

Second EMS Initiative for Government Entities April 2000 – March 2002



Final Report

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EXECUTIVE SUMMARY

Since the mid-1990s, the US Environmental Protection Agency (EPA) has actively supported various initiatives that support the adoption of Environmental Management Systems (EMS). In 1999, EPA issued a report that stated “as a matter of policy, EPA will promote and encourage the use of EMSs that help improve compliance, pollution prevention, and other measures of environmental performance”. This support for voluntary adoption of EMSs has included the National Biosolids Partnership and the EMS Pilot Project for Local Governments (August 1997 – July 1999). Both of these initiatives have helped to demonstrate the significant benefits of EMSs in the public sector and establish a solid foundation from which to further promote EMS adoption for public agencies.

The aim of the first EMS Pilot Project for Local Governments (“first initiative”) was to test the applicability and benefit of an EMS on environmental performance, compliance, pollution prevention and stakeholder involvement in local government operations. Data and information collected during this Project suggested that EMSs are entirely applicable to operations managed by local governments. Without exception, each of the nine participants found the EMS to be a useful tool for managing environmental issues, promoting compliance and pollution prevention approaches, increasing environmental awareness and stewardship, and improving operational efficiency and control throughout the organization. The Project was viewed as an overwhelming success and generated much enthusiasm for EMS adoption within local governments.

WHY DID EPA FUND A SECOND INITIATIVE?

The number of local governments with EMSs has steadily increased over the past few years, which has resulted in increased evidence that an EMS is a tool that can benefit local governments in a number of ways. Based on the success of the first initiative, and the EPA’s firm belief in promoting and encouraging the use of EMSs in local government entities, EPA decided to fund a “second initiative”, known as the EMS Initiative for Government Entities (April 2000 – March 2002). Supported by the US EPA’s Offices of Water, Air and Radiation, Compliance, Solid Waste, and Regions I and IX, the goal was to build upon the lessons learned from the first initiative to further test the applicability and benefit of an EMS on local government operations. By funding a second initiative, EPA was able to greatly increase the wealth of information available on public entity EMS adoption, including comprehensive case studies, lessons learned, and the overall costs and benefits. These initiatives have succeeded in raising the visibility of EMS and in further promoting EMS as an accepted tool among public entities. The participants in the initiatives have become avid supporters, spokespersons, and mentors for widening the EMS circle.

WHO PROVIDED TECHNICAL ASSISTANCE AND TRAINING?

The EPA once again selected the Global Environment & Technology Foundation (GETF) to lead the second EMS initiative for local governments. GETF, as in the first initiative,

provided the project participants with the training, technical assistance, and tools needed to implement their organization's EMS through workshops, all-hands and technical assistance calls, and the development of implementation materials and toolkits. GETF also collected data and information documenting the benefits, barriers, and keys to success throughout the two-year program.

HOW WERE THE PARTICIPANTS SELECTED?

The second initiative was officially publicized by EPA through Federal Register Notice Volume 64, Number 204 on October 22, 1999. Interested organizations submitted a letter of application, signed by top management, and participated in individual phone interviews. A total of forty-six organizations applied to participate in the second initiative. Candidates were evaluated and scored against the following six selection criteria, based on the keys to success and lessons learned from the first initiative, for final selection: Top Management Commitment, Resources and Organizational Support, Communication, Fenceline, Knowledge and Understanding of EMS, and Synergy with Existing Programs. From the field of forty-six applicants, fourteen local government entities were selected to participate; however, four participants were extended an offer to participate on a "pay as you go" basis due to funding limitations.

WHO WERE THE PROJECT PARTICIPANTS?

Each of the fourteen participants selected a department, division, or operation to which they would apply their EMS, called their "fenceline".

Participants in the second initiative included:

Public Entity	Fenceline
City of Berkeley, CA	Solid Waste Management Division
City of San Diego, CA	Refuse Disposal Division
City of Detroit, MI	Department of Recreation & Public Lighting
Florida Gulf Coast University - Fort Myers, FL	Solid Waste, Purchasing, Energy Efficiency, and Stewardship of Lands
Port of Houston, TX	Container Terminal and the Central Maintenance Department
Jefferson County, AL	General Services Department
Little Blue Valley Sewer District - Independence, MO	Wastewater Treatment Facility
Louisville and Jefferson County Metropolitan Sewer District Louisville, KY	Wastewater Treatment Facility and Purchasing Department
Wisconsin Department of Natural Resources - Madison, WI	Air Management Bureau
Tri-County Metropolitan Transportation District Portland, OR	Maintenance Facilities

King County Solid Waste Division - Seattle, WA	Entire Division - Eight Transfer Stations & one Regional Landfill
Massachusetts Department of Environmental Protection Lawrence, MA	Wall Experiment Station Analytical Laboratory
University of Massachusetts - Lowell, MA	Olney Science Building - Laboratory
New Hampshire Department of Transportation Concord, NH	Bureau of Traffic

WHAT IS AN EMS?

An EMS is a set of management processes and procedures that allow an organization to analyze, control and reduce the environmental impact of its activities, products and services and operate with greater efficiency and control. EMSs follow Shewart and Deming's model of "*plan, do, check, and act*" which employs a systems methodology rather than the traditional command and control approach. Personnel evaluate the processes and procedures they use to manage environmental issues and incorporate strong operational controls and environmental roles and responsibilities into existing job descriptions and work instructions. The ultimate goal of any EMS is to integrate environmental considerations into everyday business operations, and ensure that environmental stewardship becomes part of the daily responsibilities for everyone across the entire organization, not just in the environmental department.

WHAT ARE THE BASIC ELEMENTS OF AN EMS?

- Reviewing the organization's environmental goals;
- Analyzing environmental impacts and legal requirements;
- Setting environmental objectives and targets;
- Establishing programs to meet objectives and targets;
- Managing significant environmental aspects;
- Monitoring and measuring progress;
- Training; and
- Reviewing progress and making required improvements

WHY IMPLEMENT AN EMS?

There are many reasons why local government organizations choose to implement an EMS, ranging from regulatory compliance, to increased competitiveness, and environmental stewardship. The participants in the second initiative cited the following reasons for why they chose to implement an EMS:

Compliance Assurance

"Past practices in our agency have not always had environmental sensitivity at the top of our list of concerns and, as a result, we were required to engage in Supplemental Environmental Projects."

-Fred Murphy, New Hampshire Department of Transportation

Credibility with Citizens and Regulators

“When business customers see the Metropolitan Sewer District adopting a formal EMS with commitments to do pollution prevention, our credibility with them goes way up.”

-Sarah Lynn Cunningham, Louisville/Jefferson County Metropolitan Sewer District

Positive Public Image

“Local governments often have difficulty maintaining a positive public image. The media often capitalizes on the negative instead of the positive.”

-Wanda Redic-Bland, City of Berkeley Solid Waste Management Division

City/County as a Leader and Innovator

“Frankly, the reputation of many Southern municipalities is less than wonderful when it comes to environmental issues. Jefferson County, Alabama got a chance to demonstrate not only its active concern about these matters, but to pioneer the way for other local public sector organizations.”

-Len Gedgoudas, Director of Fleet Management, Jefferson County, Alabama

Privatization

“The adoption of an EMS provides San Diego with a competitive advantage on issues such as privatization.”

- City of San Diego Refuse Disposal Division

Better Management of Resources

“The decentralized structure of the Division compliance system had always presented challenges to keeping up-to-date on changes in regulation. According to our research, several employees held different information about similar permits without uniform communication and planning.”

-Pam Badger, King County Solid Waste Division, Seattle, WA

WHAT ARE THE KEYS TO SUCCESSFUL IMPLEMENTATION?

The keys to success reported by the participants in this initiative mirror those reported by the participants in the first initiative. This validates the importance, among many lessons learned, of the following five keys to success:

- **Top Management Support**
- **Dedicated Resources**
- **Employee Buy-in**

➤ **Strong Core and/or Implementation Teams**

➤ **Training**

WHAT WERE THE BENEFITS OF ADOPTING AN EMS?

The Participants realized many benefits over the course of the two-year project, many of which were once again quite similar to those realized in the first initiative. The nature of the benefits, at times, depended on the stage of the implementation process. For example, during the initial stages of implementation, the benefits fell in the areas of improved communication and/or eliminating redundancy in roles and responsibilities; however, as the projects progressed the participants began realizing cost savings, increased operational efficiency and improved environmental management. A few of the participants also acknowledged the future potential for significant external benefits, as a result of full EMS implementation, such as an improved bond rating and reduced insurance premiums.

As was evident in the first initiative, the benefits realized by the participants reinforces, by once again offering compelling evidence, that EMSs are an invaluable tool. The following table provides examples of benefits as reported by participants:

Benefit	Participant Example
Cost Savings	- \$706,000 in heavy equipment rates - “one year monetary savings of \$63,000”
Improved Bond Rating	- potentially, taken with other factors, a 1/16 th to 1/8 th of a point improvement
Reduced Insurance Premiums	- “we expect to see a 20% reduction in our insurance premiums as a result of EMS documentation and operational controls”
Improved Environmental Performance	- Eliminated need for 90,000 gallons of fuel - Eliminated 9 tons of CO ₂ - “resource conservation goal of 10% savings”
Improved Relationships with Regulators	- “more confident in our reported data” - “believe that they are less likely to pursue an enforcement action when we have an occasional accident”
Operational Efficiency and Consistency	- “relieved worries that we might have missed something [legal requirements]”
Labor-Management Improvement	- “employee buy-in was an integral aspect of the success of the EMS project in a unionized work force”
Environmental Efficiencies	- “resource conservation goal of 10% savings” - “one year monetary savings of \$63,631”

WHAT IMPLEMENTATION STRATEGY WAS UTILIZED?

GETF structured the initiative so that the participants developed and implemented the EMS in four phases. Each phase included an intensive 2 ½ day training workshop, with the goal of preparing the participants to train and lead their EMS Implementation Teams through the specific EMS elements relevant to each phase.

Phase I “Getting Ready”	April 2000 – August 2000	<ul style="list-style-type: none">▪ EMS Core Team Development and Training▪ Gap Analysis▪ Management Awareness and Buy-in▪ Develop Process Flow Diagrams▪ Outreach and Awareness
Phase II “Plan”	September 2000 – February 2001	<ul style="list-style-type: none">▪ Identify Significant Aspects & Impacts▪ Develop an Environmental Policy▪ Establish Objectives and Targets▪ Legal Requirements
Phase III “Do”	March 2001 – September 2001	<ul style="list-style-type: none">▪ Management of Significant Aspects▪ Environmental Management Programs▪ Roles and Responsibilities▪ Internal/External Lines of Communication▪ Emergency Preparedness and Response
Phase IV “Check & Act”	October 2001 – March 2002	<ul style="list-style-type: none">▪ Monitoring and Measuring▪ Assessing Compliance▪ Internal EMS Audits▪ Corrective and Preventative Action▪ Management Review

Monthly all-hands conference calls were conducted to discuss issues specific to the implementation phases and project logistics. GETF also conducted frequent technical assistance calls, on an *ad hoc* basis, with individual participants.

WHAT WAS THE AVERAGE RESOURCE COMMITMENT?

Over the two-year project period, the participants tracked the amount of time and resources they dedicated toward implementing the EMS throughout each of the four phases of implementation. Each participant submitted a quarterly report detailing information on labor time committed and costs. The bulk of the financial resources

that participants invested involved direct labor costs. Other costs included travel to training sessions, in-kind contributions, and materials. On average, each participant committed 4,331 direct labor hours totaling \$126,223 in internal costs over the two-year period.* Table 1 provides a breakdown of the average direct labor costs associated with EMS implementation over the two-year project period.

	Hours Committed (two-year period)	Total Cost (two-year period)
Average per Participant	4,331 hours	\$126,223
Range		
Low Values	2,486 hours	\$67,102
High Values	6,267 hours	\$195,565

In addition, city government personnel, community activists, administrative support staff, legal departments, and environmental managers contributed time to the EMS program.

Six of the fourteen participants utilized the services of consultants, in addition to GETF, to address specific needs in their EMS implementation. The services provided by each consultant were similar for all six participants; however, each participant utilized these services at varying points throughout the four phase implementation process. Table 2 provides resource commitments for the consultant services utilized by the five participants.

Table 2

Organization	Consultant Costs
City of Detroit	\$3,200
UMass - Lowell	\$13,100
Tri-Met	\$15,423
City of San Diego	\$18,346
New Hampshire DOT	\$23,000

Note: The Port of Houston utilized 55 hours of consultant services; however, the total cost of these services was unavailable at the time this report was written.

The use of outside consultants depends upon the capacity of each individual organization; however, it is not, in most cases, necessary to rely on consultants to develop an effective EMS.

*Two organizations did not submit a full set of data on resources and time and were therefore not included in the resource analysis. The Wisconsin Department of Natural Resource's data was omitted from the analysis due to their unique application of EMS – see the WI DNR case study for more information.

Why did EPA Fund this Initiative?

Background

The US Environmental Protection Agency's (EPA) support for the voluntary adoption of EMSs has been evident since the mid-1990s. This support has taken the form of various EMS initiatives funded by EPA such as the National Biosolids Partnership and the EMS Pilot Project for Local Governments (August 1997 – July 1999). EPA has also released various policy documents outlining its support for EMSs and the steps it will take to promote its adoption. In 1999 EPA issued a report entitled *Aiming for Excellence: Actions to Encourage Stewardship and Accelerate Environmental Progress*. The report states that “as a matter of policy, EPA will promote and encourage the use of EMSs that help improve compliance, pollution prevention, and other measures of environmental performance.” To accomplish these initiatives, EPA issued its *Action Plan for Promoting the Use of Environmental Management Systems* in August 2001. In May 2002, EPA expanded upon these initiatives by stating their own commitment to implement EMSs among EPA's employees, operations and facilities by signing into effect *EPA's Environmental Management System Implementation Policy*.

EMS Pilot Project for Local Governments (August 1997 – July 1999)

In 1997, EPA funded the EMS Pilot Project for Local Governments (“first initiative”). A group of nine local government organizations were selected to test the applicability and benefit of an EMS on environmental performance, compliance, pollution prevention and stakeholder involvement in local government operations. Data and information generated throughout the initiative demonstrated that an EMS is applicable to local government operations. More information can be found on this initiative in the final report entitled, *Final Report: The US EPA Environmental Management System Pilot Program for Local Government Entities*, January 28, 2000. Participants in this initiative experienced a wide-range of benefits including an improved ability to meet compliance requirements, increased efficiency, reduced costs and greater operational consistency, and improved environmental awareness, involvement and competency throughout the organization. The project was viewed as an overwhelming success and generated much enthusiasm for EMS adoption within local governments. The combination of this project's success and EPA's continued interest in promoting EMS at the local government level prompted EPA to conduct a “second initiative”, known as the EMS Initiative for Government Entities (April 2000 – March 2002).

Background and Project Structure

The Selection Process

The Global Environment & Technology Foundation (GETF) was selected again by EPA to lead the initiative. GETF, a 501-[c] [3] not-for-profit organization, provides EMS training and technical assistance to numerous organizations. Building on this experience and the experience of the nine participants from the first initiative, GETF provided the

project participants with the training, technical assistance and tools needed to implement their organization's EMS.

GETF used a recruitment process similar to the one used in the first initiative. The second initiative was officially publicized by EPA through Federal Register Notice Volume 64, Number 204 on October 22, 1999. GETF and EPA further advertised the initiative through organizations that serve the local government sector (e.g. Local Government Environmental Assistance Network, National Association of Counties, National Association of Local Government Environmental Professionals, etc....). Interested organizations were asked to submit a letter of application that outlined a brief description of their organization and operation, why they were interested in participating, and where they would develop the EMS. The letter needed to be signed by top management – which served as an early indication that top management would be involved in the application effort and supportive of the initiative.

Forty-six applications were received. GETF conducted phone interviews with all of the applicants. The selection criteria used was generated based on the keys to success and lessons learned from the first initiative. Applicants were asked to provide information in the following areas:

- Top Management Commitment
- Resources and Organizational Support
- Communication
- Fenceline
- Knowledge and Understanding of EMS
- Synergy with Existing Programs.

