

Launching CMOM Using an EMS

By:

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INTRODUCTION

Environmental performance ... environmental compliance ... sewer system overflows ... capacity assurance – all very hot topics in today's times. And with these issues, enforcement is poised to strike a hard blow to the wastewater collection operations throughout the U.S. in the form of the Environmental Protection Agency's proposed Capacity, Management, Operation & Maintenance (CMOM) regulations (See draft Management, Operation and Maintenance Comprehensive, List of Programs for Sewer and Treatment Systems, Environmental Protection Agency – Region 4). These regulations and the proposed CMOM program are complex on many levels. To assist utilities with this effort, it is important to know what tools are available. It is Charleston CPW's experience that an Environmental Management System (EMS) could provide a solid foundation for launching a CMOM program.

CMOM regulations are one of many at the forefront of the wastewater industry, and it could be argued that in many places, these regulations have been needed for a very long time. Concurrently, the benefits of establishment of an EMS are also at the forefront of the industry, and it could be argued that an EMS brings greater potential for regulatory compliance and environmental protection (See the EMS Integration Project Workgroup Final Report prepared by WEF, AMSA, and EPA, 2002). The authors submit that this is not a coincidental occurrence but there is a cause and effect behind their appearance. The authors would propose that there exists a significant internal and external push for enhanced environmental performance, and these programs have arisen out of a perceived need to provide an impetus for continual improvement in a utility's pursuit of operational excellence.

It is the authors' belief that every utility has a fundamental obligation and responsibility to protect public health and the environment. Corresponding with *protection* of the environment is also continual *improvement* of the environment. Preventive measures need to be established, but creative and innovative initiatives to improve the environment must be explored. The development and implementation of an EMS and a CMOM program are both potentially important tools in achieving this lofty but imperative goal.

Application of EMS and CMOM management principles increase cost effectiveness, environmental compliance and improvement, reduce risk-related liabilities, and promote technological advances. Importantly, establishment of these programs helps to demonstrate to customers, stakeholders and the general community that an organization is committed to environmentally-safe processes, the prevention of pollution, and continual environmental improvement, in addition to regulatory compliance.

The goal of an EMS is to make environmental management an integral part of an organization's overall management system. For example, ISO 14001 standards (See ANSI/ISO Standard 14001-1996) offer significant improvements to an existing management system by encouraging an interactive process which organizes structures, responsibilities, practices, procedures, processes and resources. This structure or "framework" provides continuity for implementing environmental policies and objectives and targets, which can be coordinated with improvement efforts in other areas, e.g., operations, finance, quality, and occupational health and safety.

Further, a structured opportunity is presented to help maintain and improve competitiveness and reduce operational costs. This is accomplished through in-depth examination of operational processes, and through the pursuit of leveraging technology. The use of irreplaceable natural resources is curtailed, liabilities associated with environmental concerns are attenuated, and overall management systems are designed to be more robust.

EMS AS A FOUNDATION

An environmental management system (EMS), whether ISO 14001 or another form, incorporates a common structure as relates to a CMOM program. Through the establishment of an EMS, an organization has put in place many of the elements to meet CMOM requirements (See Figure 1 – Program Element Comparison). With the inclusion of a few additional initiatives, the organization will have met and exceeded the requirements of a CMOM program.

Program Element Comparison		
Elements	CMOM	EMS
Planning	Short-term / Long-term	Continual Environmental Improvement
Structure and Responsibility	SSO Response / Inspections / Reporting	All Operations Related to Significant Environmental Aspects
Legal and other requirements	Internal and External	Internal and External
Goals & Objectives	Short-term and Long-term Planning	Requirement for Continual Improvement
Operations & Maintenance	Operational Controls / Preventive Maintenance	Operational Controls
Training, Awareness and Competence	Operational Knowledge & Awareness	Operational & Environmental Knowledge & Awareness
Communications	Internal, External & Regulatory	Internal, External & Regulatory
Monitoring & Measurement	Complete Program	Complete Program
Emergency Response	SSOs (Environmental Impacts) / Communication	All Environmental Impacts / Communication
Records Management	Complete Records Management / Reporting	Complete Records Management / Reporting
System Auditing	Self-assessments / Regulatory Agencies	Self-assessments / External Audit (for Certification)
Management Review	Significant Involvement	Significant Involvement

