Contents

3.0 PLAN IMPROVEMENT AND WATERSHED PLANNING

3.1 Introduction

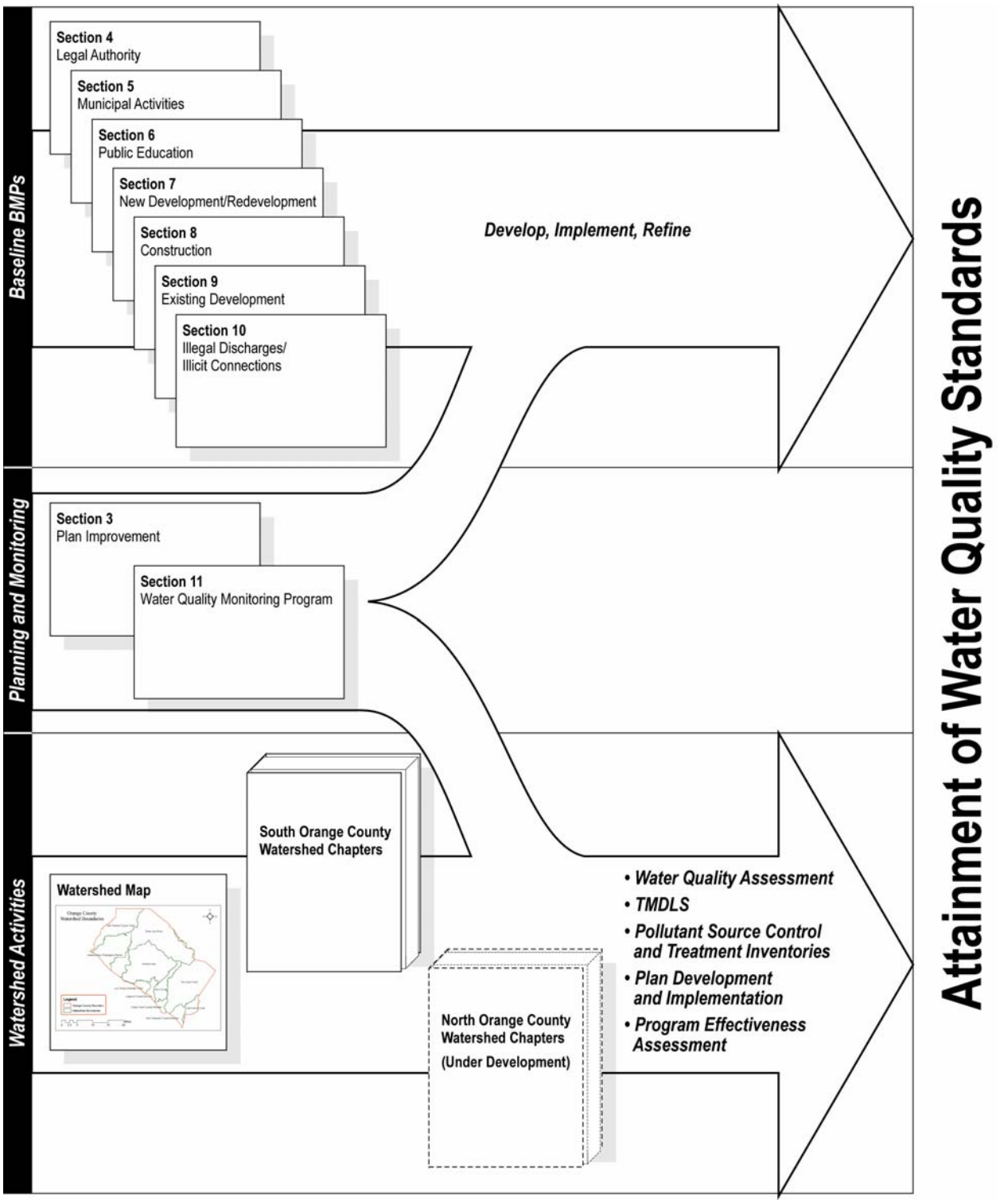
Program management of various water quality improvement programs within Orange County under the NPDES program occurs at two distinct levels: (1) activities conducted by the Permittees individually through implementing jurisdictional programs in their LIPs based on the model programs in the DAMP; and (2) activities conducted by the Permittees and others collectively to address specific water quality issues on a watershed scale. Since the program inception in the early 1990's, the Permittees to the Orange County Stormwater Program have been embarked on this two-tiered comprehensive approach to stormwater management which includes a water quality planning process, referred to throughout the DAMP. This planning process includes a systematic and detailed evaluation of the impacts of urban stormwater discharges on receiving waters to determine or validate that actual impairments exist that may warrant corrective action.