Prospective organizations were asked to have, at a minimum, the following people participate in the interview: a top management representative and the key person or persons who would lead the EMS effort.

Candidates were evaluated against each of the six selection criteria listed above. Using consistent evaluation criteria protocol and numerical scoring strategy, GETF consulted with EPA and finalized selections. Funding provided by EPA could only accommodate 10 participants in the program. However, four of the applicants were asked if they would participate on a “pay as you go” basis which brought the total number of organizations to 14. The participants and their fencelines are listed below.

Public Entity	Fenceline
City of Berkeley, CA	Solid Waste Management Division
City of San Diego, CA	Refuse Disposal Division
City of Detroit, MI	Department of Recreation & Public Lighting
Florida Gulf Coast University - Fort Myers, FL	Solid Waste, Purchasing, Energy Efficiency, and Stewardship of Lands

Port of Houston, TX	Container Terminal and the Central Maintenance Department
Jefferson County, AL	General Services Department
Little Blue Valley Sewer District - Independence, MO	Wastewater Treatment Facility
Louisville and Jefferson County Metropolitan Sewer District Louisville, KY	Wastewater Treatment Facility and Purchasing Department
Wisconsin Department of Natural Resources - Madison, WI	Air Management Bureau
Tri-County Metropolitan Transportation District Portland, OR	Maintenance Facilities
King County Solid Waste Division - Seattle, WA	Entire Division - Eight Transfer Stations & one Regional Landfill
Massachusetts Department of Environmental Protection Lawrence, MA	Wall Experiment Station Analytical Laboratory
University of Massachusetts - Lowell, MA	Olney Science Building - Laboratory
New Hampshire Department of Transportation Concord, NH	Bureau of Traffic

Upon notification of acceptance into the project, the 14 organizations were asked by GETF to sign a Memorandum of Understanding (MOU) that outlined the expectations of the project and the respective roles and responsibilities of each party involved. Signed by top management, the MOU clearly stated the organization's willingness to participate in the initiative, emphasizing the need for top management support and the need to commit resources over the two-year initiative.

What is an EMS?

An environmental management system, or EMS, is a set of management processes and procedures that allow an organization to analyze, control and reduce the environmental impact of its activities, products and services and operate with greater efficiency and control.

An EMS is appropriate for all kinds of organizations of varying sizes in public and private sectors. An EMS encourages an organization to continuously improve its environmental performance.

EMS Basic Elements:

- Reviewing the organization's environmental goals
- Analyzing its environmental impacts and legal requirements
- Setting environmental objectives and targets to reduce environmental impacts and comply with legal requirements
- Establishing programs to meet these objectives and targets
- Monitoring and measuring progress in achieving the objectives
- Ensuring employees' environmental awareness and competence

- Reviewing progress of the EMS and making improvements

An EMS helps organizations address their regulatory demands in a systematic and cost-effective manner. This proactive approach can help reduce the risk of non-compliance and improve health and safety practices for employees and the public. An EMS can also help address non-regulated issues, such as energy conservation, and can promote stronger operational control and employee stewardship. In addition, the EMS implementation process often reveals opportunities originally not considered. This process can occasionally uncover potentially serious, yet undisclosed, violations or dangerous working conditions as well as opportunities for significant cost savings and opportunities to go beyond compliance for improved environmental performance.

Methodology:

EMSs follow Shewart and Deming's well-known model of "Plan, Do, Check, Act" which is a systems methodology rather than the traditional command and control approach. Personnel evaluate the processes and procedures they use to manage environmental issues and incorporate strong operational controls and environmental roles and responsibilities into existing job descriptions and work instructions. They set objectives and targets for managing their environmental issues. They monitor, measure and evaluate their progress in environmental performance both in areas that are regulated and areas that are not.

The EMS integrates environmental considerations into everyday business operations, and environmental stewardship becomes part of the daily responsibilities for everyone across the entire organization, not just in the environmental department. EMSs provide a number of benchmarked tools to manage environmental risk effectively and offer great potential for continuous improvement in compliance and other areas of environmental performance.

Not a substitute for regulatory requirements

An EMS is not intended to be a substitute for regulatory requirements nor does it offer regulatory relief from the law. EMSs can improve an organization's compliance, pollution prevention and overall environmental performance and hopefully build greater confidence with local stakeholders. EMSs are proactive programs that identify and address the root causes of potential compliance problem areas. Senior management plays an active role in the EMS, monitoring and measuring the organization's progress toward its environmental goals, and continually looking for ways to improve environmental management.

EMS Baseline/Framework

The most commonly used framework for an EMS is the one developed by the International Organization for Standardization (ISO) for the ISO 14001 standard (1996).

Why Implement an EMS?

The results of the first initiative demonstrated that EMSs are applicable to local governments. Local governments outside the scope of the initiative have also seen and reported on the value of implementing an EMS. The number of local governments with EMSs has steadily increased over the past few years. As this number continues to grow so does the evidence that EMS is a tool that can benefit local governments in a number of ways.

There are many reasons why local government organizations choose to implement an EMS. Some want greater assurance in maintaining regulatory compliance or see the EMS as a tool to help them remain competitive with private industry. Others have wanted to display a greater attentiveness to environmental issues, often following an incident that came to the public's attention. The participants in the initiative have cited the following reasons for why they chose to implement an EMS:

- Compliance assurance
- Credibility with citizens and regulators
- Positive public image
- City/County as a leader and innovator
- Privatization
- Better management of resources

Compliance Assurance

An EMS helps an organization address its regulatory (and other environmental) demands in a systematic and cost-effective manner, which can help reduce the risk of non-compliance and improve health and safety practices for employees and the public. The EMS framework has numerous elements that require an organization to put in place various processes and procedures that can help improve its ability to meet and maintain compliance requirements.

“Past practices in our agency have not always had environmental sensitivity at the top of our list of concerns. As a result, practices lead to polluting wetlands and water ways. Because of these indiscretions, we were required to engage in Supplemental Environmental Projects. One project required achievement of ISO 14001 certification. Implementation of the EMS has shown that improved documentation of work procedures will occur, institutional memory will be eliminated, and environmental sensitivity will be a daily consideration in work efforts.” – Fred Murphy, New Hampshire Department of Transportation

Credibility with Citizens and Regulators

Through an EMS an organization commits itself to compliance, pollution prevention, and continuous improvement. The EMS is structured so these commitments are integrated into the organization's daily activities. As regulators and regulatees, local governments

with EMSs walk the talk and demonstrate that they are taking a proactive approach to meeting their compliance requirements.

“The Louisville and Jefferson County Metropolitan Sewer District is in an unusual position: we both regulate and are regulated. We encourage our industrial and commercial customers to practice pollution prevention (P2) via our web site, rate schedule incentives, industrial-customer newsletter, inspection staff visits, etc. When those business customers see MSD adopting a formal EMS with commitments to do P2 (i.e., practicing what we preach), our credibility with them goes way up.” Sarah Lynn Cunningham, Louisville/Jefferson County Metropolitan Sewer District, Louisville, KY

Positive Public Image

The mission of most local governments is to provide services in a cost effective and efficient manner to satisfy the public’s needs and demands. An EMS is a tool that can help improve the way a local government operates by streamlining operations, increasing efficiencies, eliminating redundancies and improving environmental performance. Such benefits go a long way toward improving the public’s satisfaction with the services provided which can also add value to the political leadership of the community.

“Local governments often have difficulty maintaining a positive public image. The media often capitalizes on the negative instead of the positive. The ISO 14001 environmental management system is the tool we decided to use to show our Berkeley citizens and businesses that we voluntarily do the right thing - walk the walk - and not to just pass legislation mandating that they do the right thing. The EMS provides ongoing opportunities to improve public image for us as a government agency and helps provide a positive image for the whole organization.” – Wanda Redic-Bland, City of Berkeley Solid Waste Management Division

City/County as a Leader and Innovator

An EMS is still a relatively new approach to environmental management. The number of private sector organizations with EMSs far exceeds public organizations with EMSs but the overall number is still low. Many of the local governments who have implemented an EMS have expressed the desire to be perceived as a community leader by both private and public organizations.

"I think Jefferson County had a rare opportunity to lead by example in implementing an EMS, becoming the first County in the nation to be registered to the ISO 14001 Standard. Frankly, the reputation of many Southern municipalities is less than wonderful when it comes to environmental issues. Jefferson County, Alabama got a chance to demonstrate not only its active concern about these matters, but to pioneer the way for other local public sector organizations." — Len Gedgoudas, Director of Fleet Management, Jefferson County, Alabama

Privatization

As more and more local governments discuss privatization as an option to address ever-increasing budgets, many local governments view EMSs as a tool that can add weight against this argument. Many of the local governments with EMSs have realized significant savings and improved operational efficiency which adds to their argument that they can compete.

“The adoption of an EMS is consistent with the city’s overall environmental principles and provides San Diego with a competitive advantage on issues such as privatization.”—City of San Diego Refuse Disposal Division

Better Management of Resources

An EMS helps the organization to think outside of the box. It allows an organization to examine its operations with a new perspective which can help identify areas for improvement.

“The decentralized structure of the Division’s compliance system had always presented challenges to keeping up-to-date on changes in regulation. There was no central area to track, find and update the permits and regulations. Many permits and regulations were not assigned as a responsibility to a specific member of the division, but were assigned based on who was available to do the work when the renewal came up. According to our research several employees held different information about similar permits without uniform communication and planning. Review of the existing compliance program revealed significant opportunity for improvement resulting in a new streamlined process that has saved significant man-hours.” Pam Badger, King County Solid Waste Division – Seattle, WA

Keys to Successful Implementation

The keys to success reported by the participants in this initiative mirror those reported by the participants in the first initiative. This validates the importance of obtaining top management support, having dedicated resources, securing employee buy-in, and having a strong Core Team if EMS implementation is to be successful.

Top Management Support (i.e. clear vision, business case for EMS)

“With 2,200 employees located in Districts and Patrol Sections throughout the State, expressed and continued top management support for the development of the EMS program was critical. A significant element for this support was the continued information provided to the Commissioners and directors about the progress and gains occurring in the fenceline. Maintaining this flow of information was important because changes occurred in top management during the development of the EMS. Support for the EMS program at the fenceline began to fade at this point. Throughout the changes, however, top management continued confirmation of its support for the development of

the EMS program which kept the EMS program on track.” – Fred Murphy, NH- DOT

“Management support was a real advantage. They supported our effort by providing encouragement on achieving our objectives and targets, helped to bolster our training program through interoffice directives and provided financial support to help with our training efforts.” – Kevin Considine, Tri County Metropolitan Transportation District – Portland, OR

Dedicated Resources

“Resources that provide for an annual operating budget and recognize the importance of labor are essential for the success of an EMS. UMass Lowell is fortunate that its Chancellor and Administration recognize the importance of supporting an annual budget for developing and implementing an EMS. An annual budget of \$25,000 per year has been established to support all facets of developing an EMS team, providing training, promotional media, meetings, auditing, student support and program initiatives. This budget is separate from the budget required to complete the "objectives and targets" approved by the administration. For UMass Lowell, this annual budget is considered and allows EMS teams a means to continue developing and implementing our EMS program.”

“The need for labor resources that include flexible schedules for employees to attend meetings and work on the EMS is vital to the success of an EMS. Employees are encouraged to participate. Conducting our meetings at lunch provides a time during the day that most people have been most amenable towards. The EMS budget provides a means as to have lunch available so teams (employees and students) can readily work and eat. Working EMS lunch meetings have been very successful and appreciated by all members.” –Rich Lemoine, University of Massachusetts at Lowell

Employee Buy-in

“Front line workers are the core of any organization. They are as important to their organization as an axle is to the wheel. This is especially true where labor unions make up the work force. They execute the management plan to the success of the organization or they can bring the organization to a grinding halt. Their understanding and support is critical to the success of our environmental management system. Without their support, the simple task of learning the environmental policy becomes impossible.” –Wanda Redic-Bland, Berkeley

Strong Core and/or Implementation Teams

“Our success in moving the project forward has been due in large part to the strong, committed team we have developed. Team members were carefully selected to include employees with knowledge of the technical, regulatory, and operational aspects of the Solid Waste Division.” – Pam Badger, King County Solid Waste Division – Seattle, WA

Training

“Training has always been an integral part of our Solid Waste Management operation. Daily handling of hazardous materials in the waste stream and operating heavy and potentially deadly equipment demand that we, on an on-going basis, train our employees thoroughly. Our EMS training procedure helped us develop a plan that ensures all employees receive required training which includes environmental aspects identification. Furthermore, our documentation procedure helped us immensely when after an accident, we produced the legally mandated training records with signatures of the employees who attended for California Occupational Safety & Health Administration (Cal-OSHA).” – Wanda Redic-Bland, Berkeley

Benefits of Adopting an EMS

The participants realized many benefits over the course of the project, many of which were quite similar to those realized by the participants from the first initiative. At times, the benefits realized depended on the stage of the implementation process. During the initial stages of implementation, as participants examined their existing management system and began to develop the EMS structure, the benefits fell in the areas of improved communication and/or eliminating redundancy in roles and responsibilities. As the project progressed and the participants began achieving their objectives and targets they realized cost savings, increased operational efficiency and improved environmental management. The benefits realized by the participants offer compelling evidence that EMSs are an invaluable tool. The participants reported the following benefits:

Resource Savings (Natural, Monetary)

“In terms of water use reduction, we eliminated 100% potable water use from our Greens, Dirt and Trash operations which equates to 31 million gallons of potable water saved. For fuel use and emissions, we saved 90,000 gallons of diesel and 9 tons of CO₂.” – Mark zu Hone, City of San Diego Refuse Disposal Division

“We saved \$706,000 in heavy equipment rates by shutting off equipment during breaks and lunch periods. An additional \$80,000 was saved in diesel costs thanks to these shutdowns.” –Mark Zu Hone, City of San Diego Refuse Disposal Division

Improved Bond Rating

"Many people hear 'environmental management' and immediately think two things: bureaucracy and expense. But the EMS effort for us yielded dozens of real world, long-term cost savings in areas like reduced power and water use. Perhaps even more significant is the possible impact on our bond ratings. Rating agencies recognized that, in taking time to examine how we did our-day-to-day business, Jefferson County had created a workplace that was less likely to generate injuries or serious environmental accidents. Less risk means greater opportunity for return on an investment. We're told the potential impact of our EMS, taken with other factors, is a 1/16th to 1/8th of a point

improvement, which could mean millions of dollars of taxpayer money saved each time we borrow money for capital projects. Now, that's the kind of documented savings that makes elected leaders and the public both very happy." --Billy Morace, Director of General Services, Jefferson County, Alabama

Reduced Insurance Premiums

"Insurance companies have indicated that we can expect to see, in the future, a 20% reduction in our insurance premiums as a result of our EMS documentation and the operational controls now in place." --Laura Fiffick, Port of Houston Authority

Improved Relationships with Regulators

"Our discharges are heavily regulated. The regulating agencies are responsible for over 3000 wastewater treatment plants across Kentucky. I'm convinced that when the regulators see all the effort that we've invested into our EMS, they see us as doing our best to achieve the same goals they have for Kentucky's streams and rivers. I believe they're more confident of our reported data, and less likely to pursue an enforcement action when we have an occasional accident." -- Sarah Lynn Cunningham, Louisville & Jefferson County Metropolitan Sewer District, Louisville, KY

"Increased exposure from the project has enabled us to be in more of a leadership role among environmental professionals. This in turn has led to an improved relationship with regulators and opened more doors for us as a public agency." -- Kevin Considine, Tri County Metropolitan Transportation District, Portland, OR

Operational Efficiency and Consistency

"Implementing an EMS enabled us to embark on a huge project we always knew we needed to do but could never find the time for -- to consciously identify all our regulatory requirements and formally designate responsibility for compliance and updates. We always felt we had a handle on this, but our procedure to identify our legal requirements now relieves worries that we might have missed something." Pam Badger, King County Solid Waste Division, Seattle, WA

Labor-Management Improvement

"The first aim of the City to embrace EMS in the operations of its various departments was to bring the City into conformance with environmental regulations. Detroit being the epicenter of the Big Three Automobile companies and with these companies being the cheerleaders of EMS in their operations, Detroit cannot lag behind in its efforts to be in the forefront as a leader and innovator of EMS implementations for City governments. Detroit was fully aware that to usher in EMS principles, it had to get its employee's involvement and whole-hearted participation. Thus, the City's EMS Initiative began with a meeting of the EMS Core Team and the employees of the fenceline departments. The meeting was an opportunity to highlight the "pros" of the project and provide definite

clarifications to the "concerns or fears" of the employees. We believe in our first conviction "employee buy-in" was an integral aspect of the success of the EMS project in a unionized work force is a valid one." --Bruce King, Manager of Environmental Affairs, City of Detroit

Environmental Efficiencies

"Tri-Met's EMS set an objective and target related to resource conservation which included our diesel, electricity, natural gas, and water usage. The [target] goal was 10% savings for 1 year and each facility was responsible for finding creative ways to achieve these savings. After changing procedures, communicating the goals and monitoring results, the total operational savings for one year resulted in monetary savings of approximately \$63,631."-- Kevin Considine, Tri-County Metropolitan Transportation District, Portland, OR

While many of the participants reaped early rewards from their EMS implementation efforts further study is needed to examine the long term benefits.