Figure 1. Delineates the significant similarities of the EMS and CMOM programs

Obviously, constructing an EMS or a CMOM is no simple task. It takes full commitment and buy-in from all associate levels, especially from an organization's management. In the process, leaders of the organization and associates will have to step out of their "comfort zone" and will have to start "thinking", and observing what is occurring around them. All associates must be educated as to the benefits to be realized in order to obtain "buy-in." It is the authors' experience that a common vision drives cultural change. Associates need to know that their efforts will not go unnoticed, and will result in improvements of enormous importance, namely the environment and public health.

KEY ELEMENTS IN COMMON WITH AN EMS AND CMOM

The EMS is a strongly goal-driven system. The key elements of an EMS are as follows: planning; legal & other requirements; management of environmental goals & objectives; structure and responsibility; training, awareness and competence; communications (internal and external); documentation and records management; operational controls; emergency preparedness; monitoring and measurement; and management review.

Similarly, the key elements of the CMOM program are as follows: planning, design & construction; operational controls (including maintenance); roles & responsibilities; communications and public relations; legal authorities and compliance; goals and prioritization; capacity management; monitoring and measurement; emergency response (overflow response plan); records and reporting management; and, training and safety. As one can see, there are substantial elements in common which enables a CMOM to be constructed upon or "launched" from the framework of an existing EMS.

PLANNING

Critical to a successful EMS is planning. Establishing an EMS policy will be the first step in planning and promoting the direction and excitement of "the mission" within the organization. This mission can likewise be the philosophical driving force behind a CMOM. Using the ISO 14001 Standard as an example, an organization should then interpret the standard and apply it to their organization through the establishment of simple and clearly-defined procedures. These procedures serve as the foundation on which the system is developed. These same principles and foundation can serve as the common base of a CMOM program as well.

An important component of an EMS is the consideration of environmental aspects of the organization. Basically, this is any operation or activity the organization performs that has an impact on the environment. Now, the environment should be understood to consist of air, water, land, natural resources, flora, fauna, humans, and public health. Therefore, any activity that affects any of these elements is considered an "Environmental Aspect". Subsequently, "Significant Aspects" are those aspects that have a more significant or considerably greater impact, usually adverse, on the environment. A grading exercise defined by the organization is performed to determine levels of significance. For example, one of the significant aspects determined by Charleston CPW was sanitary sewer overflows (SSOs), a pivotal issue of a CMOM program as well.

STRUCTURE AND RESPONSIBILITIES

To meet this requirement, documentation is needed to first delineate the tasks of those associates responsible for environmental compliance, environmental performance, documentation and program coordination. This can be accomplished through a combination of appropriate job descriptions, organizational charts, flow diagrams or written responsibilities specific to environmental performance and responsibilities.

With respect to CMOM, these responsibilities must indicate those associates responsible for responding, for example, to SSOs, reporting overflows and preparing monthly and yearly spill reports. This must include a formal chain of communications from the initial report to final reporting to the regulatory agency.

LEGAL AND OTHER REQUIREMENTS

Under an EMS, legal and regulatory requirements applicable to the organization must be identified. These requirements must also be used, maintained and communicated where appropriate to ensure compliance.

“Other requirements” may include, for example, grease interceptor standards, cooling towers requirements, wastewater backup provisions, tap requirements and inspections, renewals, impact fees, unit contributory loading guidelines, category waste standards, industrial pre-treatment requirements, surcharges, design & construction guidelines, and emergency procedures.

