CASQA
California Stormwater Quality Association™
Dedicated to the Advancement of Stormwater Quality Management, Science and Regulation

August 15, 2007

Xavier Swamikannu
Chief – Stormwater Permitting
Regional Water Quality Control Board, Los Angeles Region
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Re: Draft CASQA White Paper – Quantifiable Approach to Municipal Stormwater Program Implementation and Permit Compliance Determination

Dear Dr. Swamikannu:

On behalf of CASQA, I would like to formally thank you and your staff for meeting recently with Richard Boon (Chair – CASQA Policy and Permitting Subcommittee), Mack Walker (CASQA regulatory consultant), and myself to discuss CASQA's approach to providing a comprehensive strategy for managing stormwater quality and how it relates to the Ventura municipal stormwater permit. The enclosed draft White Paper presents a description of that comprehensive strategy.

This draft White Paper combines the concepts of effectiveness assessment (e.g., measurable goals), quantifiable measures (e.g., Action Levels), and CASQA's *Progressive Approach* with standard regulatory options for National Pollutant Discharge Elimination System (NPDES) permitting and total maximum daily load (TMDL) implementation. The draft White Paper also includes a frequently asked questions (FAQs) section that provides answers to specific questions raised about the *Progressive Approach*, Effectiveness Assessment, and quantifiable measures.

It is worth noting that the concept presented in the White Paper has been shared with the Ventura Countywide Stormwater Quality Management Program. Although the quantifiable measures shown in Table 1 were developed independently of the Ventura Program and only serve as examples for the purposes of this White Paper, the Ventura MS4s have indicated their support to develop quantifiable measurements for their program that are similar in nature to the ones presented in this White Paper.

Thank you for considering our approach and as always please contact me with any questions or comments. We look forward to continuing to work with you.

Sincerely,

Geoff Brosseau, Executive Director

enclosure: Draft White Paper

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This paper was written to advance the science and regulation of stormwater quality management. It presents a quantitative approach to municipal stormwater program implementation and permit compliance determination developed by the California Stormwater Quality Association.

Introduction

Section 402(p) (3) (B) of the federal Clean Water Act (CWA) provides that "permits for discharges from municipal storm sewers ... shall require controls to reduce the discharge of pollutants to the maximum extent practicable ...." While the CWA does not specifically define MEP, USEPA has described MEP as a flexible, site-specific standard. (National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges, 64 Fed. Regs. 68722, 68732, 68754 (Dec. 8, 1999).) "The pollutant reductions that represent MEP may be different for each [municipal stormwater discharger] given the unique local hydrological and geological concerns that may exist and the differing possible pollutant control strategies." (*Id.* At 68754.)

California also has not specifically defined MEP for its permitting purposes. However, the State has relied upon other federal programs to guide its understanding of MEP. In particular, the State relied upon the term as used in Superfund legislation and CERCLA. (SWRCB Order No. 2000-11 at p. 20.) Using these statutes, the State concluded "MEP requires Permittees to choose effective BMPs, and to reject applicable BMPs only where other effective BMPs will serve the same purpose, the BMPs would not be technically feasible, or the cost would be prohibitive." (*Id*. at p. 20.). However, this approach has proven to be a contentious basis for permitting. For example, the first Phase I permits issued by the San Francisco and Los Angles Regional Water Boards in 1990 were appealed to the State Water Board for their absence of numeric limits. Although the appeal was denied on the grounds of technical infeasibility, the action served notice of environmental non-governmental organizations' (NGO) dissatisfaction with an approach that they perceived as providing inadequate permittee accountability.

In addition, stormwater permits in California include requirements that the discharges of stormwater pollutants will not cause or contribute to an exceedance of a water quality standard. Compliance with this requirement is based on an iterative planning process that provides for the implementation of best management practices (BMPs) and subsequent refinement if an exceedance is identified. This approach is consistent with USEPA guidance[1] to states regarding approaches to developing permit conditions. This guidance notes the use of BMPs in stormwater permits and expanded or better-tailored BMPs in subsequent permits as necessary to provide for the attainment of water quality standards.

Thus, for permitting purposes (including MS4 (municipal separate storm sewer system) permits) USEPA and the State have interpreted the term "maximum extent practicable (MEP)" to be flexible and relative to the local conditions, and supported the iterative approach for addressing exceedances of water quality standards. In spite of this approach, there has been increasing

[1] R. Perciasepe, USEPA Assistant Administrator, 08/01/96 Memorandum regarding Interim Permitting Approach for Water Quality Based effluent limitations in Storm Water Permits.

pressure (from the permitting agencies) on municipalities to demonstrate the effectiveness of their stormwater management programs to protect water quality. Regulators have also been considering more obvious ways to assess whether a stormwater management program is meeting its NPDES permit requirements and achieving the MEP standard. Finally, environmental NGOs insist that stormwater programs have not made enough progress to improve and protect water quality, and fault the current permitting approach[2]. Indeed, the State Water Board's Blue-Ribbon Panel on Numeric Limits characterized the current state of permitting as commonly perceived to be "… overly complex, and that it is extremely difficult, if not impossible to objectively determine if a facility, operation or municipality is in compliance with its permit requirements."

CASQA believes there are several ways to show the effectiveness of a stormwater program, ranging from showing an improvement in the runoff quality, to showing an increase in public knowledge about stormwater pollution, to demonstrating that construction sites have implemented BMPs consistent with their stormwater pollution prevention plans. This paper presents a quantitative approach to municipal stormwater program implementation and permit compliance determination. The proposed quantitative approach will provide better regulatory accountability for stormwater programs, and facilitate water quality protection in an iterative, cost-effective manner.

Background

Although there have been various efforts in the last few years to develop quantifiable measures for assessing stormwater program effectiveness and defining MEP, there are a number of recent efforts that have accelerated the need to address this issue. First, the State Water Board in September 2005 convened a panel of stormwater experts (Blue-Ribbon Panel) to address the following question:

> "Is it technically feasible to establish numeric effluent limitations or some other quantifiable limit for inclusion in storm water permits?"