The Implementation Phases

GETF structured the initiative so that the participants developed and implemented the EMS in four phases. At the beginning of each phase the participants convened for a workshop where they received intensive training for 2 ½ days that was specific to the EMS elements for each particular phase. The goal of each training session was to prepare the participants to train and lead their EMS Implementation Teams through the completion of the EMS requirements. This model is similar to the one used by GETF in the first initiative. Lessons learned and keys to success from the first initiative were incorporated into the training sessions.

Phase I	Phase II	Phase III	Phase IV
April 2000 – August 2000	September 2000 – February 2001	March 2001 – September 2001	October 2001- March 2002
GETTING READY	PLAN	DO	CHECK & ACT

Monthly all-hands conference calls were conducted to discuss issues specific to the implementation phase. The calls served as a forum where participants could share their keys to success, how to overcome challenges and brainstorm on specific issues. GETF also used the calls to discuss project logistics. GETF conducted frequent technical assistance calls with the individual participants. These calls were an opportunity for GETF to interact with each participant one-on-one to discuss specific challenges or issues, provide technical assistance and feedback on work generated, and to discuss the status of the implementation process. In addition, GETF was available to provide guidance and technical assistance on an *ad-hoc* basis.

GETF utilized much of the information and documentation that was generated by the participants from the first initiative to refine the training approach and provide examples for the new participants. GETF also pulled in information generated by other local governments that have implemented an EMS. Sample documents (e.g. procedures, environmental policies, and work instructions), which were provided at the start of each phase, were found particularly useful by the participants. In addition, representatives from organizations that have implemented EMSs attended each workshop to share their experiences and insights on the implementation process. Many of the project participants found the mentoring provided by these organizations to be an invaluable resource in both overcoming hurdles and challenges as well as in streamlining their efforts to implement the EMS.

Pre-Phase Activities

To prepare for Phase I, the participants were asked to come to the first workshop having identified the person or persons who would lead the EMS implementation for their respective organization – their Environmental Management Representative (EMR). Some participants chose one person as the EMR while others chose more than one. The average number of people to serve as EMRs was two. The participants were also asked to identify the area in which they would implement the EMS. This area, which is commonly referred to as the “fenceline”, can vary from organization to organization based on their individual needs, objectives, and resources. However, GETF strongly encouraged each participant to select one operation or department as their fenceline. Starting with a smaller fenceline would allow the participants the opportunity to capture lessons learned, keys to success and good practices that could be applied as the scope of the EMS is expanded to additional operations in the organization.

Phase I – Getting Ready

April 2000 – August 2000

The focus of Phase I was to lay the foundation for the development and implementation of the EMS. This involved:

- Establishing and training the EMS Core Team;
- Developing process flow diagrams for the operations and activities within the designated “fenceline”
- Conducting a Gap Analysis
- Identifying internal and external stakeholders for outreach efforts and raise EMS awareness.

Summary of Phase I

The first workshop, hosted by the City of Scottsdale, AZ, was held to provide training on how to structure and initiate the implementation process – identifying who would be involved with the hands on elements of developing and implementing the EMS and preparing top management on what was to come. The level of understanding concerning

the EMS concept varied from participant to participant. The group received an overview of “what is an EMS” to ensure everyone started from the same point. During the training GETF emphasized the importance of integrating the EMS into the overall organizational management structure. The EMS is not meant to be a stand-alone tool. Therefore, it is important that opportunities for integration are identified early in the process to eliminate redundancy and to help ensure the EMS is on its way to being institutionalized. In addition to GETF’s training, the participants received insight on the EMS process and the activities of Phase I from the City of Scottsdale and the City of Lowell, MA who were both participants in the first initiative.

Establishing and Training the EMS Core Team

The Core Team plays an instrumental role in implementing the EMS. They have a vital leadership role in planning the EMS project, delegating tasks, establishing deadlines, collecting and evaluating the EMS work products, and providing training, guidance and assistance where needed. The Core Team functions in an advisory capacity, enlisting “buy-in” and collecting and disseminating EMS information across the entire organization, and providing guidance and leadership as the requirements are being addressed. As such, the participants were advised to choose a Core Team that was cross functional and that had plenty of institutional knowledge.

The King County Solid Waste Division attributed much of its success to the make up of its Core Team, “Our success in moving the project forward has been due in large part to the strong, committed team we have developed. Team members were carefully selected to include employees with knowledge of the technical, regulatory, and operational aspects of the Solid Waste Division.” Consistent with the first Initiative, all of the Core Teams found it challenging to balance their regular job responsibilities with the new EMS work load. Management needs to make it clearly understood that the Core Team members need adequate time to fulfill their EMS responsibilities.

The Core Team needs EMS training prior to the start of the implementation initiative. The training should be an overview of the EMS requirements and include a review of their roles and responsibilities and the associated time commitment. The Core Team must approach the Implementation Phase with a clear idea of how each of the EMS elements can be integrated within the current programs and procedures.

Developing Process Flow Diagrams

Process flow diagrams (PFDs) play an instrumental role in fulfilling some of the EMS elements (e.g. aspect and impact identification, training needs, and developing work instructions for activities or operations with significant aspects). As such, the participants were encouraged to develop PFDs of the major activities and operations within their respective fencelines.

The responsibility of completing the PFDs typically fell to the personnel on the shop floor. The participants reported that this exercise provided an opportunity to engage shop

floor personnel early on in the implementation process. The New Hampshire Department of Transportation Traffic Bureau used the PFDs to satisfy a health and safety requirement. “Using the process flow diagrams from the aspects investigation phase of the EMS, the Safety Committee at the Bureau of Traffic has begun preparation for a job hazard analyses (JHA) of approximately 200 job actions at the Bureau. It is estimated that the use of the PFDs will save approximately 300 hours of JHA development time.” The Port of Houston reported, “The process mapping exercise was a great team building exercise between Environmental and the shop floor employees.”

Conducting a Gap Analysis

The Gap Analysis serves as a tool that can identify what EMS elements may already be in place and where the organization needs to focus its effort. Prior to the start of the project, GETF emphasized that most organizations have up to 85% of what is needed, in one form or another, to satisfy EMS requirements. This typically revolves around the organization’s regulated activities.

Participants were encouraged to conduct a gap analysis to identify what EMS elements may already exist in their organization. Taking into consideration the participants’ lack of familiarity with EMSs GETF provided the participants with a gap analysis made up of broad questions rather than questions specific to the ISO 14001 standard. Many of the participants found this exercise to be a challenge but saw value in it because it introduced them to the systems concept and ultimately refined their expectations of the project. Through the Gap Analysis, numerous participants found that many of the EMS requirements were being met but were not documented as a procedure or work instruction.

Identifying Stakeholders

During the first training session GETF engaged the participants in an exercise to identify stakeholders – inside and outside the organization –that may or may not have an interest in the organizations environmental performance. This exercise left each participant with a list of stakeholders, categorized by their level of interest in the organizations environmental issues. This list would then be used as a tool that would help the participants identify how and what would be communicated.

GETF placed additional emphasis on stakeholder identification to improve and increase communication concerning each organization’s EMS effort. This was done in an effort to move the organizations towards EPA policy which states:

EPA will encourage organizations that use EMSs to obtain stakeholder input on matters relevant to the development and implementation of an EMS, and demonstrate accountability for the performance outcomes of their EMSs through measurable objectives and targets. Additionally, we will encourage organizations to share information on the performance of their EMSs with

the public and government agencies, and facilitate this practice where practicable. (Excerpt from US EPA Position Statement on EMSs 5/15/02)

All of the participants made regular efforts to communicate information about their EMS efforts through press releases, newsletters, open forums, and conference presentations. For example, Louisville and Jefferson County Metropolitan Sewer District (MSD) invited a group of stakeholders to a meeting to identify and discuss environmental issues important to the group. In turn, MSD took this information into consideration when it established its objectives and targets.

Phase II – Planning

September 2000 – February 2001

Phase II of the initiative focused on the planning elements of an EMS. Participants identified the operations and activities that would be the foundation of their efforts. As such, this phase involved:

- Identifying the significant environmental aspects & impacts of the operations and activities within the fence line
- Developing an environmental policy signed by top management
- Identifying the legal and other requirements
- Establishing objectives and targets

Summary of Phase II

Phase II marked the start of the EMS development process. At the Phase II workshop, hosted by King County, WA, the participants were introduced to environmental aspects and impacts and the process of identifying and categorizing them. The Town of Londonderry, NH, a participant in the first initiative shared its experiences concerning the aspect identification process. Londonderry emphasized the importance of involving shop floor employees in this activity and not getting bogged down in the weeds during the aspect identification process, emphasizing that this phase can often be the most technically challenging in implementation of an EMS. The participants also had the opportunity to learn about how to pursue energy efficiency and renewable energy opportunities as part of their ongoing environmental responsibilities. This session was sponsored by the Department of Energy. After the training session participants were tasked with returning to their organizations to begin addressing the planning elements of an EMS. The bulk of the participants' effort revolved around the task of identifying environmental aspects and applying significance criteria. This task provided the Core Team and Implementation Teams the opportunity to start working together and begin developing a team dynamic. A few of the participants were bogged down in the details of aspect identification which slowed down the EMS development process. The participants that had difficulty with aspect identification took early advantage of the site visit by GETF to assist with finalizing the aspect identification process and securing top management buy-in and support.

Identifying Significant Aspects

The determination of significant aspects is extremely important as it establishes the basis for building all of the other elements of the EMS. Therefore, the focus of Phase II was to identify the environmental aspects and impacts of each organization's operations and activities and determine which ones were significant. At the workshop, participants received training on how to identify their organizations' environmental aspects and impacts as well as develop the criteria that would determine significance.

To facilitate the aspect identification process, the participants were encouraged to use the PFDs developed in Phase I as a road map to identify the environmental aspects. Many of the participants used their Implementation Teams or solicited the assistance of shop floor employees to identify the environmental aspects. Many of the participants viewed the shop floor involvement as a means of securing their buy-in. Jefferson County, AL's department heads assisted with the aspect/impact identification process by attending meetings with shop floor personnel to visually demonstrate their involvement and support.

Some of the participants found the initial aspect assessment to be overwhelming - generating very large lists of aspects. Tri-Met summed up the activity by saying, "The aspects and impacts exercise was difficult for everyone; language differences between the standard (ISO 14001) and how we operate took some time to overcome; 1700+ impacts were identified originally, and getting that number to a manageable group required several sessions." GETF emphasized the need to strike a balance by taking a broad approach to the process and not get too bogged down "in the weeds."

After finalizing the list of aspects and impacts the participants then had to generate significance criteria that would be applied against the aspect and impact list. The criteria would act as a filter to identify a list of significant aspects. The responsibility of developing significance criteria typically rested with the Core Teams. All of the participants chose to use threshold criteria to determine significance (See sample below).

<u>ATTRIBUTE</u>		<u>SIGNIFICANCE VALUE</u>
1.	Regulation	All Regulated aspects.
2.	Solid wastes	Any stream greater than 5 tons per year or that can be profitably recycled.
3.	Energy Use	Any use that costs \$1,000.00 or more per month (or total usage if greater than \$10,000.00 per month).

4.	Water Usage	Any use over 5,000 gallons or total use over 25,000 gallons per week.
5.	Complaints	Five complaints or more for an existing nuisance.
6.	Public Perception	Any potential situation or occurrence that is likely to make the evening news if it occurs.

Participants then worked with to develop a documented procedure for identifying significant environmental aspects. This procedure specifies roles, responsibilities, and the frequency with which an aspect review will be conducted.

The City of Berkeley, CA found the exercise to be helpful and had the following to say, “Through the aspect identification process we identified serious conditions needing immediate mitigation; OSHA violations that are directly related to air pollution that employees come into contact with on a daily basis.”

Developing an Environmental Policy

The environmental policy serves as the driver for an organization’s EMS. It describes the organization’s commitment to the environment and delineates its environmental goals. The policy, at a minimum, should include three main commitments:

1. Compliance
2. Pollution Prevention
3. Continuous Improvement.

As such the policy is a document that needs to be approved by the organization’s top management. With the exception of one, no participants had an existing environmental policy. The City of Berkeley, through the gap analysis exercise, identified existing pieces of policy statements in various documents throughout the City. Berkeley used these pieces as the basis for developing a new comprehensive policy. In all cases the participants drafted a policy for management review and approval. For many of the participants drafting an environmental policy prompted much thought and discussion concerning the identity of their respective organizations.

Identifying Legal and Other Requirements

The environmental policy includes a commitment to compliance. To achieve this commitment the participants were required to identify and inventory their applicable state and federal regulatory requirements and develop a written procedure for this process.

Most of the participants did not have a systematic, documented process for identifying applicable local, state and federal regulatory requirements. Responsibility typically fell to either one or a hand full of individuals throughout the organization. Often, in the case where this responsibility fell to multiple personnel, a lack of communication was typical,

resulting in redundancy, overlap and gaps in collecting and disseminating this information. For example, King County, WA's decentralized structure presented a challenge to keeping up-to-date on changes in regulations. Review of their existing compliance program revealed significant opportunity for improvement, which has resulted in a new streamlined process that has saved significant man-hours, as well as the reduced potential for non-compliance.

Participants were encouraged to utilize the US EPA Office of Compliance Sector Notebook - Profile of Local Government Operations (EPA 310-R-99-001). The guidance document provides an overview of local government operations and the applicable federal regulatory requirements. Participants were also directed to the Local Government Environmental Assistance Network (www.lgean.org) for further information on state and federal regulatory requirements. Both resources served as a starting point for many of the participants which contributed significantly to their efforts to generate a baseline of regulatory requirements saving a considerable amount of time.

Establishing Objectives and Targets

Objectives and Targets provide an opportunity for an organization to improve upon its operations, specifically in those areas associated with a significant aspect. Many of the participants set objectives and targets around their lists of significant aspects. Some participants had the Core Team establish the objectives and targets while others solicited input from various levels throughout their organization. The participants reported that the more they solicited input from the various levels in their organizations the greater the opportunity to take advantage of a broad level of knowledge and expertise. Input from the shop floor typically identified areas that weren't originally considered. Including these concerns as objectives and targets sent the message that the organization is listening, which further secured buy-in on the shop floor.

In all cases GETF recommended objectives and targets be approved by management in light of the resource requirements that were needed to achieve the objectives and targets. When resource decisions need to be made management should be involved. Obtaining their approval also keeps management in the loop. The participants' initial efforts to draft objectives and targets were somewhat ambitious. Some objectives tried to achieve too much while others required too many resources. The participants found that management provided a reality check that resulted in more reasonable objectives and targets.

Phase III – Implementation

March 2001 – September 2001

Phase III for the participants marked where the EMS implementation process began to move down through the organization. The elements addressed in this phase are the heart of the EMS. Emphasis was placed on two areas – managing significant aspects and developing environmental management programs to achieve objectives and targets.