Regulatory assessments performed by an internal team are required through an EMS. This can be accomplished on a frequency required by a regulation, or, if not defined, established by the organization. These assessments must be documented for future referral and audits. This process is another effective management tool, since through this proactive process, the legal and punitive liability of the organization is narrowed.

GOALS AND OBJECTIVES

Without goals, objectives and measurable performance indicators, the concept of continual improvement, or plan-do-check-act, will not be realized. An organization must always be moving forward, pursuing short-term and long-term goals through planning and identifying trouble areas (See Figure 2 - Smoke-testing of the wastewater collection system). Since all deficiencies can't be corrected immediately, it is important to obtain the “biggest bang for the buck.” Hence, analysis tools for cost-effectiveness and life-cycle impact become important.

Obviously with the intent to stop SSOs, one needs to know where the most have occurred or are occurring. An appropriate tracking process is desirable to accomplish this. Problems should be defined specifically and categorized as a capacity problem, a grease



Figure 2. Smoke-testing on the wastewater collection system

In addition, with operational controls and design and construction standards, an organization can ensure that the wastewater system isn't being overloaded beyond its capacity. Standards must be set forth to effectively ensure proper engineering evaluations, particularly with new systems, which result in long-term capacity availability.

TRAINING, AWARENESS AND COMPETENCE

With an EMS and CMOM, training is a vital element. Associates must be trained on the elements of each program, their responsibilities and job requirements as may relate to the environment, legal requirements, emergency operations, etc. And coinciding with training is competence. With an EMS, associates must demonstrate competence in their job responsibilities to assure that their work performance has a positive impact on the environment (See Figure 5 – Competency and Training Record).

To effectively train, a pre-planned schedule is needed. The organization should step back and consider the critical elements of the program that must be communicated. Also, outside developers, vendors and contractors must be made aware of the general, overarching provisions of the EMS, and the operational controls put in place to ensure compliance and appropriate environmental performance. Providing the outside entity with written procedures prior to planning, design or construction is essential.

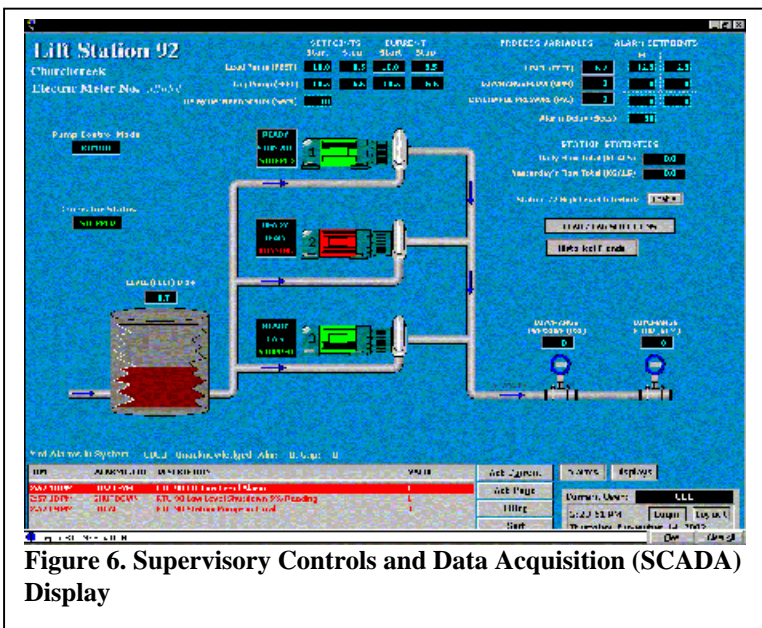
Wastewater Collection Department Competency & Training Record Pump Section							
Associate's Name: John Smith		Position: PS Tech		Supervisor: Ed Price			
Element / Function / Code	SKF	Date	Supervisor	Significant Aspects / Comments	Supervisor	Significant Aspects / Comments	Significant Aspects / Comments
Special Knowledge of Each Pump & Procedures	NA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Water Vehicle Operation	4.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Housekeeping	4.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Lift Station Work	4.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Pump Station PM	4.4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
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Emergency Operations	4.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Water Vehicle Operation	4.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Housekeeping	4.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Lift Station Work	4.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Pump Station PM	4.4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Maintenance	4.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Emergency Operations	4.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Water Vehicle Operation	4.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Housekeeping	4.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Lift Station Work	4.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Pump Station PM	4.4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Maintenance	4.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Emergency Operations	4.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11/13/02	EDP	<input checked="" type="checkbox"/>	
Water Vehicle Operation	4.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				