The logic in posing this question is that the effectiveness of a stormwater program and compliance with the permit might be evaluated by comparing runoff with a numeric value. However, the Blue-Ribbon Panel's report, issued in June 2006 (BRP Report), unequivocally states that numeric limits for municipal stormwater discharges can not be set at this time. Specifically, the BRP Report states, in the "Municipal Recommendations" Section:

> *"It is <u>not feasible</u> at this time to set <u>enforceable numeric effluent criteria</u> for municipal BMPs and in particular urban discharges.…..*
>
> *For catchments not treated by a structural or treatment BMP, <u>setting a numeric effluent limit is basically not possible</u>. However, the approach of setting an "upset" value, which is clearly above the normal observed variability, may be an interim approach which would allow "bad actor" catchments to receive additional attention. For the purposes of this*

[2] Coastkeeper/NRDC's Presentation to State Water Board, 9/14/05.

> *document, we are calling this "upset" value an **Action Level** because the water quality discharge from such locations are enough of a concern that most all could agree that some action should be taken ... ..."* Underline added. (Page 8)

The BRP Report did not fully address "other quantifiable limits for inclusion in stormwater permits." Although the Blue-Ribbon Panel conceived of the concept of Action Levels, the BRP Report did not address the details of their implementation or enforcement.

Second, prior to and during the development of the BRP Report, CASQA undertook the development of an overall strategy for stormwater permitting in California. At that time CASQA suggested that the BRP Report recommendations were best considered within a comprehensive approach or context for stormwater management in California. Although the BRP was not specifically directed to address the overall stormwater context, the appropriateness of any recommendation depended in part on compatibility with the existing permitting system. Thus, in articulating the needed context, CASQA developed a *Progressive Approach for Regulating Stormwater* and permit strategies for the upcoming renewals of the general industrial and general construction stormwater permits as well as future municipal permits (herein collectively referred to as the CASQA *Progressive Approach*). The CASQA *Progressive Approach* is shown graphically in Figure 1. Essentially, CASQA proposed a logical sequence of standard options to regulate stormwater discharges. These options (see Figure 1) included:

- Option 1 – Iterative Process and Benchmark

  Status – Currently used in USEPA multi-sector general permit (industrial) and in California stormwater permits.

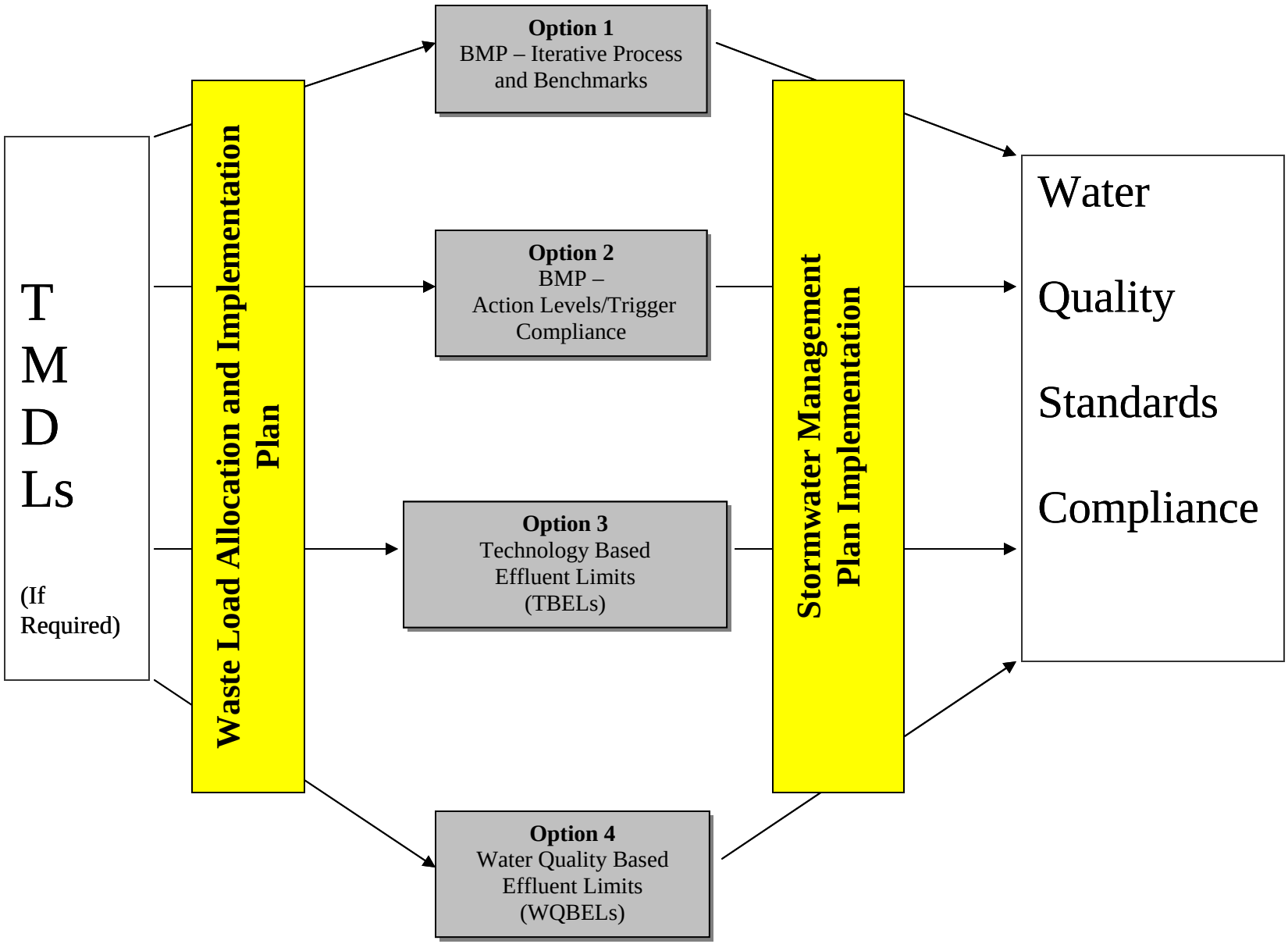
  Compliance Strategy – 1) Stormwater Management or Pollution Prevention Plan developed and implemented; 2) Effectiveness assessments conducted; 3) Analytical monitoring results compared to water quality standards and/or Benchmarks; 4) Iterative process used to focus BMPs on problematic pollutants. Compliance based on implementing iterative process (municipal) and annual compliance assessment (industrial/construction).

- Option 2 – Action Levels/Trigger Compliance

  Status – Not currently used for municipal and construction stormwater permits; however, State of Washington model exists for industrial.