Managing Significant Aspects

- Developing written procedures, including operational controls to ensure proper management of significant aspects
- Supplier and contractor issues
- Develop a procedure to ensure documentation essential to the EMS are controlled
- Records management
- Clearly identify roles and responsibilities as they relate to specific EMS activities and managing significant aspects
- Ensure all personnel have been trained
- Establish internal and external lines of communication
- Emergency preparedness and response

Develop Environmental Management Programs

- Roles & Responsibilities
- Resources
- Timeframe

Summary of Phase III

Phase III signified the mid-point of the project and offered participants an opportunity to assess their work towards attaining specific milestones. The Phase III workshop was held at Florida Gulf Coast University in Ft. Myers, Florida and began with individual participants sharing their experiences through the first two phases. The participants were then led through a case study exercise in which they identified where the Phase III elements could apply, using a flow diagram from their respective organizations, to operations and activities. The remaining portion of the workshop was dedicated to developing Environmental Management Programs (EMPs), including a presentation by the City of Charleston on how they initiated an EMP for their waste water treatment plant. The EMPs are critical in developing programs for organizations to successfully achieve the objectives and targets identified during Phase II. During this phase participants began the task of developing or revising the work instructions/procedures and integrating them into the day to day operations of their fenceline.

Operational Controls

The management of significant aspects is the core of an EMS. To ensure proper management, organizations are directed to develop documented procedures that guide how activities associated with a significant aspect, are to be conducted. Many of the participants, through the gap analysis exercise, identified that many procedures existed but were not documented.

Each participant utilized the expertise of the Implementation Teams or shop floor personnel to review, develop and document work instructions that would be used to

ensure proper management of the significant aspects. The Teams consulted the process flow diagrams which served as the basis for developing the step-by-step instructions. Each Team evaluated existing operational procedures, training materials and emergency response plans to determine their suitability. As the Teams developed the work instructions/procedures they also identified personnel responsible for managing the significant aspects, identifying associated documentation and records, identifying training requirements, communication needs, operational controls and maintenance needs, and, when required, appropriate emergency response actions.

The participants saw significant benefit in this exercise. In an effort to streamline and integrate the EMS with existing programs the Port of Houston and New Hampshire Department of Transportation incorporated health and safety requirements into their newly developed work instruction/procedures. As both organizations plan to expand the scope of the EMS to other departments and operations these templates will be used to develop additional work instructions.

Other participants noted the exercise to document procedures captured the knowledge of the most experienced personnel eliminating the need to pass information to new employees through word of mouth. The procedures will be used in formal new employee orientation training sessions. Tri-Met reported that the operating procedures will provide consistency and true best management practices at its facilities.

Supplier and Contractor Issues

As the participants conducted the aspect identification process they identified significant aspects associated with the products or services provided by suppliers and contractors. The participants reviewed existing contracts and identified opportunities to add environmental language to specifications that would ensure stronger management of the activities associated with the significant aspects. The Port of Houston plans to include language, in its tenant agreements, that stipulates a higher environmental performance standard. The San Diego, CA Refuse Disposal Division identified significant cost saving opportunities by changing a contractor standard operating procedure. The Refuse Disposal Division established a dialogue with the contractor and emphasized the significant environmental improvement that could result. The contractor, knowing that this would be included in the future contract, did not want to lose a valuable customer so they worked with the City to implement the change resulting in over \$700,000 in annual cost savings.

Training

Training plays a vital role in the success of the EMS. Training is a means to increasing the overall environmental awareness of the organization and ensuring personnel properly fulfill their responsibilities associated with managing significant aspects.

General environmental awareness training provided the opportunity to introduce personnel to the environmental policy, review roles and responsibilities, and the potential consequences of departing from specified procedures. The awareness training provides

the message that everyone in the organization has a roll in making sure the organization fulfills the commitments in the environmental policy. Many of the participants created promotional materials that were used in the awareness training. NH DOT, Tri – Met and Port of Houston developed 15 minute EMS awareness videos that were reviewed by all personnel. The videos included segments of top management expressing their commitment to the process and the importance of participation throughout the organization. All three organizations are using the videos as part of a new personnel orientation packet.

Other participants developed mascots or logos to promote the EMS effort. Jefferson County, AL uses an owl whose name is Ecological Al. Posters, brochures and internal newsletters were additional tools used for awareness efforts.

Personnel who work with significant aspects need to be trained to ensure they are knowledgeable about their tasks and responsibilities. This is referred to as competency training. To determine competency, some of the participants would use one or a combination of the two: 1) review work instructions/procedures and have personnel sign-off that they reviewed them and understand them and/or 2) job specific training (e.g. hazardous awareness training or union certification).

Documentation Control

Certain documents are essential to the establishment of the EMS framework and the management of significant aspects. To ensure personnel are fulfilling their responsibilities properly, it's a requirement that they work from current documentation that has received the appropriate approval(s). A document control procedure needs to be established to ensure personnel are working from proper documentation.

At the start of the initiative a few of the participants purchased ISO 14001 Implementation Software. A component of this software helped satisfy the document control requirement. Prior to the implementation effort none of the participants had an existing process that directed the maintenance and control of relevant EMS documentation. As the participants ventured further into the project they found the amount of draft and approved documents growing considerably. Without a document control process Core Team members and other personnel often found themselves working with obsolete documents. Once the document control process was established it reduced this concern significantly.

Records Management

Records are produced in the normal course of implementing an EMS, and they establish the benchmarks of how effectively the EMS is working. Records constitute objective evidence that an organization is actually implementing the EMS as designed, and that the EMS procedures and work instructions are being carried out. The participants were required to create a records management procedure that provided guidance on identifying, maintaining, retaining, and disposing of records. Most of the participants had

existing informal records management procedures that needed to be expanded to include new EMS records.

Communication

Many of the participants experienced an improvement with communication inside and outside their organizations. Undocumented communication procedures existed in almost every case prior to the EMS initiative. The EMS provided the opportunity for the participants to adopt formal documented procedures. Aside from the traditional correspondence with state and federal regulators, the participants opened lines of communications with various stakeholders outside the organization. For example, Louisville and Jefferson County Metropolitan Sewer District distributed invitations to their stakeholders asking them to participate in a process to identify environmental issues significant to them. Information from this meeting was later taken into consideration when MSD established objectives and targets.

The stakeholder analysis conducted in Phase I was an exercise that helped the participants identify and prioritize the internal and external stakeholders which influenced how communication was conducted and what was said.

The EMS process must also include a procedure for communicating between levels and functions inside the organization. Again, the organizations relied on informal procedures prior to the EMS initiative. The establishment of a formal procedure significantly strengthened the flow of information throughout each organization. This is critical to the implementation process because employees at all levels in the organization play a role. For them to fulfill this role a mechanism needs to be established that ensures information flow top-down and bottom up.

Emergency Preparedness and Response

The participants were required to establish and maintain a procedure for identifying and responding to accidents and emergencies related to the environment, and for mitigating the environmental impact of any emergencies that may occur. Recording emergency incidents is also key to EMS conformance. Regular testing of these emergency response plans, especially after any incidents occur, is a part of the EMS process. Many of the participants had existing elements of an emergency response program (e.g. Spill Prevention Control and Countermeasure Plan). Working through the assessment process they identified the gaps in the program that would later be addressed.

Develop Environmental Management Programs

Environmental Management Programs (EMPs) are the vehicle used to achieve the established objectives and targets. EMPs outline who (roles and responsibilities), how (resources), and when (timeframe). The participants reported that they enjoyed this element of the EMS because it allowed them to be creative in how they achieved the objectives and targets. For some, the objectives and targets were established to go beyond

compliance to improve environmental performance. This was viewed as an opportunity to “do something good.”

Phase IV – Check & Act

October 2001 – March 2002

The focus of this phase was to verify if roles and responsibilities are being fulfilled, assess whether regulatory requirements are being met, determine if objectives and targets are being achieved, and confirm whether or not the EMS is in place and functioning properly. Management also plays a critical role during this phase with an overall evaluation of how the EMS is doing.

- Monitoring and Measuring
- Assessing Compliance
- Calibration
- Nonconformance and Corrective and Preventative Action
- Internal EMS Audits
- Management Review

Phase IV Summary

The Phase IV workshop was hosted by the New England participants – NH DOT, MA DEP and UMASS at Lowell. The City of Eugene Wastewater Division participated in the session and shared their experiences with the internal EMS audit process and the management review. An Auditor from NSF International was also present to discuss the ISO 14001 registration process. Many of the participants commented that their efforts to implement the Phase IV elements brought the EMS together. In each of the preceding phases the participants tended to address each element individually. Addressing the elements individually inhibited their ability to establish the linkages between the elements. Phase IV brought the EMS linkages into focus giving the participants the opportunity to step back and look at the big (EMS) picture.

Monitoring and Measuring

Monitoring, measuring, and evaluating are the activities that will allow an organization to determine whether it is making progress towards achieving its environmental objectives and targets. The participants were guided to also evaluate the operations and activities that have associated significant aspects - are they required to monitor or measure in accordance with state or federal regulatory requirements? As an example, do they need to monitor water or air quality? If calibrated instruments are required to monitor or measure a process needs to be established to calibrate them on a periodic basis. A procedure needs to be developed that specifies how calibration and monitoring and measuring will be accomplished.

Assessing Compliance Status

Clearly stated in each organization's environmental policy is a commitment to compliance. To determine whether the policy commitment is being met, the participants need to develop or enhance an existing process where they can assess their compliance status. Most of the participants had an in-house "environmental" person that was responsible for keeping on top of regulations and implementing the requirements. Many of the participants agreed that a compliance assessment can be successfully implemented either in-house or through a consultant. If the process is to be conducted in-house, it is important that the personnel involved have the education, experience and training to do so. Two participants reported that they will attend a compliance course to improve their ability to complete this requirement successfully and thoroughly.

Nonconformance and Corrective and Preventative Action

Nonconformance and corrective and preventative action play an important role in improving the EMS and ultimately institutionalizing it. This process is used to address weaknesses or correct failures in the EMS. Nonconformance actions are typically generated through an EMS audit but can also be generated by any person in the organization. Once a weakness or failure is identified it requires the manager or personnel in the area of occurrence to identify why it happened and how to correct it. This places the responsibility squarely on the shoulders of personnel throughout the organization. The process of improving the EMS becomes the responsibility of everyone in the organization not just the environmental personnel.

The participants were encouraged to record nonconformances for tracking over time. This allows the participants to identify any trends concerning weaknesses in the system where they would then be addressed accordingly. To reduce the amount of documentation in the system some of the participants embraced a find and fix approach for minor issues. Rather than inundate the system with documentation auditors or the EMR would correct issues as they were identified. This served as an opportunity to educate personnel and reduce the burden on personnel that would have to take time to formerly respond.

Conducting an Internal EMS Audit

The internal EMS audit is an opportunity to assess the health and functionality of the EMS. This requires a periodic assessment of EMS documentation and employees' roles and responsibilities concerning EMS specific tasks and managing significant aspects. The internal audit activity requires planning and preparation.

Either prior to the project or during the initial months a few of the participant EMRs completed an ISO 14001 Lead Auditor Course. They commented that this was very helpful when it came time to organize and conduct the internal EMS audit. One of the EMRs that completed this course personally trained his organization's internal audit team.

Many of the participants were uncertain what to expect for the first internal EMS audit. In light of the negative connotation associated with the word audit many of the participants emphasized the purpose and positive outcomes of an EMS audit and assured personnel there would be no punitive action associated with any part of the process. The audit process is intended to be helpful to the organization, and should identify both positive and negative conformance in a constructive manner. The participants viewed their initial audit efforts as a learning opportunity for the auditor, auditees, and the organization as a whole. None had been through an internal EMS audit so it was a new experience for all. Over time the participants believe their auditors will refine the audit approach and subsequently their technique which will make the audit process much more efficient.

Conducting a Management Review

The Management Review is the final element of the EMS cycle. It is an opportunity to make broad decisions about the suitability, adequacy, and effectiveness of the EMS plans and arrangements, about the future of the EMS and, as appropriate, to fine-tune the system and make course corrections. Management determines whether the EMS is functioning properly and delivering benefits that outweigh costs, where responsibilities may need to be shifted, additional resources may need to be allocated, and if the environmental policy is appropriate or needs to be reviewed.

The management review was viewed by the participants as an opportunity to fully brief management on the overall EMS implementation process. Most of the participants had fed management information through the development and implementation process. However, the management review was the first time management received a comprehensive set of information providing a big picture view of the EMS. Information reported to management included:

- EMS Audit results
- Compliance assessment results
- Internal suggestions
- External communications
- Progress on objectives and targets
- Performance measures
- Reports of emergencies, spills, other incidents/accidents
- New or modified laws/regulations

Rather than create a separate meeting for the management review many of the participants integrated the EMS discussion points into a pre-existing meeting. To facilitate the process it was emphasized that the information should be distributed in advance of the meeting and presented in a fashion that is easy to understand and adds value to the process (e.g. what does management want to hear?). As some participants stated keeping management involved throughout the process can make the review process more efficient and “less painful.” The frequency at which the meetings are held varies from participant to participant – typically once or twice a year. Tri-Met summed the management review process up best, “The management review meeting provided good

guidance, a resource for future projects and a strategic direction for future departments' involvement."

FINAL WORKSHOP

Washington, DC

March 2002

The final workshop was held in Washington, DC. It provided an opportunity for the participants to share their EMS implementation experiences with a wider audience. The participants reported on the benefits associated with their EMS implementation experiences, discussed their motivations for participating in the initiative and what made their efforts successful.

Jim Connaughton, Chairman, White House Council on Environmental Quality was the workshop's keynote speaker. Mr. Connaughton discussed the need to continue the promotion and adoption of EMS in the local government sector. He emphasized the importance of embracing a "just do it" strategy. He explained, "We have 14 entities here implementing EMSs. We should make that 1400! Take the experience and replicate it. See what works and what doesn't - then copy the positive and apply it to your local needs. We have to start showing the product of EMS, not just the concept."

Implementation Status

Multiple factors can impact an organization's ability to successfully implement an EMS. Length of time, available resources, top management commitment, and employee buy-in all play a roll in whether or not the EMS will be fully implemented. It was expected that all of the participants would fully implement an EMS within the project's two-year timeframe. Like the first initiative, this was not to be the case. All of the participants are committed to completing the EMS implementation process. The participants were at various stages of the implementation process at the close of the two year process. Jefferson County, AL had completed the implementation process and went on to pursue ISO 14001 certification successfully in February 2002. About a third of the participants were at or near full implementation while the rest were toward the end of Phase III or in Phase IV and would need a few more months to complete the process.

One participant had to cease its EMS efforts due to the start of a large capital improvement project half way through EMS implementation. This project was the result of compliance issues which required a significant shift in resources away from the EMS effort. The participant anticipates resuming its EMS activities in the near future.

ISO 14001 Registration Audit

Upon completion of the second initiative program, six of the fourteen participants have said that they will pursue ISO 14001 certification. As was noted above, Jefferson County, AL achieved certification in February 2002, San Diego, CA

achieved certification in July 2002, and the Port of Houston Authority in August 2002.

As a result of certification Jefferson County believes personnel take the EMS more seriously because a third-party is coming on site to assess their work. They believe this sends a strong message throughout the organization that “will keep employees on their toes.” Some of the participants see certification as validating the internal EMS audit.

The certification of both the Port of Houston and the City of San Diego, CA Refuse Disposal Division made them the first Port and public landfill in the US to be certified. They both feel there is an honor and distinction in being the first to do so.

Organizational Resources Committed

The following section provides the average resource commitments, for an individual participant, toward EMS implementation over the two-year project period. The participants tracked the amount of time and resources they dedicated toward implementing the EMS throughout each of the four phases of the project. Each participant submitted a quarterly report detailing information on the following:

1. *Time Committed*: personnel involved by title and their respective hours
 - a. Top Management
 - b. Environmental Management Representative(s) (EMR)
 - c. Core Implementation Team
 - d. Specific Expertise Personnel: Legal, Human Resources, Maintenance, Interns, and Consultants
2. *Costs*:
 - a. Total Labor (internal): determined by the hourly rate of all employees involved in developing and implementing the EMS
 - b. Consultant Fees
 - c. Travel
 - d. In-kind Contributions from Outside Organizations
 - e. Materials: promotional materials, software, etc...