The DAMP sets forth this iterative approach for urban stormwater management at both of these levels:

- For the LIP programs, the DAMP establishes and periodically refines a baseline set of BMPs that are applicable to all areas and that are proven and cost-effective;
- For the Watershed based programs, the DAMP lays out a process for:
  - Focusing on solving water quality problems in receiving waters;
  - Prioritizing waterbodies for additional action, with those listed as impaired having a higher priority; and
  - Promoting a watershed-level approach and implementing enhanced BMPs on both an individual and collaborative basis to address watershed constituents of concern. This watershed-level planning approach is being further defined and described in detail in the Watershed Action Plans that identify enhanced BMPs to address specific watershed issues.

This Section, together with information collected through the Water Quality Monitoring Program, provides the foundation and underlying support to the program on both of these levels as illustrated in **Figure 3-1**. This approach has been gradually evolving through the first three Permit terms. Under the first term, the Permittees developed an inventory and basic understanding of their municipal storm drain systems and initiated implementation of a number of baseline BMPs on a county-wide basis. Under the Second and Third Term Permits the Permittees enhanced the existing program elements and baseline BMPs and developed additional ones; and updated the DAMP with the latest version completed in 2003. At the same time that the Permittees were refining and expanding implementation of baseline BMPs, they embarked on additional monitoring, and began looking more closely at watershed-specific issues, pollutants of concern, and priorities. It became apparent that implementation of baseline BMPs only, while important for significantly reducing pollutants and complying with NPDES permits, would not address all watershed priorities or necessarily assure that specific water quality impairments resulting from urban runoff impacts would be fully addressed.

Figure 3-1 Program Approach



Under the Third Term Permits, the County initiated detailed Watershed Planning efforts for the major watersheds within the County, beginning with the San Diego Regional Water Quality Control Board region in the southern portion of the County. As these efforts are completed for a specific watershed, they are being incorporated into Appendix D of the DAMP. As of June 2006, the following Watershed Action Plans have been completed or are in progress:

- Laguna Coastal Streams
- Aliso Creek
- Dana Point Coastal Streams
- San Juan Creek
- San Clemente Coastal Streams
- San Mateo Creek
- Newport Bay (in progress)

This systematic approach utilizes information obtained from the countywide baseline water quality monitoring program (Section 11.0) and from the additional water quality planning initiatives that have been or are currently being conducted in a number of the watersheds to determine those with beneficial use impairments, potentially attributable to urban stormwater. Once a water quality problem is identified, additional or new Best Management Practices (BMPs) are evaluated for implementation to determine their effectiveness and applicability. Since the field of stormwater management is a dynamic one, it is necessary for the Permittees to continue this systematic and iterative process of revising, adding or deleting BMPs as necessary in order to maintain a successful and responsive program.

3.2 Regulatory Requirements

Federal regulations (40 CFR 122.26 (d)(2)(iv)) require that drainage area management plans include "a comprehensive planning process....to reduce the discharge of pollutants to the maximum extent practicable using management practices, control techniques and system, design and engineering methods, and such other provisions which are appropriate."

The regulations further state that "proposed programs may impose controls on a systemwide basis, a watershed basis, a jurisdiction basis, or on individual outfalls" and "shall describe priorities for implementing controls."

The regulations thus require the development, implementation and prioritization of BMPs to control the discharge of pollutants from municipal storm drains into waters of the United States. The vehicle for this BMP implementation is the DAMP, which includes new BMPs and modifications to existing BMPs and other stormwater management program elements to address stormwater runoff from industrial, commercial, and residential areas to reduce the discharge of pollutants from municipal storm drains to the MEP.

The Plan Improvement Program was developed as a model for fulfilling the requirements of:

- Section XVI of the Santa Ana Regional Water Quality Control Board (RWQCB) Municipal NPDES Stormwater permit, Order No. R8-2002-0010;

- Section J of the San Diego RWQCB Municipal NPDES Stormwater permit, Order No. R9-2002-0001.