  Compliance Strategy – 1) Stormwater Management or Pollution Prevention Plan developed and implemented; 2) Effectiveness assessments conducted (e.g., inspections, analytical) – comparison to adaptive management indicators (Action Levels) dictates compliance response; 3) Iterative process used to focus BMPs, potentially problematic permittees are required to establish and implement corrective action plans; 4) Compliance based on meeting Action Levels and for potentially problematic permittees, developing and implementing corrective action plans.

Figure 1. CASQA Progressive Approach for Regulating Stormwater



- Option 3 – Numeric Based Technology Based Effluent Limits (TBELs)

  Status – Currently is being used by USEPA in limited cases (e.g., meat and poultry industry). USEPA has established procedures to develop TBELs (primarily for wastewater discharges). Development of effluent limitations based on treatment controls available to minimize the pollutants and considers site conditions, activities, return period, constituents, treatment effectiveness, and costs.

  Compliance Strategy – Permittee required to implement treatment and source controls to meet numeric effluent limitations. Monitoring required to confirm performance and assess compliance.

- Option 4 – Water Quality Based Effluent Limits (WQBELs)

  Status – WQBELs have not been used to date as a compliance tool except through the implementation of the TMDL program. Used in some situations inappropriately. WQBEL based on protection of beneficial uses of the receiving water. Currently USEPA does not have a procedure in place for developing WQBELs for stormwater.

  Compliance Strategy – Discharge required to comply with numeric effluent limitations. Derivation of effluent limits based on compliance with water quality objectives. Monitoring is required to confirm compliance.

This paper presents an approach under Option 2 for municipal permittees.

Third, the draft Ventura Countywide stormwater NPDES permit, issued by the Los Angeles Regional Water Board in December 2006, proposed municipal Action Levels (MALs). These MALs were expressed as numeric values for selected constituents, applied to 36-inch or greater outfalls, and perhaps most significantly, were used to define the MEP standard. This approach is not consistent with the concept of "Action Levels" as envisioned by the Blue-Ribbon Panel and instead defines the technology based effluent limit (option 3 in CASQA *Progressive Approach*) with a statistically-derived effluent limit.

Fourth, the Model Monitoring Program for Municipal Separate Storm Sewers Systems in Southern California (Model Program) developed by the Stormwater Monitoring Coalition in 2004, addresses the development of a stormwater monitoring program that supports permit compliance and stormwater management program implementation. The Model Program presents five management questions that, when addressed, use adaptive triggers to expand a monitoring program in a logical and resource-protective way to move from assessment monitoring to source identification. The five management questions posed in the Model Program are:

1. "Are conditions in the receiving waters protective, or likely to be protective, of beneficial uses?
2. "What is the extent and magnitude of the current or potential receiving water problems?"
3. "What is the relative urban runoff contribution to the receiving water problems?"

4. "What are the sources to urban runoff that contribute to receiving water problems?"
5. "Are conditions in the receiving waters getting better or worse?"

Fifth, starting in 2004, CASQA started to develop its Effectiveness Assessment method – releasing the white paper *An Introduction to Stormwater Program Effectiveness Assessment* in August 2005. This white paper was followed-up by the recently issued *Municipal Stormwater Program Effectiveness Assessment Guidance* (CASQA, 2007). The guidance provides detailed direction to stormwater managers/regulators in designing and conducting an assessment to determine the effectiveness of a stormwater management program.

Critical to the use of the guidance is an understanding of how a stormwater program may be evaluated. There are six outcome levels that are used to assess the effectiveness of a stormwater program. These six levels are summarized as follows and shown in Figure 2:

	Outcome levels
1	Documenting activities
2	Raising awareness
3	Changing behavior
4	Reducing loads from sources
5	Improving runoff quality
6	Protecting receiving water quality

The concept behind the outcome levels is that while the ultimate goal of a stormwater program is to protect receiving waters, stormwater program managers will need, at times, to rely on programmatic or implementation evaluations as a surrogate measure of the effectiveness of their programs. This is due to the inherent difficulties in measuring statistically valid changes in stormwater environmental data. It is difficult to detect measurable changes in water quality on a short-term basis, and if detected, to link those changes to the implementation of the stormwater program. Thus managers must document activities consistent with their permits and raise awareness of the public and employees regarding the importance of stormwater quality so that they may change their behavior to protect water quality. These behavioral changes will lead to reducing loads at the sources and a corresponding improvement in runoff quality. And finally this will lead to the protection of the receiving water quality. To date most program and corresponding NPDES permit have relied almost exclusively on level 1 – documenting activities to evaluate the level of implementation of required stormwater program elements and permit compliance. Ultimate program effectiveness in protecting and improving receiving water quality may not be readily measurable and should be an ongoing cooperative effort between regulators and the regulated community.

Finally, under section 303(d) of the 1972 Clean Water Act, a state is required to develop lists of water bodies that do not meet water quality standards and therefore are impaired. The state must establish priority rankings for waters on the lists and develop total maximum daily loads (TMDLs) for these waters. Each TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The allocation of the loads will depend upon the TMDL as some TMDLs have sufficient data to allocate the pollutant loadings