The bulk of the financial resources that participants invested involved direct labor costs. On average, each of the participants committed 4,331 direct labor hours totaling \$126,223 in internal costs over the two-year period (*Two organizations did not submit a full set of data on resources and time and were therefore not included in the analysis. WI DNR’s data was omitted from the analysis due to their unique application of EMS – see the WI DNR case study for more information). The values for direct labor hours committed ranged from a low of 2,486 to a high of 6,267, with a range for total internal costs from \$67,102 to \$195,565.

	Hours Committed (two-year period)	Total Cost (two-year period)
Average per Participant	4,331 hours	\$126,223
Range		
Low Values	2,486 hours	\$67,102
High Values	6,267 hours	\$195,565

The amount of resources committed by each participant varied due to several factors, including size of the defined fenceline (range from 42 to 1,500 individuals), nature of the specific process within the fenceline, existing management infrastructure, and the efficiency with which the EMS was implemented.

The majority of the direct labor hours committed by an individual organization, during EMS implementation, are the responsibility of the Environmental Management Representative (s) (EMR) and the Core Implementation Team. Each participant committed, on average, a total of 9 individuals and 3,535 direct labor hours for these two positions combined. The following table presents the breakdown of hours committed in relation to position responsibility. The averages are based on an overall average commitment of 4,331 direct labor hours.

Position	Average # of Individuals per Organization	Average Hours Committed per Individual	Total Hours Committed for Position (two-year period)
EMR(s)	2	987 hours	1974 hours
Core Team	7	223 hours	1561 hours
Specific Expertise Personnel			796 hours
			4,331 total hours

In addition to the EMS Management Representative(s) and the Core Implementation Team, city government personnel, community activists, administrative support staff, legal departments, and environmental managers contributed time to the EMS program.

The division of data by other means, such as similar process characteristics (i.e. wastewater treatment facilities), proved fruitless due to the fundamental differences among individual EMSs and the small number of participants within the initiative.

The resource commitments of each participant are examined in the individual case studies found in Appendix B *Case Studies*.

Consultants

Six of the fourteen participants utilized the services of consultants to address specific needs in their EMS implementation. The services provided by each consultant were similar for all six participants; however, each of the participants utilized these services at varying points throughout the four phase implementation process. For example, the University of Massachusetts participant only utilized consultant services over the last

quarter of its implementation, whereas San Diego used such services throughout six of the eight quarters. Consultant services included: training (awareness and internal EMS audit), documentation review, and technical assistance. The average amount spent for the consultant services was about \$14,600. The following table provides resource commitments for the consultant services utilized by the five participants.

Organization	Consultant Costs
City of Detroit	\$3,200
UMass - Lowell	\$13,100
Tri-Met	\$15,423
City of San Diego	\$18,346
New Hampshire DOT	\$23,000

* The Port of Houston utilized 55 hours of consultant services; however, the total costs of these services was unavailable at the time this report was written.

The use of outside consultants depends upon the capacity of each individual organization; however, it is not, in most cases, necessary to rely on consultants to develop an effective EMS.

Return on Investment

While the decision to develop and implement an EMS entails a commitment of time and monetary resources, EMS implementation within a diverse group of local government organizations has shown consistent short-term and long-term returns on investment that often substantially outweigh the costs of implementation. In addition to economic savings, public organizations have also realized a wide-range of other significant benefits, including improved relationships with regulators and external stakeholders, sound risk management practices which can often help avoid costly mistakes, increased use of pollution prevention, improved operational efficiency and control, and better public perception and image.

The following organizations represent prime examples of this positive return on investment from EMS implementation:

Tri-County Metropolitan Transportation District

The Tri-County Metropolitan Transportation District, Oregon's largest public transit agency, designated the organization's 5 maintenance facilities as their EMS fenceline. Over the two-year project period, Tri-Met committed \$89,241 in direct labor costs. However, in just over one year into the EMS implementation, Tri-Met was able to identify \$300,000 in operating savings, \$66,000 of which was directly attributable to meeting their defined EMS energy conservation objectives and targets. The organization was also pleased to achieve better-defined roles and responsibilities resulting from the EMS implementation process, which has allowed employees the freedom and empowerment to design systems to fit their practical needs rather than being based solely on regulatory compliance.

City of San Diego

The City of San Diego defined the Refuse Disposal Division as their EMS “fenceline.” This division is responsible for the city’s only active municipal landfill, as well as the maintenance of six closed landfills. The Division committed \$213,908 in direct labor costs over the two year EMS implementation period. With an annual operating budget of almost \$18.7 million, the Division expects an on-going annual cost savings of approximately \$868,000 from the successful implementation of the EMS. The majority of the savings have been achieved through more efficient use of heavy equipment, fuel, and water. These achievements have resulted mainly from increased employee awareness, empowerment, and enthusiasm which has continued to prompt many employee-initiated operational changes. The Division is also the first public refuse disposal division in the U.S. to achieve ISO 14001 certification.

New Hampshire Department of Transportation

The New Hampshire Department of Transportation selected its Bureau of Traffic as an EMS Pilot Facility, in the hope that lessons learned could be employed for the entire organization. The Bureau falls under the Operations Division and represents an ideal microcosm of the DOT. Over the two-year EMS implementation period, the Bureau dedicated \$96,817 in direct labor costs. The Bureau has experienced a variety of benefits directly related to EMS implementation. For example, the Bureau has created more efficient training programs through combining existing programs and refining the operational requirements and documentation controls. The restructuring of these programs is expected to save the equivalent of 127 employee workdays per year.

In addition, the Bureau has implemented several programs as a result of the EMS implementation process, including a sign material recycling process calculated to save \$22,992 and an on-site waste paint treatment program calculated to save \$40,324 over the first five years. The Bureau, after this initial five year period, expects to save approximately \$20,000 per year through the combination of these two programs. Following the successful EMS implementation, the New Hampshire Department of Transportation plans to pursue ISO 14001 certification in 2003.

What’s Next

EMS Guidance Document for Local Governments

As part of the second initiative, GETF is producing an EMS Troubleshooter’s Guide for Local Governments. The document will provide guidance specific to local governments on how to implement an EMS. The implementation guidance incorporates the experiences of the 23 organizations that participated in the first and second Initiatives for Government Entities. GETF and EPA anticipate the document will be released early fall 2002.

Building on the momentum generated by the first and second initiatives and keeping in-line with its EMS action plan, GETF, with funding from EPA, created the Public Entity EMS Resource Center (PEER Center). The PEER Center (www.peercenter.net) is made up of a central clearinghouse, in addition to people that provide training, technical assistance and mentoring to those seeking to adopt an EMS for their local government entity. It links users to a national database of key resources such as service providers, sample documentation, state EMS programs, mentors, training materials, and case studies.



The PEER Center provides an accessible, cost-effective one-stop resource that provides organizations step-by-step guidance on the implementation process. Sample documentation and an ever-growing pool of EMS mentors will continue to make EMS development and implementation easier for government entities in the future.

Local Resource Centers

As part of the PEER Center, eight Local Resource Centers (LRCs), located throughout the country, have been designated to further advance the goal of public sector EMS implementation. The LRCs, integrated into existing institutions, have been established for the purpose of providing local communities with technical expertise, field tested tools, information sharing, and support for EMS implementation. GETF will provide assistance to these organizations by helping develop business plans, providing relevant EMS materials to facilitate each organization's existing EMS assistance activities, train-the-trainer work sessions on ways to address the needs of public agencies, and other

"Local PEER Centers housed with local folks who have first-hand knowledge of implementing an EMS would be an invaluable resource tool for the entire nation." – The Honorable Steve Small, Jr., Commissioner of Environmental Services, Jefferson County Commission, Birmingham, AL

marketing services. The PEER Center will act as the initial support mechanism for the LRCs. These Centers will promote local EMS competence and encourage government-to-government sharing and mentoring that will contribute to significant savings in both time and cost for public sector organizations that want to pursue EMS implementation.

The LRCs were selected on June 18, 2002 upon the completion of a competitive application and interview process. The criteria utilized in the selection of the LRC's focused on business experience, EMS expertise, capacity, and organizational commitment, especially top management support. Based on these criteria, the following LRCs were selected:

Georgia Institute of Technology

The Center for International Standards & Quality (CISQ)

Atlanta, GA 30332-0640

Phone: (404) 894-0968 or (800) 859-0968

Fax: (404) 894-1192

www.industry.gatech.edu/quality/default.htm

Purdue University

Indiana Center for Clean Manufacturing Technology and Safe Materials (CMTI)
2655 Yeager Road, Suite 103
West Lafayette, IN 47906
Phone: (765) 463-4749
www.ecn.purdue.edu/CMTI

Texas Commission on Environmental Quality

12100 Park 35 Circle
Austin, TX 78753
Phone: (512) 239-1000
www.abouttexasems.org

University of Florida

The Center for Training, Research and Education for Environmental Occupations (TREEO)
3900 SW 63rd Blvd.
Gainesville, FL 32608
Phone: (352) 392-9570
Fax: (352) 392-6910
www.treeo.ufl.edu

University of Massachusetts-Lowell

One University Avenue
Lowell, MA 01854
Phone: (978) 934-3900
www.uml.edu/ems

University of Wisconsin-Stout

Menomonie, WI 54751
Phone: (715) 232-1122
www.uwstout.edu

Virginia Polytechnic Institute & State University

Center for Organizational and Technological Advancement (COTA)
110 Shenandoah Avenue
Roanoke, VA 24016
Phone: 540-985-5900
Fax: 540-853-8290
www.cota.vt.edu

The Zero Waste Alliance

One World Trade Center
121 SW Salmon Street, Suite 210
Portland, OR 97204
Phone: (503) 279-9383

Fax: (503) 279-9381

www.zerowaste.org

In July 2002, US EPA and GETF hosted a kickoff workshop to promote the LRC Program. The meeting was held at the Hall of States in Washington, DC and included participants from various federal and state agencies, non-profits, and higher educational institutions.

Third EMS Initiative for Government Entities

In further promoting EMS for public entities, a “third flight” of EMS participants, is anticipated to begin in late fall 2002. The program will be funded by the EPA Offices of Water and Air and Radiation through a cooperative agreement with GETF. Based on the successful experiences of the two preceding initiatives, this third initiative will aim to provide an additional set of public agencies with technical assistance and mentoring and provide additional data and mentors to the PEER Center. Each participant will have the benefit of gaining knowledge and employing lessons learned from the 23 participants from the first and second EMS initiatives.

Appendix A:

Glossary of Terms

Accreditation: Formalized procedure by which an authoritative body formally recognizes that an organization or facility is competent to carry out specific tasks and/or meets specific accreditation requirements.

Audit: A planned, independent and documented assessment to determine whether agreed upon requirements are being met within an organization.

Audit Cycle: The period of time in which all the activities in a given site/facility are audited.

Audit team: Group of auditors, or a single auditor, designated to perform a given audit; the audit team may also include technical experts and auditors-in-training. Note: One of the auditors on the audit team performs the function of lead auditor.

Certification: The environmental management system of an organization is certified for conformance with ISO 14001 after it has demonstrated such conformance through a formal audit process through a third party.

Certification body: A third party that assesses and certifies/registers an organization's environmental management system with respect to published environmental management system standards and any supplementary documentation required under the third party's certification system.

Compliance: An affirmative indication or judgment that the supplier of a product or service has met the requirements of the relevant specifications, contract, or regulation. Comparable to Conformance.

Conformance / Conformity: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation. In terms of ISO, conformance to ISO 14001 certification requirements - comparable to Compliance.

Continual improvement: The process of enhancing an organization's environmental management system to achieve improvement in overall environmental performance in line with the organization's environmental policy. This widely adopted principle is intended to ensure that an organization does not simply adopt an environmental management system for cosmetic purposes and thereby remain static, without commitment to reduce its impact on the environment.

Emergency response plan: A formal, detailed plan that describes an organization's specific logistics and reporting requirements in the event an emergency, such as fires, erosion or spills. A fundamental element of an environmental management system.

Environment: Surroundings in which an organization or facility operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation.

Environmental Aspect: Element of an organization's activities, products or services that can interact with the environment.

Environmental Impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

Environmental Management Representative (EMR): The clearly identified environmental management system team leader who has responsibility for the planning and facilitating an organization's environmental management system from start to finish and has the designated authority of senior manager to get the job done.

Environmental Management System (EMS): A management approach which enables an organization to identify, monitor and control its environmental aspects. An environmental management system is part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

Environmental Management System Audit: A systematic, documented verification process of objectively obtaining and evaluating an organization's environmental management system to determine whether or not it conforms to the environmental management system audit criteria pre-defined by the organization, and for communication of the results of this process to management.

Environmental Objective: Overall environmental goal, arising from the environmental policy, that an organization sets itself to achieve, and which is quantified where practicable. Objectives are based on specific significant aspects.

Environmental Performance: Measurable results of the environmental management system related to an organization's control of its environmental aspects, based on its environmental policy, objectives and targets.

Environmental Policy: An organization's formal statement defining its intentions and principles in relation to its overall environmental performance, which provides a framework for action and for the setting of its environmental objectives and targets.

Environmental Target: Detailed performance requirement, quantified where practicable, based on an organization's defined environmental objectives and that must be met in order to achieve those objectives.

Fenceline: The area in which an organization chooses to implement its environmental management system – a department, division or specific operation.

Interested Party: Individual or group concerned with or affected by the environmental performance of an organization.

ISO: The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies from some 140 countries, one from each country. ISO is responsible for the development of ISO 14001.

ISO 14001: An international voluntary standard for environmental management systems. This is one standard in the ISO 14000 series of International Standards on environmental management.

Lead auditor: Person qualified to manage and perform environmental management system audits.

Non-conformity: The non-fulfillment of a specified requirement. Any or all of the following: a) one or more environmental management system requirements have not been addressed; or b) one or more environmental management system requirements have not been implemented; or c) several nonconformities exist that, taken together, lead a reasonable auditor to conclude that one or more environmental management system requirements have not been addressed or implemented.

Observation: A practice within an organization's operations, while not in strict violation of environmental management system requirements, that can make conformance difficult or potentially provide an opportunity for error. Examples include overly difficult processes, poor housekeeping, and inadequate personnel training.

Prevention of Pollution: Use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution.

Pollution Prevention: The development, implementation, and evaluation of efforts to avoid, eliminate, or reduce pollution at the source. Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

Registrar: Third-party entity which audits and registers an organization's environmental management system with respect to the ISO 14001 environmental management system standard.

Stakeholders: Those groups and organizations having an interest or stake in a organization's environmental management system program (e.g., regulators, shareholders, customers, suppliers, special interest groups, residents, competitors, investors, bankers, media, lawyers, geologists, insurance companies, trade groups, unions, ecosystems and cultural heritage).

Verification: The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing and documenting whether items, processes, services, or documents conform to specified requirements.

Waste Minimization: The use of source reduction and/or environmentally sound methods and practices that reduces the quantity and/or toxicity of pollutants entering a waste stream prior to recycling, treatment, or disposal. Examples include: equipment or technology modifications, reformulation or redesign of products, substitution of less toxic raw materials, improvements in work practices, maintenance, worker training, and better inventory control.

Appendix B:

Case Studies

Tri-County Metropolitan Transportation District (Tri-Met) Portland, Oregon

Profile

Tri-Met is the state of Oregon's largest public transit agency, serving nearly 600 square miles in the urbanized portions of Multnomah, Washington and Clackamas counties. During its 30+ years as an agency, Tri-Met has seen ridership increase to its current record level of 80 million rides a year. By providing efficient transportation alternatives and taking cars off our roads, Tri-Met helps preserve the region's quality of life and keep the air clean and is recognized as one of America's Best Transit Systems.

Tri-Met is governed by a seven-member, volunteer board of directors who are appointed by the governor. Each board member represents a geographic area within the Tri-Met service boundaries. The Board sets policy direction for the agency. The general manager serves at the board's discretion and runs the agency, which employs 2,530 people.

Tri-Met operates the 33-mile MAX light rail line and 102 bus routes. In fall 2001, a 5.5-mile MAX extension will connect Portland International Airport to the regional light rail system. A 5.8-mile Interstate MAX proposal, includes 10 new stations between the Expo Center and Rose Quarter Transit Center, and would operate directly between the Expo Center and downtown Portland. Additionally, Tri-Met runs LIFT, door-to-door transportation for people with disabilities and others unable to ride the fixed-route system. The LIFT program provides nearly 15,000 rides a week.