While the permits describe in detail a programmatic approach to implementation of stormwater management, they contain a provision that discharges from the MS4s shall not cause or contribute to exceedances of receiving water quality standards (designated beneficial uses and water quality objectives) for surface waters or groundwaters. The permits presume that the DAMP and its components are designed to achieve compliance with receiving water limitations through an iterative process and the application of increasingly more effective BMPs.

If there is evidence that the permittees continue to cause or contribute to an exceedance of water quality standards, notwithstanding implementation of the DAMP the permittees shall promptly notify and submit a report to the Executive Officer of the Regional Board that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of water quality standards. Once approved, the Permittees will implement the revised DAMP and monitoring program in accordance with the approved schedule.

3.3 Plan Evolution

3.3.1 Approach to Plan Development and Improvement

As noted above, the BMPs fall into two general categories:

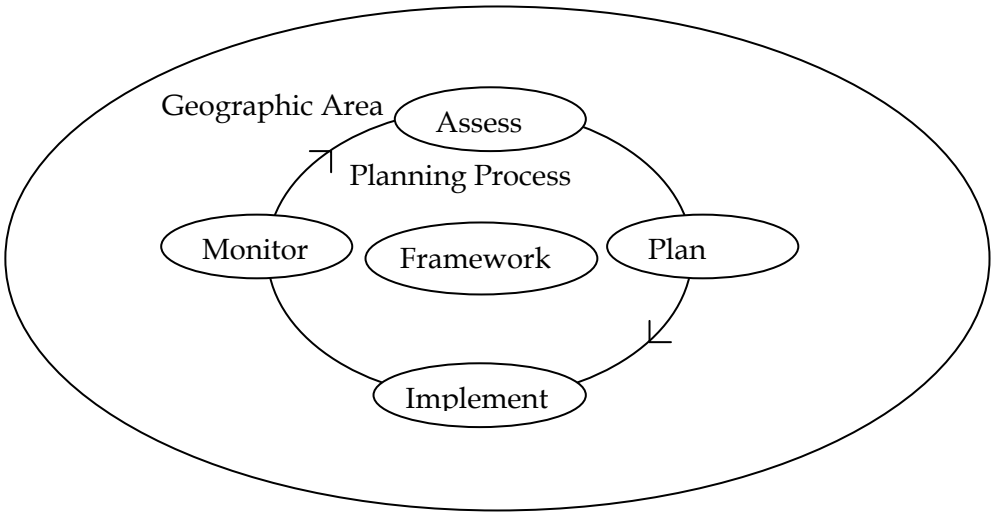
- The "baseline BMPs" addressed in the DAMP include establishing adequate legal authority to control pollutant discharges (Section 4.0), implementing BMPs as part of routine municipal activities (Section 5.0), conducting an effective public and business education program (Section 6.0), implementing routine non-structural and structural BMPs in new developments and significant re-developments (Section 7.0), implementing structural and non-structural on-site BMPs for construction projects (Section 8.0), implementing BMPs for existing development (Section 9.0) and identifying and eliminating illegal discharges/illicit connections (Section 10.0). In general, these BMPs are implemented to the extent applicable throughout the County under all Permittees' Local Implementation Plans.
- The pollutant-specific watershed-based programs include enhanced BMPs such as structural BMPs identified through the water quality planning process and site specific or regional/watershed Treatment Control BMPs for new developments necessary pursuant to Section 7.0 of the DAMP. Water quality problems will be identified through the countywide water quality monitoring program and other water quality assessments.

The formation of special task groups or continued participation of individuals in the process is vital to the long-term viability of the water quality improvement process (and by extension, watershed management) in Watershed Committees. Consideration of protection of environmental resources, and not only water quality issues, needs to be constantly integrated into this process. The interdependency of many resources requires that public understanding of potential issues related to single-purpose projects must be sought and integrated into the planning process.

It is expected that one of the functions of the management group will be the continued education of the participants and general public on the progress of water quality improvement efforts.

The approach taken to develop the Watershed Chapter recognizes that each Permittee's LIP and this Watershed Chapter represent the principal planning documents for two separate but nonetheless similar and highly interdependent water quality planning processes targeting the control of pollutants in urban runoff. These iterative processes can be represented in each case as shown **Figure 3-2** and described in **Table 3-1**.