accomplished through written notifications, information on a website, e-mail communications, and/or bill inserts.

External communication with respect to both an EMS and CMOM involves receiving of customer complaints, concerns, and follow-up. Both programs require effective logging of complaint and concern calls or reports of overflows, with documentation of responsibility, and communication of the concern to responsible parties. A method is necessary to efficiently address the concern and follow-up through completion. This can be accomplished via formal logs, call-in databases, and/or standard procedures, for example.

Regarding communications to parties affected by SSOs, an organization is required to immediately notify the public, health agencies, drinking water suppliers, and any other affected entity when an overflow occurs which could imminently and substantially endanger human health. Door hangers or flyers could be used as an effective means of communicating to those affected parties. And within the overflow response plan/emergency plan, interested parties must be consulted to establish an effective program for all involved. With a good communications program, including SOPs and established reporting formats, this requirement can be easily and confidently fulfilled.

MONITORING AND MEASUREMENT



Monitoring is a very broad term when referring to an EMS or a CMOM program. Monitoring may refer to monitoring elements of a process utilizing instrumentation, monitoring reports, monitoring equipment or operational control effectiveness (See Figure 6 – SCADA Display). Or it may refer to the monitoring of the overall EMS or CMOM program, to include periodic evaluations, monthly operating reports, charts, graphs, improvement programs, goals and objectives and targets.

Control methods or processes must be established to effectively monitor and analyze either system from the start to

the finish. Subsequently, appropriate documentation with a structured approach to deficiency correction is considered necessary. This should be accomplished through short-term and long-term improvement projects and programs, referring back to goals and objectives.

With respect to CMOM activities, a Sanitary Sewer Evaluation Survey (SSES) is an essential tool in monitoring and measuring of the collection system (See Figure 7 - SSES Library). The utility should display how they have applied SSES report recommendations during rehabilitation plans. Of course the long-term goal is to decrease

excessive inflow/infiltration (See Figure 8 – CPW Customers to WW Treatment Comparison).

With both systems, monitoring of the implementation and effectiveness is necessary. An implementation schedule is beneficial to keep the organization and those responsible for implementation of objectives on track and accountable. And with CMOM, the utility must maintain the program and keep it up-to-date. Therefore, a written program



Figure 7. Sanitary Sewer Evaluation Survey (SSES) Library

description is required detailing the elements of the program. Further monitoring with regard to a CMOM will include SSOs, water quality monitoring such as biochemical oxygen demands, dry and wet weather flows, and wastewater main cave-ins and blockages.