Tri-Met's operating budget for FY2001 is \$280.7 million. The majority of revenue, about 65 percent, is derived from payroll taxes. Passenger revenues cover about 19 percent. For more information see www.trimet.org

Fenceline

The fenceline for EMS establishment is Tri-Met's 5 maintenance facilities benefiting approximately 580 maintenance employees. Future plans include the maintenance of way department and purchasing/procurement departments.

Core Team

The core team is made up of three members of the EMS Steering Committee with the EMS project manager designated as the Environmental Management Representative. 7 employees from maintenance, maintenance of way, facilities management and safety departments make up the remainder of the EMS Core Team.

Key Drivers for Adopting an EMS

Tri-Met identified several critical factors that led to the decision to design and adopt an EMS within their 5 maintenance facilities. Tri-Met observed that the adoption of an

EMS presented the potential to lead to regulatory benefits and enhanced relationships with regulators from EPA's Performance track to Oregon DEQ's Green Permits. After considering green building initiatives, LEED certification and Energy Star Buildings the EMS structure was seen as an ideal framework to transition easily into these programs and toward sustainability. Tri-Met also identified several internal drivers that offered similar benefits for the environment:

- Improved employee participation in the facility's environmental performance;
- Improved overall environmental performance;
- Improved facility compliance with environmental regulations; and an opportunity to use employee creativity to move beyond regulations.
- Increased support from environmental professionals including EPA, DOE, DEQ.
- Executive order from Governor mandating sustainable state offices by 2025.



Significant Aspects & Impacts

After looking at flow charts, internal surveys and processes within the maintenance facilities many environmental impacts were identified. Not all of these areas could be improved upon immediately given budget cycles, technological and human resources' constraints. Using criteria like severity, human health impacts, frequency of occurrence, natural resource depletion and regulations each impact was ranked. The impacts were scored using a weighting percentage with a numerical value to determine what would be considered to be significant. From this list of significance 12 objectives and targets were created.

Objectives and Targets

Objectives	Targets
Consume less water when washing vehicles; accurately measure efforts	10% monthly reduction in usage associated with washing
Improved industrial waste water discharges; evaluate engineering solutions	Estimated the use of methylene chloride at all facilities
Increased focus on spill prevention; training; safe rinse zones established	Improve drainage catch basins; zero industrial wastewater violations in 2001
Annual replacement of filter cartridges; investigate spray bottle alternatives	Facilities plant maintenance mechanic trained on filter preventative maintenance
Reduce solid waste impacts of activity, research potential substitutes, new paint bay designed	Investigate no/low VOC paints pros and cons; investigate low VOC paint guns.
Extend life of glass bead, minimize waste, train/engage employees in efficient use	Informal training by 4/27/01; permanent reminders using postings next to units
Creation of refrigerant management program	Audit training records; review 608/609 guidelines; evaluate potential remedies
Improved waste water treatment, reduce chemical usage, publicize pump schedule	RFP for wastewater equipment upgrades, monthly facility walkthroughs documented
Maintain existing compliance record; improve training; investigate low mercury tubes	Universal waste tracking updated monthly with improved internal procedures.
Increased internal reporting and training on Veeder-Route system	Annual training on tanks' alarms, monitoring equipment, emergency preparedness and response.
Increased recycling of used absorbents, recycling of paints	No changes in waste generator status of Tri-Met facilities.
Conservation of electricity, natural gas and water fees	10% usage reduction in 03/01 compared to 03/00

Benefits of Adopting an EMS

Tri-Met has realized a number of benefits resulting from the adoption of an EMS into their 5 maintenance facilities. The EMS has enabled them to

- Streamline communications concerning environmental practices. Better-defined roles and responsibilities allowing for more freedom to implement EMS procedures.
- Identification of areas where utility savings existed. \$300,000 in operating savings identified as of June 2001. Of which \$66,000 is directly attributable to in energy conservation objectives and targets.
- Allow employees the freedom to design their system to fit their needs rather than having to change operations to fit environmental regulations.
- Reduce Tri-Met's environmental footprint through more efficient operations.
- Envision a workplan for incorporating The Natural Step.
- Focus on continual improvement of maintenance, ridership and our EMS.

Resources

The number of hours associated with the development and implementation of the Tri-Met EMS program are listed below.

Environmental Management Representative. 2077 hours

Core, Steering and Administrative Teams.	513	hours
Other	168	hours
Consultants	51	hours
TOTAL hours	2,809	hours

The labor cost associated with the development of the Tri-Met EMS program is:

Total Internal Labor Cost \$89,241

Personnel working on the development and implementation include the EMS Project Manager, two members of the EMS steering committee, the cross-agency core team (7 staff members) and occasional consultants. Top management is also involved with regular reviews. Although the EMS is not fully implemented based on total resources currently committed the total direct labor time will equal 2,809 hours. Based on this estimate the labor costs and consultants for the two-year project will equal approximately \$89,241.

Next Steps

Tri-Met is committed to using the EMS and expanding the EMS fenceline to other parts of the agency over time. The EMS fenceline will next involve the purchasing and procurement departments in the core team and begin to engage contractors who perform work on-site. The next steps also involve exploring the requirements for Agency involvement in Oregon DEQ's Green Permits program and more closely aligning objectives and targets to the system conditions contained in The Natural Step in order to make progress toward a longer-term goal of making the Agency more sustainable.

Management Commitment

An Environmental Management System allows us to go beyond the minimums of local, state and federal compliance regulations and moves us towards sustainability.

- Fred Hansen, Tri-Met General Manager





City of San Diego, California



Profile

The sixth-largest city in the United States, San Diego is the southern-most major metropolitan area in California. The city lies 125 miles south of Los Angeles and 500 miles south of San Francisco. Current estimated population for the City of San Diego is 1,277,000.

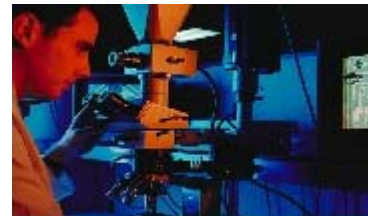
According to the San Diego Regional Chamber of Commerce Economic Research Bureau, projections for the 1999 economy indicate continued growth through 2000. The value of all goods and services generated in San Diego County are projected to be \$117.3 billion for 2001.



The “2020 Regionwide Forecast” released by the San Diego Association of Governments projects that between now and the year 2020 there will be 1 million additional residents, over 365,000 new homes, more than 310,000 new jobs, and a more ethnically diverse population.

The key industries within San Diego and its surrounding communities include: agriculture, defense, high technology, international trade, manufacturing, biotechnology, retail and tourism. Some notable facts...

- The city has more than 100,000 high technology workers in over 500 companies.
- San Diego has the third largest concentration of biotechnology industry in the United States.
- Telecommunications industry contributes more than \$5 billion annually to the local economy.
- San Diego is regularly ranked in the top-ten most popular destinations in the continental United States for international visitors.
- Ranks as the 10th largest agriculture producer in the nation.
- Trade is a major economic strength. The San Diego-Mexico border is the busiest in the world. Goods moving through San Diego customs district totaled \$23 billion in 1997.



The City of San Diego is a charter city operating under the Council-Manager form of government. The City Council is comprised of eight Council Members, elected by district, who serve overlapping four-year terms. The Mayor, elected at large, serves a four-year term. The Mayor and City Council, acting as the City's legislative and policy-making body, appoints the City Manager. The City Manager is the City's chief administrator responsible for implementing policies and programs adopted by the Mayor and City Council. The City Manager is responsible for the daily operations of the City and its' seven business centers. There are also five independent departments (City Auditor, City Clerk, Personnel and Retirement) and a City Attorney elected at large.

Fenceline

The Environmental Services Department is primarily responsible for management of the City's solid waste. The Department consists of over 500 employees organized into six divisions and has a total operations and capital budget of over \$100 million.

The Refuse Disposal Division has been selected as the fenceline. Due to its significant impact on the environment and heavy interface with regulators, Refuse Disposal presents a multi-faceted opportunity. The Division is made up of four major programs that include: Fee Collection, Miramar Landfill Operations and Maintenance, Inactive Site Operations and Maintenance and Biological Services Vegetation Restoration and Bird Control. The Division is overseen by a Deputy Director and consists of 94 employees with a budget of almost \$18.7 million (FY2000).

The Division is responsible for the City's only active municipally owned landfill. Miramar Landfill handles about 1.4 million tons of refuse annually and processes over 400,000 transactions per year.



Other responsibilities include:

- Administration of accounting and cash management for 17 franchised commercial haulers and \$45 million in collected revenues
- Maintenance of six closed municipal landfills, including active environmental restoration
- Operation of a greens diversion/composting operation
- Meeting regulatory requirements from numerous agencies

Key Drivers for Adopting an EMS

The City of San Diego identified several factors that led to their decision to design and implement an EMS. The city hoped to improve employees' participation in environmental performance as well as improving the city's overall environmental performance. In addition, the adoption of an EMS is consistent with the city's overall environmental principles and potentially provided San Diego with a competitive advantage on issues such as privatization. The availability of government assistant programs to aid in EMS development made the adoption of an EMS attractive for the City of San Diego. An EMS was also viewed as a valuable public relations tool.

Significant Aspects & Impacts

After development and review of the RDD's process maps the EMS Core Team conducted an environmental impact/aspect survey throughout the Division. The impacts/aspects that were identified as a result of this survey were then subjected to our significance criteria matrix producing a list of our significant aspects. Keeping in mind our business realities, twelve of the twenty-three significant aspects were selected for management through our Environmental Management Programs. Objectives and targets were set for managing these significant aspects and the EMPs were put in place. The remaining significant aspects are being controlled through Standard Operating Procedures until such time as they can be addressed through the EMP process.

Objectives & Targets 2002

1) Fuel Use Reduction

- Heavy Equipment
10% fuel use reduction in contracted heavy equipment.
- Stationary Equipment
Review, and amend where necessary, operating procedures and maintenance activity to obtain optimum fuel efficiency.
- Support Vehicles
5% fuel use reduction in Landfill Gas Management and Groundwater Monitoring programs.



2) Water Use Reduction – Potable/Reclaimed

- 25% Potable water use reduction
- Conduct Native Plant Nursery water use baseline study.
- Complete Native Plant Nursery water tension meter feasibility study.

3) Resource Conservation Effort (RCE)

- 10% paper use reduction throughout division.
- Complete landfill gas to energy feasibility study for Arizona Street landfill, select privatization vs. city operation, select firm if study data supports project.

4) Positive Impact (Continuous Improvement)

- Expand N.P.D.E.S. Best Management Practices (BMPs) program to include routine pump down of desilting pond, additional mulch and straw wattle application and installation of extra silt fencing.



- Expand Native Habitat Restoration Program awareness to all relevant city departments.
- Complete Ticket-less Transaction for Commercial Haulers Pilot Project and implement program with Waste Management of California. Implement program with as many other commercial haulers as possible.

Benefits/Results of Adopting an EMS

The City of San Diego has realized a number of benefits resulting from the adoption of an EMS into their Refuse Disposal Division. In addition to the long term benefits expected from our EMS, we have been pleasantly surprised by the enthusiasm shown by employees who have already changed the way they look at their jobs. Concurrent with the development of the EMS structure, they have suggested and implemented new work methods including: reductions in potable water use of up to 90% (31 M gallons/year); 50% reduction in water cost by using reclaimed water for 100% of operational water needs; potential for up to \$750 K in annual equipment operations cost savings as a result of looking at fuel use/emission reduction measures for our heavy equipment ops; 90% reduction in purge water generation in our groundwater monitoring program; utilization of stormwater from our sedimentation basin for dust control (up to 500K gallons per storm event) which concurrently minimizes stormwater impacts to the adjacent San Clemente Canyon stream. Other Benefits from their EMS implementation include:

- Increased environmental awareness as employees view processes and operations from an EMS perspective.
- Opportunity to identify environmental impacts throughout the division (both positive and negative).
- Ability to see more clearly the environmental consequences of our operation by focusing on the creation of flow charts and the determination of impacts and aspects.

- Operational cost savings realized by viewing our fenceline areas with an EMS perspective. These savings will be realized as the operational controls are implemented through our Environmental Management Programs.

Resources

The man-hours associated with the development of the City of San Diego EMS program.

Personnel		
Environmental Management Representatives	3877	hours
Core Team	725	hours
Partnership Team & Other	1337	hours
Consultants	152	hours
Total	6091	hours

The labor costs associated with the development of the City of San Diego EMS Program:

Direct Labor Costs	\$195,563.67
Consultant Costs	\$18,345.26

Next Steps

The Refuse Disposal Division has selected NSF-International Strategic Registrations, Ltd. to conduct the ISO 14001 registration audit through the spring/summer of 2002.

Costs/Savings (projected through 3/02)

The Refuse Disposal Division committed the resources of one full time position to fulfill the role of the EMR, hired two student interns to support the project, utilized a four member Process Team to provide project oversight, a five member Core Team for EMS development and implementation, and a twelve member Partnership Team to assist the Core Team in the field. Labor costs are projected to total approximately \$160 K, travel costs \$20 K, and consultant services \$25 K. ISO registration will total approximately \$ 16K.

On-going (annual) cost savings total approximately **\$868,000.00** based on:

- \$706,000.00 Heavy equipment rate savings by shutting off equipment during breaks and lunch periods,
- \$80,000.00 diesel cost savings by shutting down heavy equipment during breaks and lunch periods,
- \$47,000.00 Plant protector/pots reuse program,
- \$29,000.00 water cost differential for using reclaimed water in place of potable water, and
- \$ 6,180.00 water meter charge savings (6" to 4" meter downsize).



Jefferson County, Alabama



Profile

Jefferson County is Alabama's most populous county, with a population of more than 660,000, which represents 15% of the state's total population. It is the principal center of finance, trade, manufacturing, transportation, health care and education in the state. Birmingham, the state's largest city, and 35 other municipalities are located within the County's 1,141 square miles.



Jefferson County Commissioners Mary Buckelew, Bettie Fine Collins, and Chris McNair offer comments at the EMS Kickoff.

The County Commission is the governing body of Jefferson County. The five Commissioners are elected from five districts within the County for four-year terms. The Commission employs over 4,000 individuals. The County Commission wishes to remain progressive by maintaining its planned balanced growth and providing an excellent quality of life for its residents.

Jefferson County is the home of six colleges and universities, four business schools and six junior colleges and trade schools with a combined enrollment of over 36,000. The County is a major center for health care and biomedical research. Altogether, 21 hospitals with a total of 6,400 beds are located in the County. Mercedes-Benz has a major manufacturing plant in the area and has

attracted seven new businesses. In 1999, the American Honda Motor Company broke ground for their new \$400 million plant in Lincoln, Alabama (22 miles from the Jefferson County line). Honda plans to produce 12,000 engines and an equal number of minivans or sport utility vehicles on an annual basis. Our community's designation as being in marginal nonattainment for the 1-hour ozone standard is the major impediment to continued growth and economic development.

Fenceline

Jefferson County selected the General Services Department and Fleet Management as its fenceline. General Services consists of many divisions but the pilot initiative addressed

the Crafts, Maintenance, Grounds, and Custodial divisions. Fleet Management deals, as one might expect, with the cars, trucks, and other vehicles constituting Jefferson County's rolling stock.

General Services and Fleet Management were selected over other County departments because of the variety of potential environmental impacts of the divisions and because of the enthusiastic support for EMS implementation from the Department of General Services Director, the leadership at Fleet Management, and the County Commission. Environmental impacts include energy consumption, resource recycling, air emissions, biodegradable materials disposal, pest control, purchase and disposal of hazardous materials.

The General Services Department divisions consist of 235 employees, and Fleet Management has 70. The General Services Department also supervises capital building projects and renovations via contractors and subcontractors. The building capital improvement fund budgets for an 8-year period. Fiscal Year 1997-2004 will be approximately \$135,500,000.

The General Services Department manages the public buildings of the county including custodial services, air conditioning and heating, waste disposal, recycling, etc.

The **EMS Core Team** consists of Bill Peters, who is the Environmental Management Representative (EMR) and Director of Jefferson County's Department of Environmental Protection (DEP); Roy Burnett from Risk Management; Drew Doonan and Bill Hassell from General Services; Len Gedgoudas from Fleet Management; Mike Higginbotham, the DEP's Education and Training Coordinator; and Jan Trucks, the DEP's Records Manager.