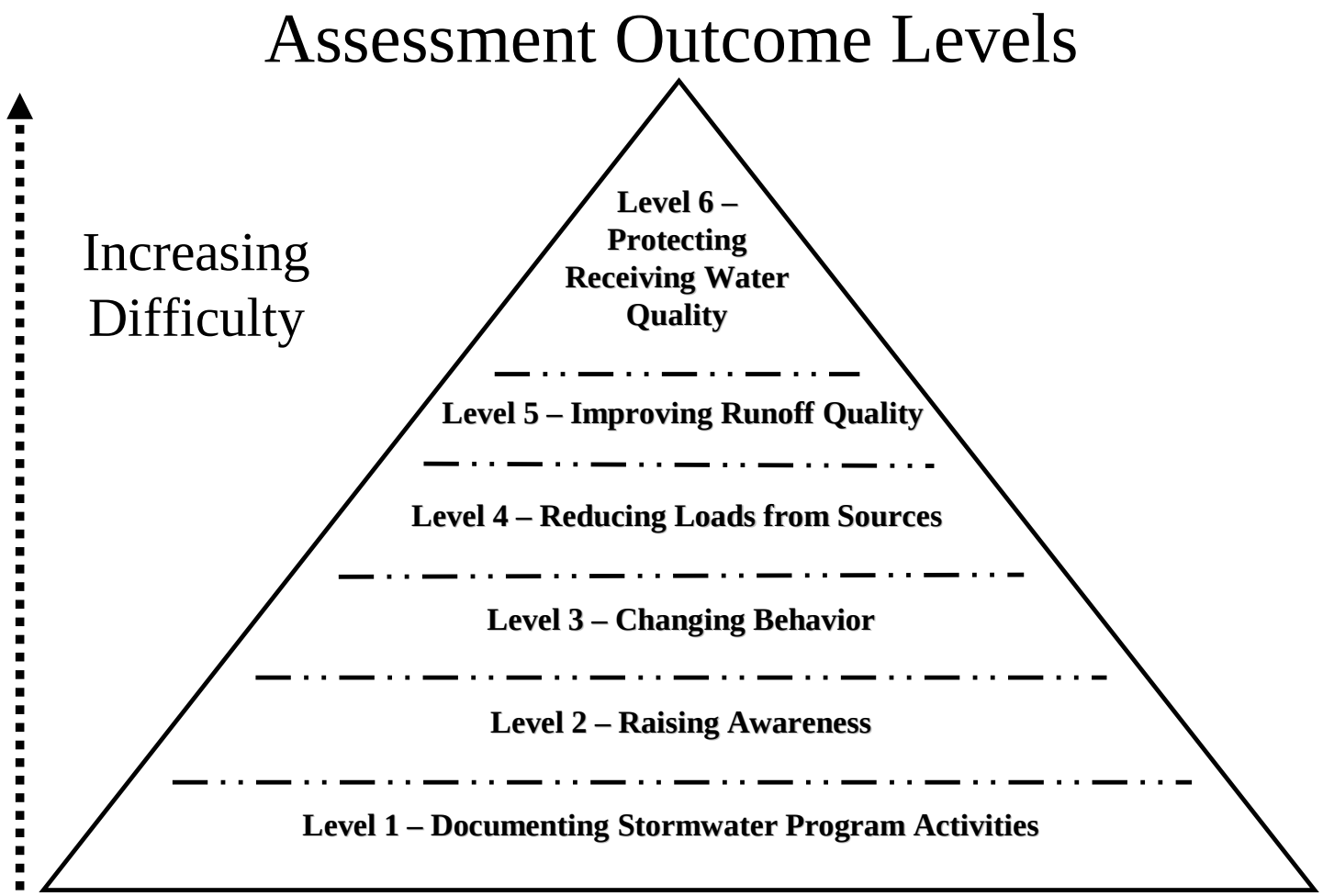


Figure 2. Classification of Outcome Levels

among point and non-point pollutant sources while other TMDLs assign the loading to the receiving water with follow-up allocations being developed when sufficient data are available. The TMDLs must be approved by the State Water Board and USEPA.

Once approved the TMDLs are incorporated into NPDES permits according to the schedules and requirements identified in the approved TMDLs. The TMDL program essentially serves as the safety net for water quality protection should the implementation of the non-point and point source control program (i.e., NPDES permits with technology based effluent limits) be inadequate to protect receiving water quality. The TMDL load allocations are in essence water quality based effluent limits. The limit may be expressed as a numeric value or by a narrative description of BMPs, thus the TMDL program may be incorporated into the CASQA *Progressive Approach* at any one of the compliance options and is pollutant and waterbody specific.

Approach

In the following paragraphs CASQA presents an approach that addresses and integrates the issues and efforts discussed above. The approach expands on earlier CASQA efforts to characterize Option 2 of the *Progressive Approach* and may be used as an approach to determine compliance for upcoming municipal stormwater NPDES permits. The objectives of the CASQA approach are to:

1. Develop quantifiable measures for assessing stormwater program implementation and integrating these quantifiable measures into a NPDES permit for compliance determination purposes.
2. Establish an assessment process (including the use of numeric Action Levels applied to outfalls) for identifying water quality issues relevant to stormwater discharges and prioritizing follow-up action for identifying the sources and implementing additional control measures.
3. Integrate at a conceptual level the TMDL program into the stormwater program and NPDES permit to ensure consistency and to avoid redundancy.

Ultimately this approach may be used to establish permit conditions and compliance requirements. Compliance would be determined by the permittee's efforts to meet the permit conditions and protect water quality.

The approach consists of two parallel tracks (see Figure 3): a Program Implementation track and a Source Identification, Assessment, and Control track. The Program Implementation track reflects the development and implementation of the stormwater management plan. The permittees, in consultation with the Regional Water Board, would develop quantifiable measures for establishing the level of program implementation. The quantifiable measures would focus on the first four outcomes levels identified in the CASQA effectiveness assessment guidance manual. As an example, CASQA members have developed various quantifiable measures for each of the stormwater program elements. These quantifiable measures are shown in Table 1. Further development is warranted and is expected to be conducted on a permit-by-permit basis to reflect local conditions and water quality concerns and program resources.

