

For example, preliminary estimates of costs include the need for Alameda County to construct 50 storage systems the size of the Oakland Coliseum on the shores of San Francisco Bay to store the runoff from a one-day, two-inch storm. The City and County of Sacramento have estimated that the total cost for treating Sacramento metropolitan area stormwater runoff with conventional BMPs which will not necessarily meet water quality standards with no more than one exceedance every three years to be about \$1 per person per day for all the residents of that region. The costs for treating stormwater runoff to meet water quality standards in the Los Angeles metropolitan area have been projected to be in the order of \$70 billion.

US EPA Region 9, as part of the proposed California Toxics Rule, failed to conduct an economic analysis of the cost of ultimately having to achieve water quality standards in urban area stormwater runoff. The US EPA Washington D.C., as part of developing proposed Phase II regulations, failed to conduct an economic analysis of the cost of achieving water quality standards in the runoff waters. Information of this type is an

essential component for formulating urban area and highway stormwater runoff water quality management programs.

There is growing general agreement that it will not be possible to treat urban area and highway stormwater runoff to comply with current water quality standards of the type that exist today for protection of aquatic life under worst-case conditions at the point of runoff because of the significant economic burden that the cost of the collection, storage, and advanced wastewater treatment works would have on urban residents. The US EPA is using as an affordable cost for implementing urban area stormwater runoff water quality management programs a cost of one to two percent of the median household income per community. This approach, however, does not necessarily consider other societal needs for the funds that are proposed to be spent for urban area stormwater runoff water quality management.

There is general agreement that before a stormwater discharger initiates expenditures of the projected magnitudes, there is need to develop a good understanding of the water quality use impairment problems that are being addressed. Also, there is need to assess the potential water quality use impairment benefits of using various types of BMPs in controlling these problems, as well as controlling the concentrations of chemical constituents in the stormwater runoff that cause exceedances of water quality standards in the receiving waters for the runoff.

At many locations there is also increasing evidence that spending the funds necessary to achieve current water quality standards in urban area and highway stormwater runoff waters with no more than one exceedance every three years for heavy metals and regulated organics will not result in significant improvement in the designated beneficial uses of the receiving waters for the runoff. A number of studies have shown that the heavy metals and the regulated organics in the urban area streets and highway stormwater runoffs are in non-toxic, non-available forms and remain so in the receiving waters.

There are, however, toxic constituents in urban area stormwater runoff, including organophosphate pesticides such as diazinon and chlorpyrifos used by homeowners for structural, lawn, and garden pest control which are not regulated by water quality criteria/standards. This pesticide-associated toxicity cannot be controlled by the installation of conventional stormwater BMPs.

An Urban Pesticide Committee has been formed by the San Francisco and Central Valley Regional Water Quality Control Boards to review urban pesticide stormwater runoff toxicity issues. Membership on this Committee is open to anyone who is interested. It is currently composed of water quality and pesticide regulatory agency staff, representatives of stormwater dischargers, environmental groups, pesticide manufacturers, and other interested individuals. Several participants in this Committee made presentations to the State Stormwater Quality Task Force in November 1997 on their work on urban pesticide stormwater runoff toxicity issues. This Committee has determined that one of the initial areas that must be addressed in developing an urban runoff pesticide toxicity

management program entails determining the water quality significance of this toxicity to the beneficial uses of the receiving waters of urban area stormwater runoff.

The Stormwater Science Workgroup will monitor the activities of the Urban Pesticide Committee and periodically report on those activities that are of importance to managing toxicity in urban area stormwater runoff.

Urban area and highway stormwater runoff has been found to contain elevated concentrations of pathogenic organism indicators such as total and fecal coliforms which can cause or contribute to impairment of the receiving water sanitary quality for contact recreation and domestic water supplies. Further, for certain marine waters, urban area and highway stormwater runoff associated pathogenic organism indicators can cause an impairment of use of shellfish through closure of harvesting areas due to elevated levels of coliform organisms within the shellfish. While the regulated chemical constituent issues associated with urban area and highway stormwater runoff may be resolvable through the development of appropriate discharge limits that will protect the designated beneficial uses of the receiving waters for the urban area and highway stormwater runoff, it is likely that the sanitary quality issues of urban area and highway stormwater runoff may be much more difficult to address achieving sanitary quality related water quality standards. This will be one of the major issues that the Stormwater Science Workgroup will address.

### **Stormwater Runoff Water Quality Monitoring Programs**

There is widespread growing recognition that traditional end of the pipe and edge of the pavement stormwater runoff water quality monitoring programs provide limited information on the water quality impacts of urban area stormwater runoff associated constituents. Several of the municipal stormwater runoff monitoring programs are shifting the emphasis in the program from monitoring a suite of chemical constituents in the runoff waters to assessing the water quality impacts of the chemical constituents in the runoff waters as they may impact the beneficial uses of the receiving waters. The Stormwater Science Workgroup will provide guidance to the Task Force on how to best utilize the funds available for water quality monitoring so as to define the real water quality use impairment impacts of stormwater runoff associated constituents in the receiving waters for the runoff.