In an effort to engage the fenceline, the EMS process was given a "face" in the creation of Ecologic Al, an owl mascot urging employees to "**thinkecological**" – that is, to always remain aware of potential impacts their activities may be having on the broader community and our environment. Al and the **thinkecological** slogan adorn a number of premiums designed for the program, and an inflatable version of Al is used regularly at public events to help share the EMS message.



Fenceline employees from General Services listen intently to a presentation at an EMS sponsored chemical safety training.

Key Drivers for Adopting an EMS

Jefferson County identified **several critical factors that led to the decision to design and adopt an EMS** within the General Services and Fleet Management Departments. **Among these were:**

- ◆ A conviction that insurers and bonding agencies could reward the adoption of an EMS, acknowledging a safer work environment and reduced risk with better rates;
- ◆ The role of the EMS as a valuable marketing and public relations tool that would clearly demonstrate the County's desire to hold itself to a very high standard of environmental conduct;
- ◆ Numerous regulatory benefits and the potential for improving employee participation in the facility's environmental performance;
- ◆ Improve facility compliance with environmental regulations;
- ◆ The widening enthusiasm for the EMS concept among environmental management professionals;
- ◆ The high availability of government assistance programs to aid in EMS development; and
- ◆ The ability to partner environmental management with existing health and safety programs as an important factor in EMS adoption.

Objectives and Targets

Jefferson County recognizes two important and separate aspects of the EMS process relative to objectives and targets. First and foremost, the County wants to plainly demonstrate its commitment to obeying all laws and applicable guidelines relative to environmental matters. Handling things such as refrigerants, batteries, motor oil, and hazardous and medical waste have been carefully revisited and clarified.

The **County** perceives the EMS as **an opportunity to hold itself to a somewhat higher standard** and to set the example for the broader community. Consequently, **EMS efforts have included:**

- ◆ voluntarily reducing waste cardboard generation;
- ◆ shifting to soy based inks at the Print Shop;
- ◆ improvements in conservation technologies in Jefferson County facilities, which will yield roughly
 - an 8% reduction in water use
 - an 8-12% reduction in electricity on an annual basis; and
- ◆ adopting other sustainable approaches to the delivery of government services.

Benefits of Adopting an EMS



Jefferson County has realized a number of benefits resulting from the adoption of an EMS in its General Services and Fleet Management Departments. As a result of adopting an EMS:

- ◆ **Jefferson County has seen an increased level of environmental awareness among employees** as a result of filling out impact/aspect forms and attending meetings with Team Leaders. In addition, through meetings with team members and employees we are getting more employee involvement.
- ◆ **Operating procedures that have been established are standardizing the flow of work, assuring that our activities are both efficient and as sensitive as possible to environmental concerns.** Additionally, as data is collected over the next several years, we anticipate a significant decrease in waste

production, greater attention to resource management, and eventual cost savings.

Environmental Protection employees Joy McDowell, Stacey Sims, and Mike Higginbotham do outreach about the EMS message at a public event along with Ecologic AI.

- ◆ **Lastly, it must be noted that the EMS has opened opportunities for coordination with departments not currently in the fenceline.** Cooper Green Hospital, for example, has warmly embraced our efforts and included us in some of their promotional activities.

Registration to the ISO 14001 Standard

Jefferson County's fenceline submitted itself for an external audit in February of 2002. The results actually exceeded expectations, with the audit team declaring Jefferson County a "model program" and an example for other public sector entities. Jefferson County became the first county in the nation to become registered to the ISO 14001 Standard.

Resources

The man-hours associated with the development of the EMS program are found below:

Environmental Management Representative & Core Team	3472	hours
Other	405	hours
Total	3877	hours

The labor costs associated with the development of the EMS program are found below:

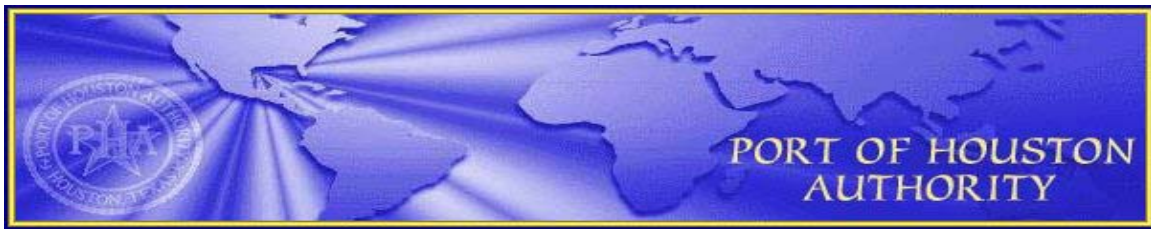
Labor Costs

\$92,734

Next Steps in Sharing the EMS Success Story

Ongoing self-evaluation and goal setting will assure a steady movement towards our commitment to continual improvement as will regular visits to maintain ISO 14001 Registration.

Additionally, Jefferson County intentionally started small and with the most enthusiastic participants to achieve early success as well as learn the process. More long term, Jefferson County is working diligently towards its goal to include other departments in the fenceline who will be attracted by the financial and resource savings, the improved morale, and the safer work environments an EMS has to offer – Risk Management and Information Services have already come forward, and expansion into other areas of currently participating fenceline departments is ongoing.



Profile



The first steamship traversed Buffalo Bayou in 1863 and in 1870, the US Congress established Houston as an official port of entry. The citizens of Harris County and the US Congress subsequently funded the dredging of a deepwater channel to connect Houston with the Gulf of Mexico. On November 10, 1914, President Woodrow Wilson pressed a button in Washington, D.C., and a mortar fired on the banks of the Houston Ship Channel. This event marked the completion of the Channel that made it possible for ocean going vessels to sail fifty miles up a narrow, winding channel to the Turning Basin, a few miles from downtown Houston.

Today, the Port of Houston is an internationally recognized port being the eighth largest port in the world. Nationally, the Port of Houston ranks first in foreign tonnage and second in total tonnage. The Port of Houston is also home to the second largest petrochemical complex in the world. In the year 2000, more than 7,000 ships and 100,000 barges called at facilities along the Houston Ship Channel.

The Port of Houston Authority (PHA) is an autonomous political subdivision of the State of Texas and is governed by a board of seven commissioners. The City of Houston and the Harris County Commissioners Court each appoint two commissioners and the Chairman. The Harris County Mayors & Councils Association and the City of Pasadena each appoint one commissioner.

The PHA owns approximately 8,000 acres of property adjacent to the Houston Ship Channel. The developed properties contain eleven terminals, 13 dredged material disposal areas, and 150 lease areas. These facilities were designed for handling general cargo, containers, grain and other dry bulk materials, project and heavy-lift cargo and virtually any other kind of cargo. In addition, the PHA operates two container terminals, handling more than 1 million twenty-foot equipment units (TEUs) per year. The PHA facilities are located in two counties, four cities, one industrial district, and in

unincorporated areas of Harris County. The PHA employs approximately 500 individuals.

FENCELINE

The PHA selected two facilities for its fence line; the PHA's Barbours Cut Container Terminal and the Turning Basin Terminal's Central Maintenance Facility. These facilities were selected as they are operated by PHA personnel.

The Barbours Cut Container Terminal consists of six container berths, 125 acres of container marshalling yards, a maintenance facility, and a 24-hour emergency response crew with a fireboat. The facility operates 24 hours a day seven days a week and handled approximately 600,000 TEUs in 2000. The maintenance facility performs vehicle and equipment maintenance as well as facility maintenance (painting, HVAC, exterminating, etc.). The PHA expects to spend approximately \$50 million over the next five years in terminal improvements to increase container capacity and vessel productivity. Approximately 125 individuals are employed at the terminal.



The Turning Basin Terminal is at the navigational head of the Houston Ship Channel, eight miles from downtown Houston. The Turning Basin Terminal includes 37 public wharves, each offering between 428 and 806 feet of quay. The terminal has more than 1.9 million square feet of short-term covered storage and 3.3 million square feet of open storage. The Central Maintenance Facility, located at the Turning Basin Terminal, conducts vehicle and equipment, and facility maintenance for the Turning Basin Terminal and several other nearby terminals. Approximately 50 individuals are employed at this facility.

Key Drivers for Adopting an EMS

The PHA's desire to develop and implement an EMS was driven by the following factors:

- Potential to improve environmental performance
- Improve employee's awareness of environmental issues and participation in the environmental program
- Reduction in costs
- Potential for regulatory benefits
- Valuable public relations and marketing tool
- Consistent with the PHA's overall environmental principles

Significant Aspects and Impacts

As part of the EMS, the Environmental Affairs Department developed process flow diagrams of all of the activities conducted within the Fence line. These flow diagrams were used as tools to extract the environmental aspects and associated impacts of the activity.

After all of the environmental aspects and impacts were identified, the EMS Core Team developed criteria to prioritize these aspects. Each aspect and associated impact was ranked from one to five (five being the most significant or largest) in eight categories: regulatory, health, natural resources, costs, probability of occurrence, solid waste generation, volume, and public issues.

Objectives and Targets

When developing objectives and targets for the PHA's Fence line, the following critical factors were considered: commitment to the PHA's Environmental Policy, legal requirements, communication to internal and external interested parties, financial obligations and organizational goals of the PHA. Other factors included the ability to control, track, and measure each target and the associated costs.

The PHA believes the EMS is an opportunity to hold itself to a higher environmental standard and to set an example of a "model port" in its community. Consequently, the PHA developed the following objectives and targets:

- Reduce NOx emissions
- Reduce stormwater impacts
- Reduce generation of solid wastes
- Increase recycling efforts
- Participate in a Texas Natural Resource Conservation Commission (TNRCC) Clean Texas Program.

Benefits of Adopting an EMS



With the development and implementation of the EMS, the PHA has realized many benefits, both within the Fence line and throughout the organization, such as:

- Improved Environmental Performance – Through the process mapping and development of objectives and targets, the PHA discovered ways to increase recycling efforts, decrease use of products, and methods to reduce potential impacts to stormwater runoff. In addition, each Department participating in the mapping exercise learned a great deal about the operations within the Fence line and its potential impacts on the environment.
- Increased Internal Environmental Awareness – The PHA held an employee environmental mascot contest to represent the Environmental Policy and the Objectives and Targets of the EMS.
- Enhanced Management Confidence in Environmental Program – Job tasks and responsibilities were re-developed to incorporate the Significant Aspects and training requirements for each job description. This provided management with a better understanding of the interaction of job activities and the environment and the training provided to minimize these impacts, and the comfort of knowing these issues were being handled appropriately.
- Leaders in the Industry – As a result of the EMS, the PHA has been invited to participate in many discussions on environmental issues statewide and to provide assistance to other ports across the country and internationally.

Resources

The number of hours associated with the development and implementation of the Port of Houston Authority EMS program are listed below.

Environmental Management Representatives.	2105	hours
Core, Steering and Administrative Teams.	1087	hours

Other	406 hours
Consultants	87 hours



TOTAL hours 3685 hours

Total direct internal labor cost: \$97,256

Next Steps

It is anticipated that the PHA's EMS will be fully implemented by the summer of 2002, and the PHA intends on pursuing ISO 14001 certification at that time. The PHA has already initiated education of its tenants by including one tenant on the EMS Core

Team, and plans on continuing outreach to other tenants on the value and importance of an EMS. The PHA will also begin evaluating including other PHA Facilities and Departments in its EMS, such as Real Estate and Turning Basin Facilities.



Profile

Wisconsin Department of Natural Resources WDNR

The WDNR is an integrated resource management agency responsible for coordinating the many disciplines and programs necessary to provide a clean environment, well managed natural resources and a full range of outdoor recreational opportunities.

The WDNR is made up of seven divisions that include Air and Waste, Land, Forestry, Water, Customer Assistance and External Relations, Administration and Technology, and Enforcement and Science. To carry out the policies and programs of each of the seven Divisions, so that the needs of local citizens can best be met, the state is divided into five Regions.

Air Management Program, within the Air and Waste Division, works to protect human health and the environment through developing air quality implementation plans and collaborating with local, state, regional and international partners. Air quality trends, the status of attaining the ambient air quality standards and the need for public health advisories are determined through air monitoring operations.

Implementation of air quality plans happens as staff conduct inspections, initiate compliance actions, develop rules to set air quality standards and methods of attaining the standard and operate the permit program in accordance with state and federal requirements.

Wisconsin Cast Metals Association WCMA

The Wisconsin Cast Metals Association is a trade association consisting of some 55 member firms, representing more than 20,000 employees and approximately 85% of the production of metal castings in Wisconsin. WCMA's policy is to be proactive, rather than reactive, on legislative and regulatory issues affecting the foundry industry.

The Wisconsin Cast Metals Association originated in the mid-1960's, was one of the first organized efforts by foundries to begin dealing with legislative/regulatory issues. Formed initially to provide industry input on an air pollution control ordinance being proposed by Milwaukee County, the organization's focus shortly thereafter shifted to the state level.

WCMA can be credited with helping to accomplish legislation leading to beneficial reuse of high-volume industrial by-products, outside of landfills, for the first time, contributing to research determining the effect on groundwater from stored foundry sand as compared to native soils and assembling a national database on successful reuse applications, including a website that can be accessed and updated, with the assistance of grants from the Recycling Market Development Board and the American Foundry Society. WCMA can be counted on to provide constructive input into WDNR air quality implementation efforts.

Fenceline

Benzene Reduction Action Team – BRAT Co

Representatives from the WIDNR and WCMA came together in July 2000 forming a virtual company, the benzene reduction action team (BRAT Co) to develop processes and means to manage benzene emissions. BRAT Co is a cooperative partnership between the Wisconsin Cast Metals Association and Wisconsin Department of Natural Resources Air Management Program.

These 10 -12 individuals make up the Core and Implementation Teams and also lead environmental management program (EMP) teams, performing all functions in development of the Company's environmental management system. The fence line for BRAT Co.'s environmental management system is a unique application of the ISO 14001 standard bounded around a single pollutant rather than a physical site. BRAT Co is committed to reducing benzene emissions from foundry operations and developing innovative regulatory methods that offer quantifiable environmental and economic benefits.

Aspects for this type of application of ISO 14001 are the areas of interaction between foundry benzene emissions and regulatory actions that influence emissions.

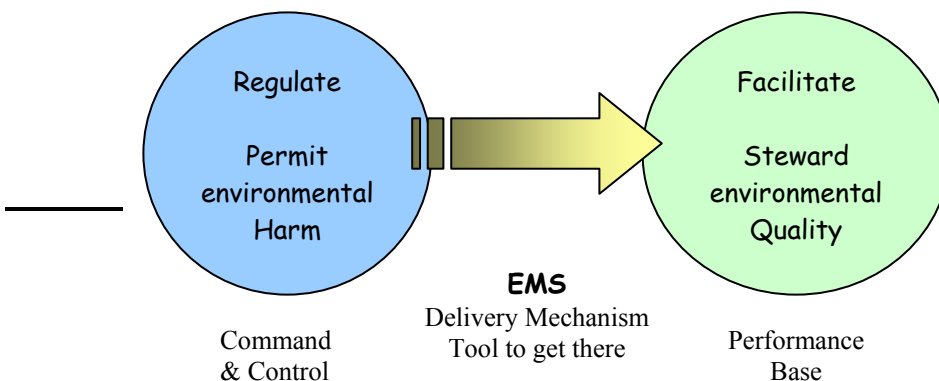
Aspects

- CASTING- the source of hazardous air pollutants from thermal decomposition,
- PERMITTING-the primary vehicle of regulatory agencies,
- RULE DEVELOPMENT- how limitations, standards and compliance methods are set.

Key Drivers for Adopting an EMS

An environmental management system provides a tool to evaluate an identified issue and work toward emission reductions along a new path. Traditional regulatory approaches allow a specified level of hazardous air pollutants to be emitted by foundry processes. Regulations dictate the level and often restrict operations as a means of meeting emission limitations.

Systematic management of a pollutant will enable BRAT Co to shift toward continual reductions in Benzene through education of best practices based on pollution prevention and provide a regulatory framework to recognize these efforts.