Figure 3-2 Water Quality Planning Process



Based upon the annual watershed assessment, the Watershed Permittees and other participating jurisdictions will work together to address the priority water quality issues identified through this watershed planning process. It is anticipated that water quality issues that are determined to be specific to a jurisdiction would be referred to that jurisdiction and thereafter be addressed as a jurisdictional program initiative through the LIP. Alternatively, the issue may originate from multiple jurisdictions within the watershed. In this instance, the problem would be addressed as a watershed cooperative effort.

Updates to this program will be the subject of annual reporting which will include a water quality assessment and revisions to the listed water quality improvement initiatives.

Table 3-1 Watershed Management Processes		
	Local Implementation Plan	**Watershed Chapter**
Geographic Area Covered by Plan	Defined by political (city/county) boundaries	Defined by hydrologic boundaries
Planning Process	Focused on reducing discharges of pollutants in urban runoff and stormwater pollution on a uniform countywide basis. Directed by DAMP/LIP in conformance with NPDES permits requirements.	Focused on improving local receiving water quality where it is adversely impacted by urban runoff and stormwater pollution. Directed by NPDES permit requirements and 303(d) list/TMDLs.
Framework	Directed by Orange County Stormwater Program committee structure and Regional Board review. Public consultation principally through California Environmental Quality Act (CEQA) process/Regional Board review.	Directed by municipal and public agency stakeholders. Characterized by public participation.
Assessment	Based on information from countywide municipal and regional cooperative investigations of stormwater and receiving water quality and are undertaken on an annual and 5 year basis.	Based on information from watershed specific investigations and are undertaken on an annual basis.
Planning	Broad based approach with emphasis on well established pollution prevention and source control measures.	Pollutant specific approach with emphasis on treatment controls and consideration of innovative regional solutions.
Implementation	Individually by the Watershed Permittees.	Individually and collaboratively by Watershed Permittees and other agencies.
Monitoring	Considers pollutant load reduction.	Considers beneficial use attainment.

The watershed planning process can form the basis for an administrative system, resource allocations, a communication mechanism with residents and community groups, and ultimately a means for tracking and measuring BMP implementation and effectiveness. By focusing on watersheds as the planning unit, the watershed becomes the geographic and administrative unit for a wide range of program activities and community involvement that can result in cost effective and measurable results. These include activities conducted by the Watershed Permittees while implementing their jurisdictional programs and activities conducted by the Watershed Permittees and others collectively to address issues on a watershed scale. The programs range from NPDES coordination to the establishment of a long-term Watershed Management Framework, which varies in structure by watershed.

The development of a forward thinking, cost-conscious watershed implementation plan requires that several factors associated with existing and possible future management practices be evaluated and prioritized. These factors range from cost and efficiency to location and source types, all of which should be evaluated at several different scales. Scale plays an important role in watershed management. It is associated with characterizing sources and their impacts to receiving waters, determining the types and locations of appropriate management practices, and the effectiveness of these practices on improving water quality. The need to address and understand how to bridge various scales has been an ongoing issue in the community of watershed management professionals (e.g., planners, scientists, engineers). How to address multiple scales in a meaningful way typically requires the development of assessment tools at multiple scales because the monitoring and/or modeling of thousands of BMPs is not necessarily cost effective or useful. The assessment tools should provide a means for balancing cost effectiveness, management practice efficiency, and ongoing assessment and adjustment needs at both regional and site scales.