This Workgroup will also provide guidance to the Task Force on how stormwater managers can determine the water quality significance of an exceedance of a water quality standard in the receiving waters for the runoff caused by runoff derived constituents. It is planned that the Stormwater Science Workgroup will organize several technical sessions devoted to stormwater runoff water quality monitoring issues.

### **Addressing Bay Protection and Toxic Hot Spot Designation and Ranking**

In addition to considering traditional water quality standards violations associated with exceedance of a water quality standard in a receiving water water column, the

Stormwater Science Workgroup will provide guidance to the Task Force on approaches that the Task Force may wish to consider in implementing contaminated sediment management programs that will address compliance with the WRCB Bay Protection and Toxic Cleanup Program requirements for managing toxic hot spots. Particular attention will be given to providing guidance on appropriately evaluating the designation and ranking of, as well as determining the responsible parties for, funding cleanup of toxic hot spots relative to discharges of particulate constituents in urban area and highway stormwater runoff. Also, attention will be given to providing guidance on how an urban area or highway NPDES stormwater permit should be modified to control the discharge of constituents in urban area and highway stormwater runoff that cause toxic hot spots in the runoff receiving waters.

### **Addressing DTSC's Designation of Hazardous Waste**

Cal/EPA Department of Toxic Substances Control (DTSC) is revising the approach it uses to define hazardous waste within the State. This activity is important to managers of urban area and highway stormwater runoff water quality since currently, and under the proposed revised definition of hazardous waste, particulates in urban area and highway stormwater runoff that accumulate in stormwater runoff conveyance structures or BMPs can be classified as a "hazardous waste." The chemical of greatest concern is lead since its concentrations in urban area streets and highway stormwater runoff particulates can exceed current DTSC hazardous waste classification limits. Such classification greatly increases the cost of managing particulate residues associated with urban area and highway stormwater runoff. The Stormwater Science Workgroup will provide advice to the Task Force on suggested approaches that the Task Force may wish to follow in reviewing the technical validity of DTSC's proposed revised hazardous waste classification as it may impact urban area and highway stormwater runoff associated constituents.

### **Coordination With BMP Workgroup**

At the March 13, 1998 meeting, the State Stormwater Quality Task Force initiated a new BMP Workgroup devoted to urban area stormwater runoff BMPs. This Workgroup is being chaired by Scott Taylor of RBF, Irvine, California. The State Stormwater Quality Task Force Executive Committee formulated the following goals and Workgroup activities.

#### **Goal: Develop better understanding of BMPs for specific applications.**

- Develop BMP recommendations.
- Compile and review information on BMPs.
- Function as a clearinghouse.
- Establish protocols for development of BMP performance standards.
- Coordinate BMP review efforts.
- Identify grant moneys for studies.

*Products:*

- Determine and report status of US EPA/ASCE BMP efficacy initiative.
- Investigate/compile other BMP initiatives.
- Determine WRCB needs and opportunities for SWQTF assistance.
- Determine interest in BMP Manual update/review.
- Make recommendations regarding continued distribution of BMP manuals.

The Stormwater Science and the BMP Workgroups will closely coordinate their activities because of the significant scientific component of properly selecting, implementing and evaluating urban stormwater runoff BMPs. The Stormwater Science Workgroup will provide guidance on the kinds of site-specific studies that need to be conducted in reliably selecting site-specific BMPs that are technically valid, cost-effective and protective of the receiving water designated beneficial uses. The Stormwater Science Workgroup will also provide guidance on reliably evaluating the efficacy of BMPs as they may impact the designated beneficial uses of the receiving waters for urban area and highway stormwater runoff.

### **Coordination With Watershed Workgroup**

The State Stormwater Quality Task Force developed a Watershed Workgroup in 1997 chaired by Richard Watson of Richard Watson Associates, Mission Viejo, California. The overall goals and activities of the Watershed Workgroup are:

#### **Goal: Watershed Management**

- Develop approaches for urban stormwater quality management in a watershed management program.
- Develop guidance on the incorporation of urban stormwater runoff water quality management in a TMDL program.

*Products:*

- Report to the Task Force on urban stormwater runoff water quality management under a watershed-based water quality management program.
- Report to the Task Force on stormwater runoff water quality management under TMDL regulations.

The State Stormwater Quality Task Force Watershed Workgroup has selected as one of its primary areas of activity, during 1998, the development of guidance to the Task Force on approaches that should be incorporated into urban area and highway stormwater runoff water quality management programs under the TMDL regulatory regime. The Stormwater Science Workgroup and the Watershed Workgroup will work closely together where the Stormwater Science Workgroup will provide technical input to the Watershed Workgroup with particular reference to TMDL issues.