Figure 3. Proposed Option 2 Permit Structure

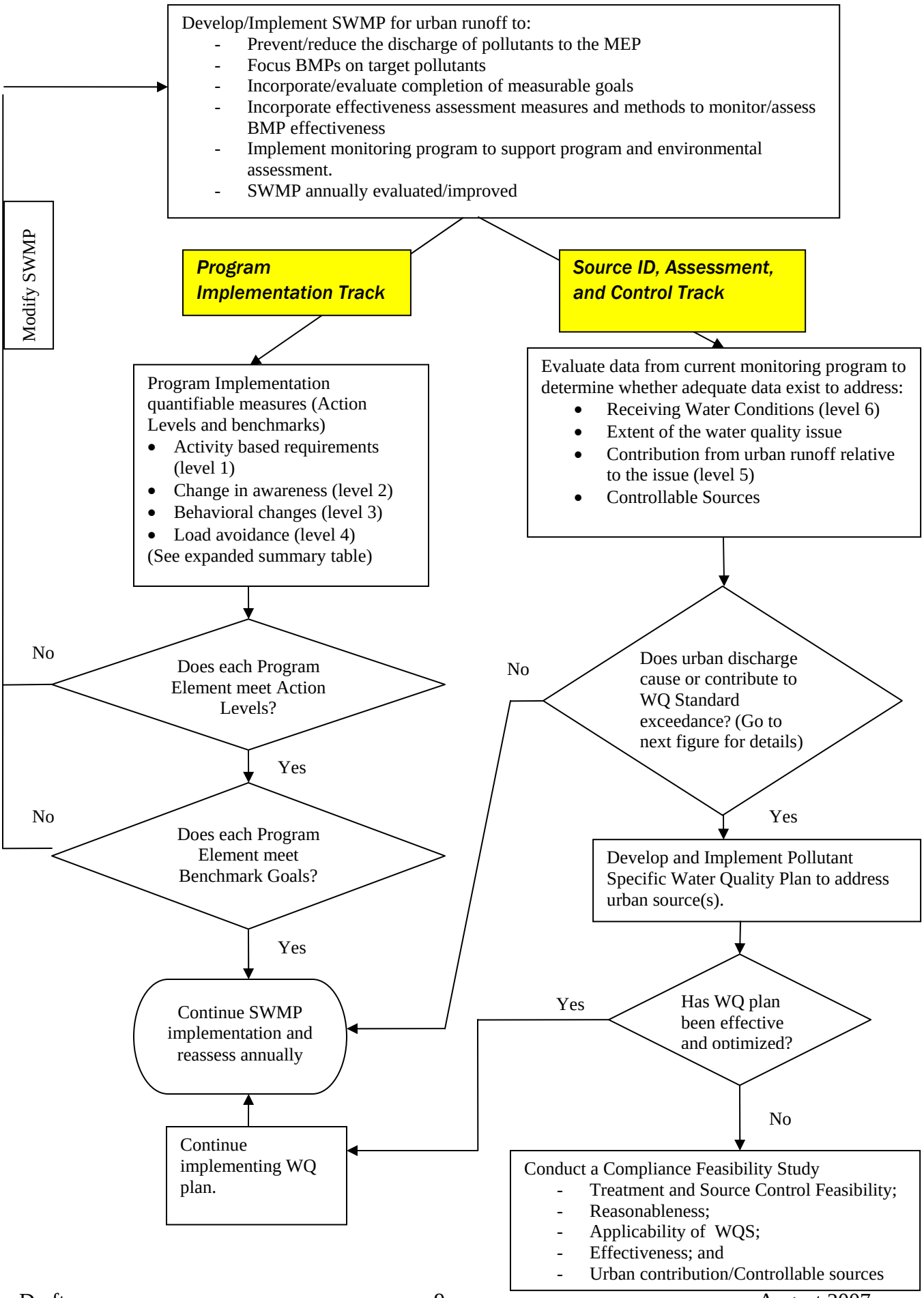


Table 1. Quantifiable Measures for Assessing Permit Compliance*					
Program Element	**Effectiveness Assessment Outcome Level**	**Goal**	**Expressions for Defining Quantifiable Measure**	**Action Level[3]**	**Benchmark[4]**
Construction	1- Documenting Activities	Provide frequent inspection of construction sites	% of all construction sites are inspected according to specified schedule during wet season	90	100
	3 – Changing Behavior	Increase the number of construction sites in compliance with BMP implementation and local stormwater requirements	Upon first inspection, % of construction sites in significant compliance with local construction stormwater requirements	for >1 ac., 75% <1ac. 50%	100
			% of state permitted sites have completed and available SWPPPs for each site (document during inspection)	80	100
Illegal Discharges / Illicit Connections	3 – Changing Behavior	Respond rapidly and efficiently to illicit discharges	% of illicit discharges impacting human health responded to within 24 hours of upon receiving notification	80	100
		Eliminate all illegal connections	% of illegal connections eliminated or permitted once detected	80	100
Industrial / Commercial	1- Documenting Activities	Provide frequent inspection of industrial sites	% of state permitted industrial sites are inspected according to specified schedule	90	100
	3 – Changing Behavior	Increase the number of industrial sites in compliance with BMP implementation and local stormwater requirements	Upon first inspection, % of industrial sites in significant compliance with local stormwater requirements	75	100
			% of state permitted sites have a completed and available SWPPP for each site (document during inspection)	75	100

* The expressions and numeric values are necessarily generic since they are meant to be generally applicable statewide. Further development is warranted and is expected to be conducted on a permit-by-permit basis to reflect local conditions and water quality concerns and program resources.

[3] Action Level is an "upset" value that is clearly above the normal observed variability and identifies atypical results. If the level of implementation or performance exceeds the Action Level then immediate corrective action must be taken. This approach allows "bad actor" catchments or problem areas to receive additional attention. Action Levels are not effluent limitations and should not be interpreted as such (based on the *Storm Water Panel Recommendations to the California State Water Resources Control Board, June 2006*).

[4] Benchmarks are values that are set at levels that represent typical or average results and assist in determining whether a stormwater management plan is successfully implemented. Benchmarks are not effluent limitations and should not be interpreted as such.

Program Element	Effectiveness Assessment Outcome Level	Goal	Expressions for Defining Quantifiable Measure	Action Level[3]	Benchmark[4]
Municipal Operations	2 - Raising Awareness	Raise a target audience's awareness and understanding of an issue	% of employees to which requirement is applicable have attended training and taken test	90	100
	3 – Changing Behavior	Implement BMPs at vehicle maintenance facilities	% of City owned vehicle maintenance facilities that have developed, implemented, and kept current SWPPP (General Permit) or SWPCP (non-General Permit)	80	100
		Decrease use of pesticides	% of permittee landscaping under IPM	30	70
		Optimize use of fertilizers	% of permittee landscaping with site specific nutrient management plans	30	70
New Development	3 – Changing Behavior	Change a target audience's behavior which results in the implementation of recommended BMPs	**Upon first review**, % of projects that are incorporating LID concepts and adequate source controls as required by performance standards	80	100
			Upon first review, % of projects requiring treatment that are incorporating adequate treatment controls as required by performance standards	80	100
	4 – Load Reduction	Ensure adequate maintenance of post construction BMPs	% of post construction BMPs with adequate maintenance (based on inspection); quantify load reductions.	70	100
Public Education	2 - Raising Awareness	Raise public awareness and understanding of an issue	% of general public who know difference between sewer and storm drain	25	50
		Increase awareness of target audience	% of target audience who know not to dump in storm drain	50	75

Effectiveness Assessment Outcome Levels

1 – Documenting Activities
2 – Raising Awareness
3 – Changing Behavior
4 – Reducing Loads from Sources
5 – Improving Runoff Quality
6 – Protecting Receiving Water Quality

Once the quantifiable measures are identified and incorporated in the NPDES permit, the municipality would be required to implement the program. Documentation would be required to support the determination of whether the quantifiable measures are being met. If the quantifiable measures are not met the municipality would be required to modify their stormwater program to support the implementation needed to meet the quantifiable measures.