Benefits of Watershed Management

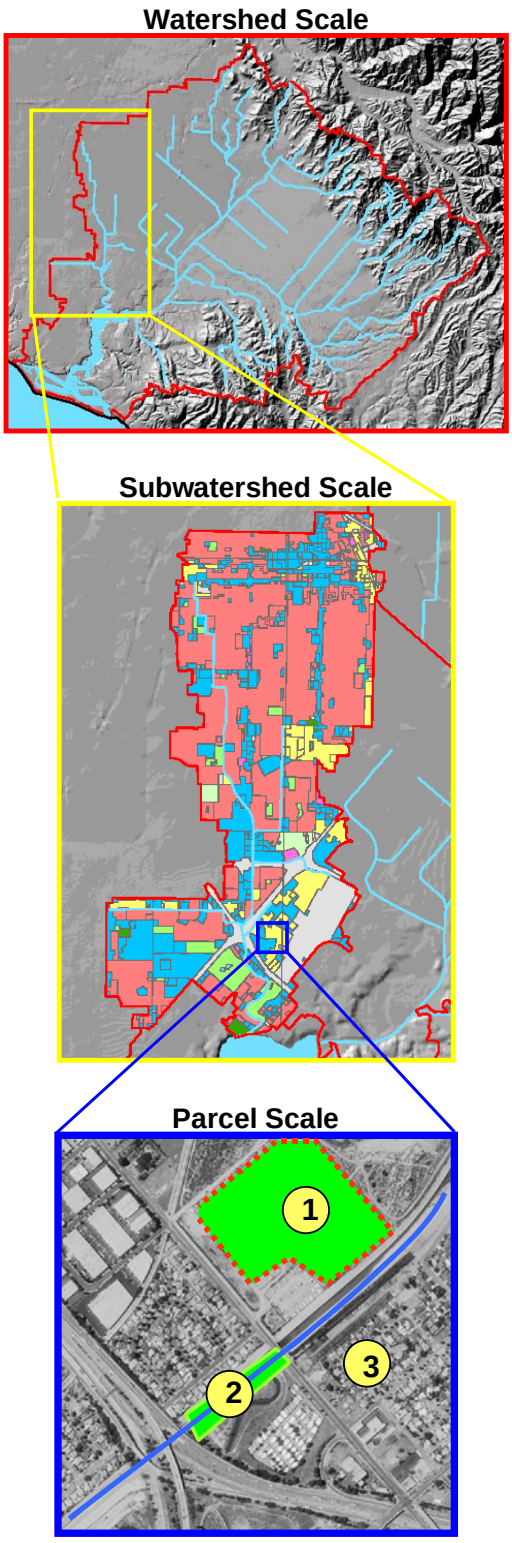
- Locally driven needs, goals, and objectives
- Locally run and designed
- Consistency with federal and state programs
- Economies from streamlined analysis and implementation procedures
- Opportunity for flexibility in the development of management alternatives
- Decision-making based on environmental and local considerations
- Effective Capital Improvement Program planning and budgeting

The broadest scale considered in watershed planning is the watershed or basin scale. As an example, in the Newport Bay watershed, this scale would encompass a 154 square mile area (see the first box in **Figure 3-3**). This level of planning provides an accounting of existing and potential source controls in the watershed and an understanding of their basin-wide effectiveness. Evaluating BMPs at a watershed scale also takes into account the variety of activities contributing to pollution, often including both rural and urban land uses. Comprehensively addressing all of these sources may require many BMPs that work in tandem and are evaluated together since the overall effectiveness may be greater than the sum of the individual practices.

Evaluations of BMP effectiveness can also be concentrated on a smaller geographic area, such as a subwatershed. A subwatershed scale focuses BMP implementation on a limited set of "like" source types and pollutants. For example, the coastal zone or coastal subwatersheds may focus on bacteria sources (including birds) and select a subset of BMPs that could be applied in

coastal areas where available space may be limited. This assessment scale provides a better understanding of cause and effect relationships than the watershed scale although it requires more specific information on sources and controls.

Figure 3-3 Representation of Scale



However, the more specific information provides a better foundation for defining a site's characteristics and using the characteristics to define other similar subwatersheds in the region. Again, as an example, in the Newport Bay Watershed, the Santa Ana-Delhi Channel represents a sample subwatershed (see the yellow box in **Figure 3-3**).

The most detailed scale is represented by a community or parcel and can be evaluated in much greater depth (see the blue box in **Figure 3-3**). For instance, detailed analyses or modeling can be performed to evaluate the impact(s) of individual BMPs (or a train of BMPs). These results can be used to estimate water quality improvements at similar locations or extrapolated to estimate impacts in a larger area with similar characteristics. For larger areas, rather than just extrapolating results, modeling may be helpful to ensure that the physical and chemical processes present in the watershed are appropriately represented and evaluated.

In practice, watershed planning efforts should consider the watershed, subwatershed, and parcel scales. Each scale provides meaningful information that can be scaled up or down to provide the basis for planning decisions and determining effectiveness of existing and/or planned BMPs. In addition, the impact of BMPs should be assessed to determine the effectiveness of both individual BMPs and the overall implementation plan (this is especially important for watersheds with TMDLs and approved implementation plans).

3.3.2 Methodology for Examining BMP Retrofit Opportunities

Watersheds determined to require additional BMPs have been surveyed for potential retrofitting. Where retrofitting opportunities are not found, new structural BMPs will be considered, consistent with the principles of MEP standard. Existing flood control, retarding, sediment control, water conservation, recreation, habitat, and greenbelt facilities will continue to be evaluated in terms of their potential for modification to provide water quality benefits.