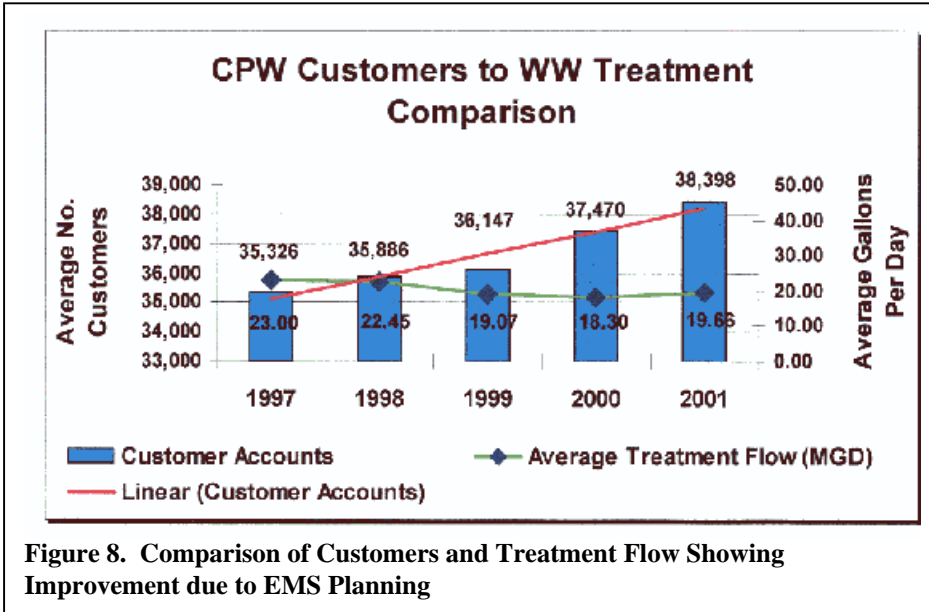


Figure 8. Comparison of Customers and Treatment Flow Showing Improvement due to EMS Planning

EMERGENCY RESPONSE

It is good business practice to have in place plans associated with response to emergencies. With an EMS, all potential emergencies must be identified, and a response documented. This requires much pre-planning based on past experiences with certain emergencies such as natural disasters, chemical spills, and large-scale plant and system failures or potential for emergencies such as terrorist acts. And relating to a CMOM, this would include SSOs (See Figure 9 – SSO Response Flow Chart).

A response plan for the aforementioned items is critical. During an emergency, there are so many things occurring that it becomes difficult to respond in the midst of the chaos. Though pre-planning, the organization has a predetermined, composed plan to follow, leaving out the skewed judgments sometimes experienced during the overall panic of an emergency.

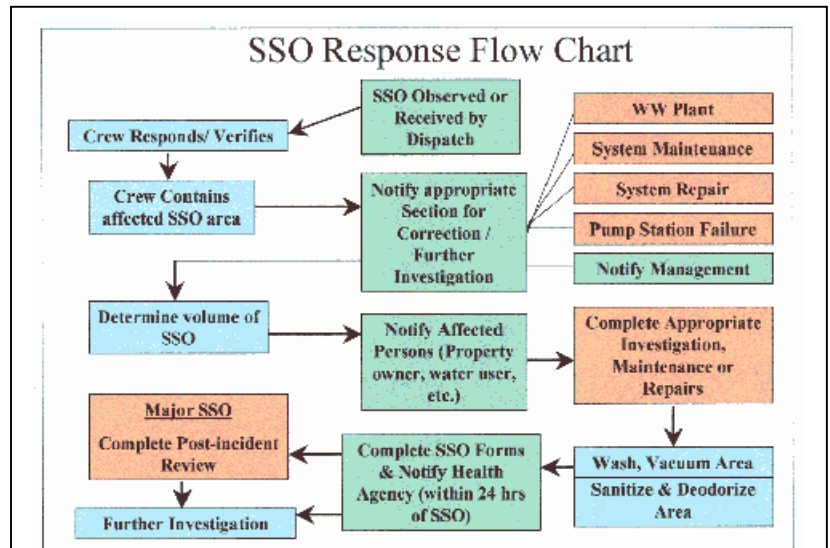


Figure 9. Emergency response plans are required as part of an EMS and a CMOM program

With regard to CMOM, response measures must be identified relating to SSOs to protect water supplies, public health and the environment. And coinciding with the plan, the organization needs to know what agencies to notify with regard to reporting, and with respect to protection of public health and the environment. Names, numbers, contact personnel, and emergency numbers all require identification and documentation to aid in notification.