There are two levels of quantifiable measures, one called an Action Level and one called a Benchmark. The Action Level quantifiable measure reflects the level of implementation or performance where, if below the Action Level, the municipality's effort is inadequate and immediate action must be taken to correct. Permit compliance would be determined by whether the municipality takes immediate corrective action and meets the Action Level. The Benchmark level is a level of implementation or performance that reflects an adequately managed and comprehensive stormwater program. Ultimately all municipalities should attain the Benchmarks.

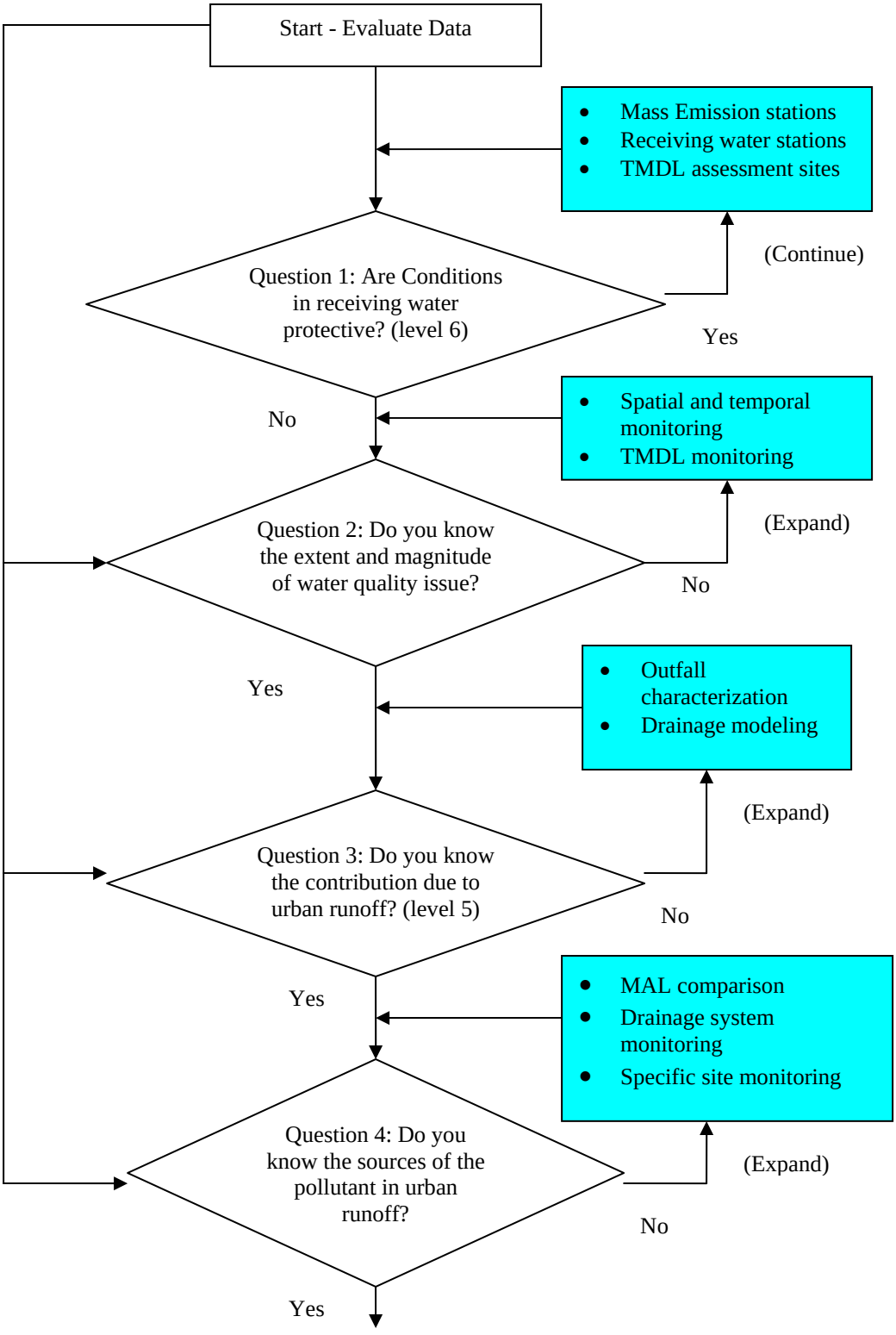
Ultimately the goal of all municipalities is the protection of water quality through the implementation of a comprehensive stormwater program. The critical difference between the approach described above and the current iterative process used in existing permits is that the quantifiable measures are actually tied to performance. They reflect a measurement of an effective program and not just "bean counting" quantifiable measures that dominate current permits. They also move the program to a higher outcome level from just documenting that an action took place (e.g., inspect construction sites twice during the wet season and once during the dry season) to one that shows a change in behavior or reduction in loads (e.g., construction contractors are in compliance with local erosion control requirements). It also establishes a systematic approach to move the program forward towards level 6 and water quality protection.

In parallel and in conjunction with the Program Implementation track is the Source Identification, Assessment, and Control track. This track is structured after the Model Program and supports the overall stormwater program by addressing the management questions noted previously. The monitoring program is a logical and resource-protective way to move from assessment monitoring to source identification and focused control measures.

Because of the various approaches and permit requirements used to-date in monitoring, different municipalities are at difference stages of the Model (monitoring) Program. Thus, the first step (see Figure 4) is to evaluate the data collected to-date including all point and non-point source monitoring as well as other environmental programs that could be used to answer the management questions. These other environmental programs include wastewater point source, TMDLs, Surface Water Ambient Monitoring Program (SWAMP), Bight and others. Depending on the completeness of the data, the permittees may enter the flow diagram at different stages. But assuming a municipality is starting with the initial question of whether current conditions are protective of beneficial uses (Question 1, Figure 4) then every effort should be made to use ongoing environmental monitoring efforts and where appropriate augment the monitoring effort to provide the data to answer the question.

Once a water quality issue is identified then the municipality is required to determine the extent and magnitude of the problem (Question 2, Figure 4). This is accomplished through a broader

Figure 4. Expanded Monitoring Flow chart – Does Urban Discharge Cause or Contribute to Water Quality Standard Exceedances? (1)



(1) Highlighted boxes reflect current or proposed monitoring efforts (function of MS4 program)

temporal and spatial monitoring effort, including upstream and downstream monitoring of urban areas.