To supplement these earlier efforts, a countywide evaluation was initiated in 2003 to identify opportunities within the existing storm drain infrastructure for configuring/reconfiguring storm drains or channel segments in order to improve water quality and maintain the designated beneficial uses. This effort is discussed further in the following section.

3.3.3 BMP Selection and Implementation

Current BMPs

The Permittees have historically conducted activities that provide ancillary water quality benefits (street sweeping, catch basin cleaning etc.). The DAMP and the Third Term permits continued to recognize the importance of continuing the BMPs that have been initiated and included new commitments to enhance these current countywide efforts. In many instances changes have been included to further improve their effectiveness over the Third Permit Term and to increase the Permittee commitment to their implementation.

New BMPs

Although the DAMP provides for the implementation of a successful Orange County NPDES Stormwater Program through the BMPs that have already been developed and implemented, the Permittees recognize that the field of stormwater management is highly dynamic and that the BMPs were identified within the 2003 DAMP have continued to be implemented and evaluated. In some cases BMPs have been or may in the future need to be revised, deleted or

added to in order for the program to remain successful. In addition, water quality degradation caused by urban stormwater discharges that is identified either through the water quality monitoring program or the water quality planning process may elevate the need for additional or new BMPs to be implemented in order to effectively address the problem.

New candidate BMPs can be prevention or removal oriented and can be considered either for updating baseline BMPs or for incorporation as watershed-based BMPs. New BMPs are generally identified from one or more of the following:

- A review of technical literature (such as the ASCE/EPA database);
- A review of existing control programs;
- Demonstration or research projects;
- Input from consulting firms and municipalities already involved in new BMP implementation; or
- Other sources.

New structural BMPs, chosen for broad implementation, should be selected from candidate BMPs that have been field-tested and evaluated as to their pollutant removal efficiency and cost effectiveness. They should also be planned and located to maximize their cost-effectiveness.

Assessment of BMP Effectiveness

Methodologies for assessing the performance of BMP effectiveness can include conventional monitoring (such as water quality monitoring) and non-conventional monitoring.

Conventional monitoring, while theoretically providing a more direct indication of actual BMP performance is very challenging for a number of reasons. Water quality monitoring is costly, particularly given the highly variable nature of stormwater runoff, and targeted on a limited number of BMPs. Furthermore, not all BMPs are readily evaluated through water quality monitoring. Therefore, an accurate, quantifiable assessment of the cumulative effectiveness of current BMPs is difficult for a variety of reasons, including:

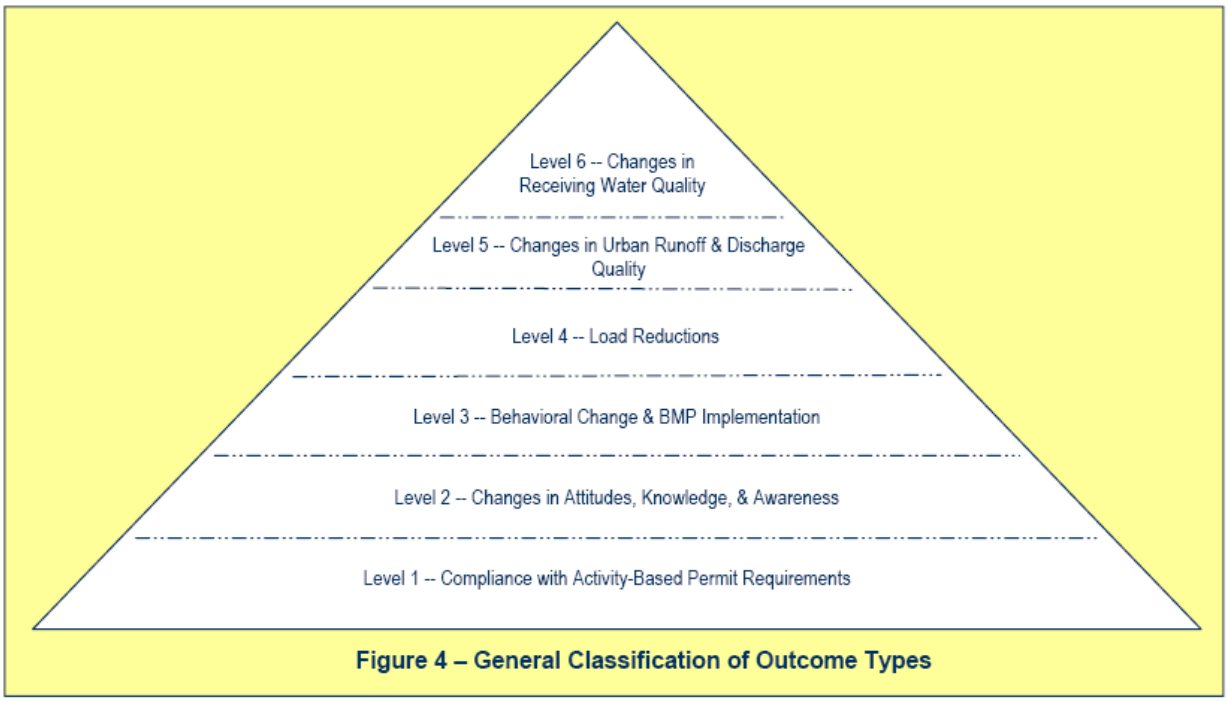
- Non-structural BMPs began to be implemented prior to the first municipal stormwater permit requirements, meaning no "baseline" monitoring data representative of "pre-BMP" conditions can be identified;
- The BMPs identified in the 2003 DAMP are being implemented incrementally on a countywide basis. Since, to date, no watershed has been uniquely subject to a single BMP, the influence of an individual BMP upon the overall surface water quality cannot yet be readily determined;
- There is considerable variability in water quality data that complicates any statistical correlation of the data with storm frequency, storm length and intensity, land use, or land management practices. This is even more compounded by storm seasons in recent years that have varied much in their intensity, duration and volume;
- Many of the BMPs identified in the 2003 DAMP are implemented to address the issues associated with a specific land use. However, since the land uses are extremely varied

within the watersheds, it has not proven possible to characterize the effects of those specific BMPs; and

- Factors other than chemical water quality may be more directly responsible for impairment of beneficial uses, yet all these factors combine in their effects and are difficult to separate one from another.

A method for evaluating overall stormwater program effectiveness on both a programmatic and BMP level has been under development for the California Stormwater Quality Association and can be considered for incorporation into the Orange County Program. The concept approach, illustrated in **Figure 3-4**, provides a hierarchy of potential outcomes that can be evaluated ranging from programmatic permit compliance assessment to demonstrated changes in receiving water quality.

Figure 3-4 Concept Approach for Program Evaluation (From CASQA, 2005)



While assessing the cumulative effect of BMPs employed countywide on the water quality of receiving waterbodies may take a number of years, there are a number of programs that are currently contributing to the assessment of individual project BMP performance. The Permittees have conducted several studies discussed below to evaluate and assess BMP performance and efficiency.

Trash and Debris BMP Evaluation **-**The objectives of the study were to review characterization information on trash and debris in Orange County and to identify candidate structural BMPs. The study concluded that site characteristics may be the principal determinants of BMP selection. During the reporting period the findings of this study were developed into a BMP selection guide for retrofit applications to modify

an existing facility to provide a water quality (trash/debris removal) function. This guide will be finalized in 2006-07 and incorporated into **DAMP Appendix E**.

Erosion Control BMP Effectiveness Study - The study was conducted during the current permit period to evaluate selected erosion with the goal of providing information on (1) the effect of time and weathering on product condition; (2) the frequency a product must be applied to be effective; (3) the maximum slope on which a product will perform effectively; and (4) how product performance is affected by soil types. The study comprised an evaluation of two types of hydraulic mulch (paper and wood based), two types of polyacrylimide (low and high molecular weights), and wood mulch (without a binding agent). The findings of the evaluation will be reported in the **2005-06 Unified Report** and incorporated into **DAMP Appendix E**.

BMP Effectiveness and Applicability for Orange County - This study was commissioned to review existing information on available structural BMPs and to organize and present specific information to facilitate the selection, siting, design, construction and maintenance of the most appropriate and cost-effective BMPs for a particular site in Orange County. The study recommended consideration be given to using extended detention basins, vegetated swales, vegetated buffer strips, bioretention, sand and organic filters, infiltration basins and infiltration trenches. In 2005, the study report was updated to include the flow reduction BMPs developed under the auspices of the Nitrogen and Selenium Management Program.