To communicate the organization's emergency plans, proper training is critical. This should be performed on a periodic basis, recommended annually. This will keep the key players informed of what is required of them should an emergency occur. Another effective tool recommended by the EMS is the conducting of drills, where appropriate to the nature of the organization. Actual mach drills are effective tools in enhancing emergency response. The panic of the situation is reduced if the associates are walked-through the exercise.

The EMS program requires that post-incident reviews be conducted after the "smoke has cleared". This is another highly effective management tool in improving the overall response of the organization, as the responders can regroup after the occurrence, compare notes, and effectively define future improvement steps to incorporate into the plan to abate adverse consequences resulting from future emergencies.

RECORDS MANAGEMENT

To effectively evaluate operational activities, good documentation and records management is essential. Records give a "snapshot" in time, indicating the organization's performance with respect to certain job and operational responsibilities. Furthermore, accurate records allow trends to be determined and a program's success monitored. Efficient management of records associated with environmental impacts is also a requirement of an EMS. Records must be identified properly, maintained appropriately, and the proper disposition established. Records must include those associated with training and audit results.

Records need to be legible, identifiable and traceable to activities, products and services involved. Records are to be stored properly to protect from damage and must be readily retrievable. Of course, records seem to multiply over time; therefore, a retention schedule is required to facilitate records management.

With respect to CMOM requirements, records management focuses on SSO reporting, summary reports and documentation associated with the same. Retention times are also required on formal and associated documentation. Records associated with customer complaints, SSO forms and reports must be kept at least for a period of three (3) years from the date of the incident.

SYSTEM AUDITING

Both the EMS and CMOM programs require periodic auditing to ensure the programs are complete, effective and properly managed. An EMS system requires periodic audits to be conducted to confirm that the environmental management system has been properly implemented and maintained, and audit results must be communicated to senior

management. It is advantageous to periodically conduct *internal* audits prior to going through an external audit if external registration to a standard such as ISO 14001 is sought.

With CMOM and as part of the NPDES permit, an organization or regulatory agency, or both, must conduct program audits appropriate to the size of the system and number of SSOs experienced. A record of the audit and/or a summary report must be submitted to the regulatory agency confirming compliance, and including deficiencies and the steps identified to respond to them. It is currently unclear if internal and external audits will be required; however, it would again be advantageous to conduct the internal audit prior to the external, irrespective of the final regulatory disposition. With the establishment of an EMS foundation, an organization conducting or going through an audit would be capably prepared and familiar with audit practices.

MANAGEMENT REVIEW

Senior Management should know how the systems are working, whether it's an EMS or CMOM program. EMS requirements necessitate management to be kept informed of, and be involved with, review of the EMS to ensure its continued suitability, adequacy and effectiveness. This could be accomplished through audit results, regularly scheduled management meetings, and other forms of communication.

Management reviews include having top management to assess the need for possible improvements to an EMS. Changes to an EMS policy, status of objectives and targets, and comparative evaluation of the strategic plan are all important items to consider during a review. Also, changes within the organization must be evaluated to determine their effect on an EMS. In addition, senior management must ensure the organization's commitment to continual improvement, pollution prevention, and regulatory compliance.

CONCLUSIONS

As has been discussed, the goals of implementing an EMS or a CMOM program are comparable, for example, the goals of prevention of pollution and continual improvement in environmental performance. The achievement of these goals can be facilitated through a structured management system. As has been shown, there are many elements common to both an EMS and a CMOM program. Therefore having the elements of a robust EMS in place as an initial framework will enable the organization to more easily implement and assure the success of a CMOM program.

REFERENCES

- ANSI/ISO Standard 14001–1996
- Management, Operation and Maintenance Comprehensive, List of Programs for Sewer and Treatment Systems, Environmental Protection Agency – Region 4, July 2000
- EMS Integration Project Workgroup Final Report prepared by WEF, AMSA, and EPA, 2002