## **Approach:**

It is proposed that stormwater dischargers, regulatory agencies, environmental groups, members of the public interested in the appropriate use of public funds, and other interested parties work together to develop a strategy based on a consensus approach for managing urban area and highway stormwater runoff associated water quality problems and exceedances of US EPA worst-case water quality criteria/state standards based on these criteria. The Stormwater Science Workgroup's activities will focus on:

Exploring approaches for developing appropriate wet weather urban area and highway stormwater runoff chemical constituent and pathogenic indicator organism discharge limits that will protect the designated beneficial uses of waterbodies without significant unnecessary expenditures for chemical constituent and pathogenic indicator organism control.

Developing appropriate water quality standards for urban area and highway stormwater runoff that properly reflect how chemical constituents in such runoff impact the designated beneficial uses of the receiving waters for the runoff. Of particular importance will be the incorporation of aquatic chemistry, aquatic toxicology, and water quality into adjusting water quality standards from the current worst-case-based approach so that they serve as reliable indicators - regulatory tools for cost effective protection of receiving water beneficial uses.

There are a variety of alternative approaches that can be incorporated into regulating urban area and highway stormwater runoff so that this runoff complies with current US EPA interpretation of the Clean Water Act requirements of not causing violations of water quality standards in the receiving waters for the runoff. These include the development of site specific criteria/standards, development of mixing zones for urban area and highway stormwater runoff, conducting use attainability analyses, granting of temporary variances under wet weather flow conditions, revisions of the Clean Water Act, and the incorporation of Porter Cologne Act economic considerations in establishing appropriate limitations on urban area and highway stormwater runoff. The Stormwater Science Workgroup will make recommendations to the Task Force on the potential applicability of each of these approaches that would enable compliance with appropriately developed water quality standards that would protect the designated beneficial uses of receiving waters without significant unnecessary expenditures for chemical constituent and pathogenic organisms indicator control.

In addition to considering the traditional constituents of concern in urban area and highway stormwater runoff such as copper, zinc, lead, oil and grease, suspended solids, pathogenic organism indicators and litter, the Stormwater Science Workgroup will provide guidance to the Task Force in addressing some of the emerging constituents of concern including mercury, chromium, dioxins, PAHs, nutrients (N and P), and arsenic. Also, toxicity to various forms of aquatic life of unknown causes will be a constituent of concern.

## **Timetable for Program**

The proposed Stormwater Science program will be active during the anticipated several years that the BMP ratcheting-down process to achieve no violations of water quality standards in the receiving waters for NPDES permitted urban area and highway stormwater runoff due to constituents in the runoff. It is anticipated that the basic framework for development of an appropriate regulatory approach will be reported to the Task Force in the Fall of 1998. At that time, specific guidance will be provided to the Task Force on how to develop the detailed information needed by stormwater managers, regulatory agencies, and others to select the most appropriate approach(es) for NPDES permitted urban area and highway stormwater runoff to achieve compliance with Clean Water Act requirements.

A steering committee for the Stormwater Science Workgroup will be organized representing the various interests that will work closely with Chairman G. Fred Lee in developing materials that will be reviewed by the Workgroup and by the Task Force. Communication among the Workgroup steering committee, Workgroup, and interested Task Force members will be by email and, where necessary, by fax. Anyone interested in being placed on the email mailing list will be added to this list. All interested parties will be encouraged to provide comments on all materials developed by the Workgroup as those materials are developed. Comments on the Stormwater Science Workgroup proposed program should be directed to Dr. G. Fred Lee, ph. (530) 753-9630, fx (530) 753-9956, email [gfredlee@aol.com](mailto:gfredlee@aol.com). Additional background information on many of these issues is available in recently developed discussions of these topics including the following:

G. Fred Lee and Anne Jones-Lee, "Comments on US EPA National Pollutant Discharge Elimination System-Proposed Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Proposed Rule, Federal Register, January 9, 1998" submitted to US EPA, Washington, DC, April 7, 1998

Anne Jones-Lee and G. Fred Lee, "Stormwater Managers Beware of Snake-Oil BMPs for Water Quality Management" Proc. Water Environment Federation conference "Advances in Urban Wet Weather Pollution Reduction," Cleveland, OH, June (1998) (in press)

G. Fred Lee and Anne Jones-Lee, "Appropriate Application of Water Quality Standards to Regulating Urban Area Stormwater Runoff" Proc. Water Environment Federation conference "Advances in Urban Wet Weather Pollution Reduction," Cleveland, OH, June (1998) (in press)

G. Fred Lee, "Comments on Selected Issues that Influence the Application of Water Quality Standards to Urban Area and Highway Stormwater Runoff Water Quality Management" Report of G. Fred Lee and Associates, El Macero, CA April (1998)

Copies of these papers and reports as well as other publications pertinent to this draft program are available as downloadable files from <http://www.gfredlee.com>.

*Reference as: "Lee, G.F., 'State Stormwater Quality Task Force Stormwater Science Workgroup Activities: A Proposed Program,' G. Fred Lee & Associates, El Macero, CA (1998)."*