BMP Retrofit Opportunities Study - In 1997-98, the feasibility of incorporating BMP retrofits to optimize beneficial use attainment began to be addressed in the context of the long-term water quality planning initiatives being conducted within Orange County, a number of which are in cooperation with the Army Corps of Engineers. To supplement these earlier efforts, during 2003-04, a countywide evaluation was initiated to identify opportunities within the existing storm drain infrastructure for configuring/reconfiguring storm drains or channel segments in order to improve the water quality and maintain the designated beneficial uses (see **DAMP Appendix E**). This effort was continued in 2005-05 with further use of the GIS-based model.

Tustin Area Spill Control (TASC) Demonstration Project - To address the various regulatory, technical and coordination issues associated with preventing and planning for sanitary sewer overflows (SSOs), the County and OCSD initiated a pilot project titled Tustin Area Spill Control (TASC) Demonstration Project. The project accomplished:

- Development of SSO response procedures;
- Completion of the Request for Proposal process for selecting primary and backup sewage spill response contractors for containment and recovery of sanitary sewer overflows;
- Conducting SSO hands-on field response training; and
- Development of a Memorandum of Understanding for delineating jurisdictional and financial responsibilities within the TASC project.

Assessment – Toward Better Assessment

A number of important initiatives are being supported by the Permittees aimed at the development of assessment techniques and methodologies to support more informed and consistent decision making across Southern California. Notable amongst these initiatives are the Regional Research Monitoring Program (Stormwater Monitoring Coalition) and the Development of the California Sustainable Watershed/Wetland Information Manager (CalSWIM) – prototype Database.

Regional Research Monitoring Program (Stormwater Monitoring Coalition) - The goal of the *Stormwater Monitoring Coalition* is to identify region-specific research needs to better understand stormwater mechanisms and impacts, and to collectively sponsor the development of assessment techniques and methodologies that will enable more informed and consistent stormwater management decision-making across the region.

The SMC has initiated several of the 15 research projects identified in the research agenda, including: Microbial Source Tracking Method Comparison, Development of Standardized Sampling and Analysis Protocols, Implementation of a Laboratory Intercalibration Program, Peak Flow Impact Assessment, and the Freshwater Stream Bioassessment Monitoring Program.

Development of California Sustainable Watershed/Wetland Information Manager (CalSWIM) – Prototype Database - In response to a commitment to develop a prototype watershed database for cumulative impact assessment, the County of Orange as Principal Permittee has joined with the University of California, Irvine (UCI) in developing and implementing a prototype database called the California Sustainable Watershed/Wetland Information Manager (CalSWIM). CalSWIM is a web-based expert system and database focused, initially, on Newport Bay and the Newport Bay watershed and can be viewed at www.calswim.org. The technical objective of CalSWIM is to provide an interactive platform for coastal wetland and watershed managers, planners, and engineers to explore alternative wetland and watershed management strategies.

The Permittees will continue to assess and evaluate the data from these and other studies in order to try and determine the overall effectiveness of the implementation of the BMPs on water quality within Orange County.

3.3.4 Plan Revision

This 2006 draft DAMP has been revised and updated from the 2003 DAMP and is being submitted in conjunction with the Report of Waste Discharge in as part of the Permit Renewal process in 2006-07. The TAC will review, and submit to the Permittees for local approval, the updated DAMP. The documents will then be submitted to the Regional Boards.

3.4 Funding of Structural Controls

3.4.1 New Development BMPs

Each developer will finance and implement the construction site controls specified in this plan and will institute the appropriate post-construction BMPs. If an approved regional or watershed plan is in place that anticipates the new development, the developer may be required to contribute to the implementation of the regional or watershed structural BMPs. This may be accomplished by establishing a water quality plan and funding program for each affected watershed (see Section 7.0 for more detail).

3.4.2 Watershed Structural BMPs

Financial requirements for the construction, operation and maintenance of watershed structural BMPs (water quality wetlands, biofiltration swales) will continue to be evaluated on a watershed scale on a case by case basis. Appropriate financing programs will be proposed, including consideration of means to assure appropriate participation by land developers, project proponents, and any other local stakeholders.

Those structural BMPs, which are retrofitted existing structures, will continue to be operated and maintained by the present owners for each new structure. The planning process will include consideration and determination of maintenance responsibility for each new structure.