Next the permittees are required to determine the relative contribution from urban runoff to the receiving water problem (Question 3, Figure 4). This effort can reflect minimal resolution and in many cases an estimate based on typical outfall runoff characteristics for difference land uses applied to typical runoff quantities for corresponding land uses may suffice. This estimate serves as starting point and is refined as more data is collected.

The next question pertains to identifying the sources to urban runoff that contribute to the receiving water problem (Question 4, Figure 4). Using the outfall characterization data (both wet and dry weather data) the permittee may develop municipal Action Levels that are used to identify the catchments with the most likely sources of the pollutant in question. As suggested by the Blue-Ribbon Panel Action Levels would be established to identify the "bad actors" thus an appropriate outlier number would be established (e.g., mean plus two standard deviations). Outfalls would be monitored for the problematic pollutants and compared with the Action Levels. This would in turn allow the permittees to focus on catchments for subsequent drainage system monitoring and source identification work.

Assuming that the municipality has determined that its urban discharge is causing or contributing to a water quality standard exceedance (Figure 3, 1st decision diamond), the municipality must develop and implement a pollutant specific water quality control plan. Such a plan would include identification of the controllable sources of the pollutants and proposed control measures/BMPs to mitigate the sources. A time schedule with milestone dates would be established. In situations where there is TMDL, the plan could be equivalent to a TMDL Implementation Plan.

As noted previously, the TMDL program serves as the regulatory safety net for water bodies that have become impaired in spite of efforts to implement BMPs for point and non-point sources of pollutants. The TMDL may be incorporated into any of the four options identified in the *Progressive Approach* (see Figure 1). As such the load allocation developed in the TMDL is incorporated into a permit and may be applied at the point of discharge (level 5 outcome) or in the receiving water (level 6 outcome). In addition and if sufficient data exists the permits may require the implementation of BMPs and control measures to achieve the allocations. Alternatively the permit may establish requirements to demonstrate that the load reductions are being met (level 4 outcome). The permit may also require additional special studies to further support the TMDL.

In the case of a TMDL, to answer the question posed in the 2nd decision diamond in Figure 3: "Has WQ plan been effective and optimized?, municipalities will implement control measures and studies to both assess the allocation as well as to gauge progress toward the allocation. For example, in the case of progress measures, they might be expressed as:

- Outcome level 4 – Reducing loads from sources: annual average load reduction resulting from implementing pollution prevention activities, and source and treatment control measures

- Outcome level 5 – Improving runoff quality: rolling multi-year annual average load relative to allocation, or concentration relative to receiving water target

Monitoring would be ongoing and if, after fully implementing the pollutant specific water quality control plan (Figure 3, 2nd decision diamond), there is improvement in the runoff or receiving water then the municipality would continue the implementation of the plan. If on the other hand, there is no change in water quality then the municipality would be required to prepare a compliance feasibility study. This study is critical critique of the water quality issue and a through evaluation of the options to address the issue. Included in this evaluation is a review of the applicability of the water quality standard to the water body in question, a technical and financial evaluation of the BMP options (including source control and treatment control BMPs), and identification of regulatory options for addressing the water quality issue. Ultimately the municipality would recommend an approach to address the water quality issue either through BMPs, regulatory opportunities, or some combination of the two. The compliance feasibility study would serve as the basis for the renewal of the permit.

Conclusion

CASQA has incorporated the Action Level concept, recommended by the State Water Board's Blue-Ribbon Panel, with CASQA's Effectiveness Assessment method, and standard regulatory options for NPDES permitting and TMDL implementation into a comprehensive strategy for managing stormwater quality. CASQA has also introduced two significant enhancements to compliance determination: 1) triggers and 2) measures of achievement. And for the triggers, CASQA has fleshed out written expressions and numeric values suitable for refinement and pilot testing. These enhancements will take compliance determination from a subjective and difficult process to a more objective and transparent task, while also making compliance determination relevant and meaningful for water quality protection. CASQA believes the proposed quantitative approach advances the science of stormwater quality management. As a result, the approach will provide better regulatory accountability for stormwater programs and facilitate water quality protection in a cost-effective manner.

References

Blue-Ribbon Panel, 2006. Storm Water Panel Recommendations to the California State Water Resources Control Board: The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial, and Construction Activities; June 19, 2006

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Stormwater Monitoring Coalition, 2004. Model Monitoring Program for Municipal Separate Storm Sewers Systems in Southern California (Model Program)

USEPA, 1999. National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges, 64 Fed. Regs. 68722, 68732, 68754; December 8, 1999

Frequently Asked Questions

What is the CASQA draft White Paper?
The draft White Paper presents a comprehensive strategy for managing stormwater quality. It is derived from lessons learned in a critical review of the still-developing field of stormwater quality management. It uses those lessons learned to lay out a strategy for regulating, implementing, and evaluating stormwater quality programs. The strategy combines the concepts of effectiveness assessment, quantifiable measures, and CASQA's *Progressive Approach* with standard regulatory options for National Pollutant Discharge Elimination System (NPDES) permitting and total maximum daily load (TMDL) implementation. The draft White Paper presents a viable approach for regulating, implementing, and measuring the effectiveness of stormwater program implementation and demonstrating progress towards water quality protection.

What is the basis for the CASQA draft White Paper?
The draft White Paper is based on several regulatory and non-regulatory references, including:

- USEPA Effluent Guidelines
- Section 402(p)(3)(B) Clean Water Act (CWA)
- NPDES stormwater regulations
- USEPA Memorandum regarding Interim Permitting Approach for Water Quality Based Effluent Limitations in Storm Water Permits
- California State Water Board Blue-Ribbon Panel report
- CASQA *Progressive Approach*
- CASQA Municipal Stormwater Program Effectiveness Assessment Guidance

How does the CASQA *Progressive Approach* portion (Figures 1-3) work?
Essentially, the *Progressive Approach* is a logical sequence of the following options to regulate stormwater quality:

- Iterative Process and Benchmarks
- Action Levels/Trigger Compliance
- Technology Based Effluent Limits (TBELs)
- Water Quality Based Effluent Limits (WQBELs)

The *Progressive Approach* identifies when it is appropriate to shift from an iterative BMP-based approach to technology-based effluent limits and/or water quality-based effluent limits, as well as the process that should be followed in order to derive appropriate and scientifically sound numeric limitations.

Each of the four regulatory options is based on the system of adaptive management, where in general, decisions are made and actions taken, that are then evaluated for their effectiveness, and the results of the effectiveness assessment are used to make more informed decisions and to take more effective actions. The differences between the four regulatory options are based on:

- the level of scientific understanding of the water quality issues, their causes and effects;

- the level of potential controllability of the causes, including the performance of best management practices;
- which types of quantifiable measures (e.g., Action Levels, Benchmarks, numeric effluent limitations) are appropriate for assessing effectiveness; and
- the basis of triggers (e.g., technology, water quality) for modifying decisions and actions.

How does the CASQA *Progressive Approach* differ from the iterative approach that has been the basis for stormwater permits to-date?
The current form of the iterative approach is recognized and incorporated into the *Progressive Approach* as one of the four options for regulating stormwater quality. By virtue of having three other options, the *Progressive Approach* takes the potential basis for stormwater permitting well beyond the current iterative approach.

How does the CASQA *Progressive Approach* and TMDL program relate to each other?
TMDLs have become one of the major regulatory drivers behind the scope of stormwater quality permits and programs. The *Progressive Approach* recognizes and incorporates this regulatory standing in several places. Figure 1 (Overview) shows that when a TMDL is in place, its resulting Implementation Plan and Waste Load Allocations (WLAs) drive the scope and focus of the Stormwater Management Plan (SWMP). Regardless of the regulatory option in place, the SWMP is based on the TMDL Implementation Plan and is designed to achieve Waste Load Allocations protective of water quality standards.

In Option 2 (Action Levels/Trigger Compliance) of the *Progressive Approach,* how does one ensure a rigorous means to determine compliance with the permit?
Although the concepts of effectiveness assessment and quantifiable measures have been used in Option 1 (Iterative Process and Benchmarks); their use has historically been relatively limited. In its Municipal Stormwater Program Effectiveness Assessment Guidance CASQA has fleshed out the concepts of effectiveness assessment and quantifiable measures into methods and details and these have been incorporated into Option 2. The key difference in Option 2 from the status quo of Option 1 is that the results of effectiveness assessments are compared to adaptive management indicators (e.g., Action Levels), which when triggered, dictate a compliance response.

How is effectiveness assessment incorporated into Option 2?
CASQA's Effectiveness Assessment method includes the following 6 levels of outcomes for evaluating stormwater program effectiveness:

	Outcome Level	Outcome Type	Assessment Type
1	Documenting activities	Effort	Implementation
2	Raising awareness	Achievement	Implementation
3	Changing behavior	Achievement	Implementation
4	Reducing loads from sources	Achievement	Implementation
5	Improving runoff quality	Achievement	Water Quality
6	Protecting receiving water quality	Achievement	Water Quality

Outcome levels 1-4 are incorporated into the Program Implementation track and outcome levels 5-6 are incorporated into the Source Identification, Assessment, and Control track. Effectiveness of a stormwater management program is measured at these levels using a variety of methods (as described in CASQA's Municipal Stormwater Program Effectiveness Assessment Guidance) and the resulting outcomes are used in the adaptive management loop represented in Option 2.

How does one establish Action Levels, how are they measured, and how does one know that the Action Levels are meaningful?
CASQA has incorporated the Action Level concept, recommended by the State Water Board's Blue-Ribbon Panel, into the draft White Paper by combining the Action Level concept with the Effectiveness Assessment method. The concept of an Action Level is that it is a level implementation or performance where, if below the Action Level, a municipality's effort is inadequate and immediate action must be taken to correct. Implementation or performance below an Action level is defined as atypical.

A working list of Action Levels have been developed for standard stormwater program elements (e.g., Construction, Industrial / Commercial) for several implementation outcome levels (e.g., 2 – Raising awareness, 3 – Changing behavior) and quantifiable measures (e.g., % of illegal connections eliminated or permitted once detected). The Action Levels were developed through analysis of stormwater program evaluations and discussions with municipal stormwater program managers. Quantifiable measures were chosen and written to be as objective as possible. The actual numeric values of the Action Levels are set to identify atypical implementation or performance. In the best professional judgment of the managers, the working list of Action Levels represents meaningful indicators of municipal stormwater program performance.

Action Levels are used in Option 2 of the *Progressive Approach* in both the Program Implementation and the Source Identification, Assessment, and Control tracks. In the latter track, it is expected that Action Levels may be developed to assess water quality at outcome levels 5 – Improving runoff quality and 6 – Protecting receiving water quality. For example, a permittee may develop Action Levels that are used to identify catchments with the most likely sources of a pollutant.

The expressions of the quantifiable measures and Action Levels are necessarily generic in the draft White Paper – how will more detail and definition be provided?
The expressions and numeric values are necessarily generic since they are meant to be generally applicable statewide. The expressions may often need to be tailored to local stormwater program characteristics. To make further progress on this, CASQA suggests that the MS4s initiate development of specific quantifiable measures for their respective programs. The measures may be identified in their stormwater management plans or Reports of Waste Discharge that would subsequently be refined with the Regional Water Boards in the tentative and final NPDES permits. This approach allows the MS4s the opportunity to closely review their programs and align their measures with their water quality issues, public interest, and fiscal and personnel resources. The level of detail would have to be sufficient enough to ensure the measures are properly quantified to avoid misunderstandings during the permit compliance assessment.

The level of detail in the flow charts in the CASQA *Progressive Approach* could connote that the *Progressive Approach* is a lengthy process – is it?

Time is not a design feature of the *Progressive Approach*. The approach is silent on timelines and schedules because the times it takes to implement the approach are dependent on several factors, including extent and level of understanding of the water quality issue, pollutant causing the issue, level of knowledge of pollutant sources and their controllability, and current level of BMP implementation and ability to increase it. For some pollutants and sources, the time to implement the approach could be relatively short while for others, significant time may be needed. Although not explicitly designed around the scientific method, the *Progressive Approach* does incorporate some of its basic principles (e.g., objectivity, inquiry beginning with a state of uncertainty and moving toward a state of certainty – sufficient at least to terminate the inquiry for the time being), as well as the principles of adaptive management.

How does the strategy articulated in the CASQA draft White Paper simplify compliance determination over the current Annual Reporting process?

Determination of compliance under the current Annual Reporting process is based primarily on narrative descriptions of programs, activities, and BMPs; with some quantitative reporting of levels of effort expended – all of which are subjectively compared against a standard of maximum extent practicable. The draft White Paper introduces two significant enhancements to compliance determination: 1) triggers and 2) measures of achievement. These enhancements will take compliance determination from a subjective and difficult process to a more objective and transparent task, while also making compliance determination relevant and meaningful for water quality protection.