Implementation and maintenance of an EMS at a foundry, another part of the pilot, will recognize responsibility for environmental improvement lies with the foundry and new relationships/dialogue between regulators and those regulated are needed.

Objectives and Targets

Environmental Policy Element	Aspect	Objective
Research innovative technologies , strategies and raw materials that prevent the formation of benzene from foundry casting operations. Provide exchanges of scientific and technological information for benzene reduction	Casting	Study changes to the casting process that will reduce benzene emissions. Process changes may include; material substitution, casting process redesign, process optimization, core and sand additive or abatement alternatives. Monitor changes to air quality resulting from implementing process change activities.
Explore and test regulatory approaches that support and promote the reduction of benzene emissions reducing their impact on the environment.	PERMITTING	Study how a regulated foundry can use it's EMS to demonstrates compliance with benzene limitations as regulated under Wisconsin's Hazardous Air Pollutant rule, ch. NR 445, Wis. Adm. Code.
		Study revisions to the existing permitting process in order to make more efficient and effective progress toward reducing benzene emissions.
		Study the effectiveness of innovative regulatory options and permit efficiency efforts on the control and regulation of benzene.
Explore and test regulatory approaches that support and promote the reduction of benzene emissions reducing their impact on the environment.	Rule Development	Design a process by which a rule may be developed to address hazardous air pollutants. The process is to be based upon the core elements of an environmental management system, as defined in the ISO 14001 standard. The process must contain a plan, do, check, act cycle and support continual reduction in environmental impact of the pollutant
		Provide language to the WDNR Air Program for inclusion in the revision to Wisconsin's Hazardous Air Pollutant rule that will allow the use of EMS based compliance methods for benzene emissions from regulated foundries.

Benefits of Adopting an EMS

What BRAT Co has Learned

- Aspect identification exercises lead to a better understanding of the complexity and interconnections of regulatory and industrial activities.
- Working as partners in BRAT Co builds understanding of how regulatory work is perceived by those outside the WDNR.
- Allows learning by Doing

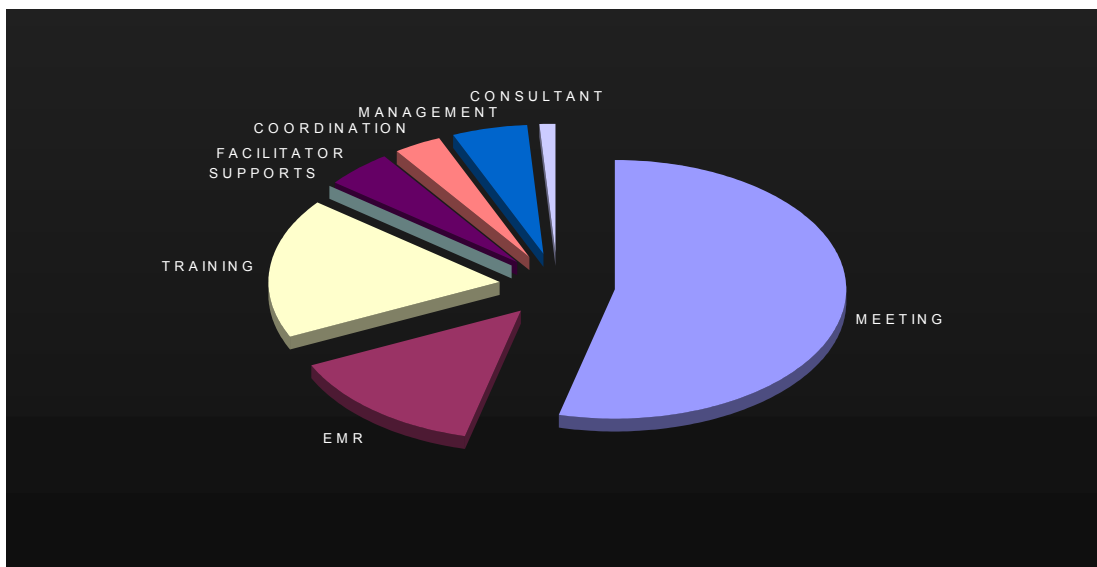
Benefits of our Environmental

Management System Approach:

- Provides the Department and Industry with response to increased public awareness and concern about benzene.

- Provides tool for reducing benzene emissions outside of current regulatory structure.
- Provides an opportunity to pilot alternative regulatory approaches.
- Supports WDNR and WCMA missions to promote environmental quality by sharing knowledge, responsibility, decision making, recognition and costs.

Resources



Time spent by members of BRAT Co to come together to develop the EMS.

The number of hours associated with the development and implementation of the Benzene Reduction Action Team EMS program are listed below.

Environmental Management Representatives.	2015	hours
Core, Steering and Administrative teams.	4187	hours
Other	54	hours
Consultants	15	hours

TOTAL hours	6271	hours
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The labor cost associated with the development of the BRAT Company program is:

Total Internal Labor Cost	\$350,323
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(These total costs do not include hours and internal labor costs incurred during the last quarter of the project, January 1, 2002 to March 30, 2002.)

BRAT Company has been fortunate to engage consultant time pro bono.

Next Steps

Find out more by visiting the Web Site:



<http://www.dnr.state.wi.us/org/secretary/EMS/sites/Air/air.htm>

King County Solid Waste Division

King County, Washington

Profile

King County, Washington spans more than 2,200 square miles, with an estimated population of 1.67 million. It is the most populated of Washington State's 39 counties and the 12th most populous county in the nation. The King County Solid Waste Division (the Division) provides solid waste and recyclables services to residents and businesses in King County. The Division's regional transfer and disposal system serves the citizens of all the unincorporated areas of the County as well as 37 of the 39 cities, excluding only Seattle and Milton. The Division's service area has a population of about 1.13 million, or about 68 percent of King County's total population. Services provided by the Division include:

- ❑ Operation of one active regional landfill, eight transfer stations, and two rural drop boxes
- ❑ Maintenance and monitoring of ten closed and custodial landfills
- ❑ Development and implementation of regional waste reduction and recycling programs designed to preserve landfill space, conserve natural resources, and protect the environment
- ❑ Participation in the region's Moderate Risk Waste program and operation of the King County Household Hazardous Wastemobile
- ❑ Development of both the *Comprehensive Solid Waste Management Plan* and *Local Hazardous Waste Management Plan* for the region

In 2001, County facilities handled 943,200 tons of garbage, yard waste and recyclables. Wastes delivered to County facilities by both commercial hauling companies and private customers hauling their own wastes resulted in 803,571 vehicle transactions. Garbage collected at the County's transfer stations and drop boxes is transported by Division employees to the County's only active landfill – the Cedar Hills Regional Landfill – for disposal. Recyclable materials yard waste collected at County transfer stations and drop boxes are transported to private processing facilities.

The County also has established extensive programs and services to encourage waste reduction and recycling among the region's residents, businesses, and schools. Currently the Division manages more than twenty waste reduction, recycling, and reuse education and promotion programs. The Division, in concert with several other County agencies, also educates residents and businesses about the proper disposal of household hazardous wastes. Since the late 1980s, the amount of materials diverted from the landfill to the recycle bin has increased 250 percent. In 1999, more than 600,000 tons of materials were recycled by our region's customers. The County is continually pursuing new markets for recyclable materials and recycled-content products.

Description of Fenceline

The fenceline for this project is the entire Solid Waste Division, which is part of the King County Department of Natural Resources and Parks (DNRP). The overall mission of DNRP is to enhance the quality of life in King County by protecting water and land resources and by safely disposing of, treating, and reusing wastewater and solid waste.

The Solid Waste Division, in cooperation with the other divisions within DNRP, is responsible for carrying out this mission.

Key Drivers for Adopting an EMS

Several critical elements factored into the Solid Waste Division's decision to pursue the development of an EMS. The Division viewed an EMS as a tool that would provide a competitive advantage over the private sector. We also saw the opportunity for regulatory benefits and improved facility compliance with environmental regulations. Another key driver for adopting an EMS was the likelihood for improvement in environmental performance, including potential for improved employee participation in the facility's environmental performance.

Structure of Core Team

The Project Manager and Project Sponsor discussed potential team members and requested suggestions from other Management Team Members, with particular input from the Operations Manager. They determined they wanted team members that had at least some of the following qualities:

- Commitment to the environment
- Ability to communicate with co-workers
- Field experience and knowledge of operations
- Environmental management skills
- Creativity and energy
- Ability to see the forest
- Be open to feedback from all levels of the organization

We then requested participation directly to selected potential members. We strove for a team with about 12 to 15 members. Our project manager is an environmental manager from the Engineering Services Section and our Management Sponsor is the Planning and Communications Section Manager. Our team has two engineers, an auto machinist, two planners, a hazmat specialist, a recycling specialist, a utility worker, the Division editor, a transfer station operator, two environmental specialists, a storeskeeper and a landfill gas operator.

Lessons Learned

- Getting staff to the meetings can be a struggle. Some staff (or their supervisors!) require extra support or reminding. All staff need to be reminded of each meeting.
- Communication methods vary depending on whether field staff have computer or telephone access. Some have neither.
- It was really worth it to have a diverse, inter disciplinary team with a variety of backgrounds and experience, from both office and field.
- Field staff participation may have to be limited to meeting time if they have no office or computer access.

Significant Aspects & Impacts

A summary of the Division's significant aspects and potential impacts:

1.0 SIGNIFICANT ASPECTS AND IMPACTS

Environmental Aspect	Associated Potential Impacts
Aspect 1—Materials/resource consumption	Impact 1.1—Use excess natural resources
Aspect 2—Energy Consumption	Impact 2.1—Use more energy than necessary
	Impact 2.2—expense
	Impact 2.3—Tax overall area's energy capacity
Aspect 3—Air Emissions	Impact 3.1—Impact on air quality
	Impact 3.2--Odors
Aspect 4—Potential Spills/Leaks	Impact 4.1—Surface water Quality
	Impact 4.2—Ground Water Quality
	Impact 4.3—Air Quality
	Impact 4.4—Community concerns
Aspect 5—Possible Discharge to Surface Water	Impact 5.1—Surface Water Quality
	Impact 5.2—Storm water permit compliance
	Impact 5.3--sedimentation
Aspect 6-- Fuel Use	Impact 6.1-- Depletion of non renewal resource
	Impact 6.2-- Air quality
Aspect 7—Water Use	Impact 7.1—excess consumption of water
	affects regional water supply and uses energy
	Impact 7.2—may affect salmon (ESA)
Aspect 8—Discharge to sewage Treatment facility	Impact 8.1—may exceed treatment plant limits
	Impact 8.2—may exceed trt plant capacity
	Impact 8.3—treatment involves hazmats
Aspect 9--Noise	Impact 9.1—effect on neighbors
Aspect 10—Discharge to groundwater	Impact 10.1--groundwater quality
Aspect 11—Aesthetics of surrounding area	Impact 11.1—Affect natural beauty of surroundings

Aspect 12—Lighting	Impact 12.1—Light pollution
	Impact 12.2—energy use
	Impact 12.3—affect neighbors
Aspect 13--Dust	Impact 13.1—air quality
Aspect 14--Litter	Impact 14.1--aesthetics
Aspect 15—Fiscal efficiency	Impact 15.1—delays in implementing environmental controls
Aspect 16—Hazardous materials and waste management	Impact 16.1—Water, air and soil quality
Aspect 17—Waste to Energy- landfill gas	Impact 17.1—energy resources
	Impact 17.2—air quality
Aspect 18—Leachate production	Impact 18.1—Groundwater quality
	Impact 18.2—POTW discharge
Aspect 19—birds and other vectors	Impact 19.1—neighbors/employees
	Impact 19.2—water pollution

Objectives and Targets

The Division set the following objectives and targets for our first EMS cycle:

Objective: Increase efficiency and conservation of energy, water and fuel use

Target: Reduce water use by 12% over target period

Target: Reduce energy by 10% over target period

Target: Reduce Fuel use by 5% (gas and diesel) over target period

Objective: Minimize air emissions

Target: Conduct vehicle emissions tests in all vehicles three years or older and all gas vehicles

Target: Evaluate shop heating system for efficiency and emissions and develop alternatives where appropriate. Objective: Reduce, reuse, recycle!

Target: Provide in-house recycling at 100% of sites/locations

Target: Reduce consumption of paper 10% in first year.

Target: Support the goals of the Transfer Station Recycling Team.

Objective: Improve Compliance with Environmental Regulations

Target: Develop and implement a searchable regulations and permit database.

Target: Develop a system to document and track regulators' inspections of our sites and all exceptions/citations/violations.

Target: Conduct a full environmental audit of all Division facilities and develop compliance schedules for exceptions.

Objective: Make environmental responsibility a part of our daily work

Target: Develop and implement an environmental education program for the Division

Target: Make environmental elements a priority in all projects.

Target: Evaluate vehicle idling practices with respect to fuel consumption and emissions and establish a standard for Division employees.

Objective: Minimize use of hazardous materials

Target: Implement a hazardous materials use and minimization education program.

Target: Identify all chemicals used in the Division and evaluate them for the level of hazard they pose

Target: Identify the top ten hazardous materials in use and replace with more environmentally sound materials over target period.

Objective: Improve spill and leak management

Target: Develop a spill management program

Target: Implement preventative maintenance schedules for all vehicles/equipment with leak or spill potential

Benefits of Adopting an EMS

The Solid Waste Division has so far received the following benefits during the implementation process:

- The Division has already seen a decrease in energy savings and water use. Our Algona Transfer Station has decreased water use by 30% and our Renton Transfer Station has decreased energy use by 20%. Most transfer stations have met our initial goal of a 12% reduction in water use and 10% reduction in energy use.
- The high level of employee involvement built into our EMS planning and implementation process has added to the Division's efforts to change the culture of the organization into one that is more inclusive and participatory.
- During the process of identifying the current regulations and permits that affect solid waste, the team organized a list of the environmental regulations into one clear and

manageable document. This was a task that the Division had intended to do for some time but had not allocated resources.

- The regulations and permit identification project also helped the team find areas needing improvement in the organizational structure of our current regulations management system.
- The EMS is a learning process that helps us see both the strengths and weaknesses of our operating procedures and policies. Implementing an EMS is an opportunity for staff to learn and grow.

Resource Commitment

The number of hours associated with the development and implementation of the King County Solid Waste Division EMS program are listed below.

Environmental Management Representative.	1144 hours
Core, Steering and Administrative teams.	2184 hours
Other	2 hours
TOTAL hours	3,330 hours

The labor cost associated with the development of the King County Solid Waste Division EMS program is:

Total Internal Labor Cost \$119,828.59

Next Steps

The Division does not plan to obtain ISO 14001 certification for its EMS. However, we are committed to keeping our EMS as a permanent part of our environmental programs and have made staffing commitments to assure it will continue.

Management Statement

“The Environmental Awareness Program (EAP) is making good progress. Thanks to Special Waste Supervisor Pam Badger and the EAP Team, we’re saving fuel, energy, water and other resources, such as paper, all across the Division. The real heroes are all of you who are keeping the environment in mind every day on the job.”

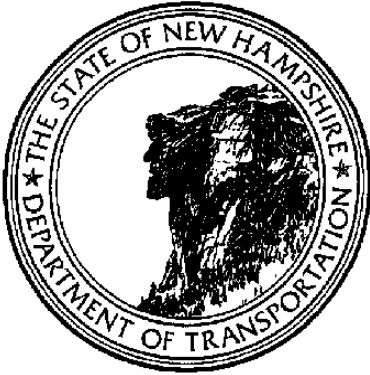
- Rod Hansen, Solid Waste Division Manager, Inside Trash, February 2002.

New Hampshire Department of Transportation

Concord, NH

Profile

The New Hampshire Department of Transportation is the second largest state agency with nearly 2,300 employees who live and work throughout the state. Under state law



NHDOT is responsible for “planning, developing and maintaining a state transportation network which will provide for safe and convenient movement of people and goods throughout the state...” This includes, “by means of a system of highways and railroads, air service and mass transit.... in order to support state growth and economic development...”

There are five divisions within the agency that meet these responsibilities. They are Public Works and Transportation, Operations, Project Development, Administration and Aeronautics.

The Division of Public Works and Transportation is responsible for public works projects including the planning and design, field supervision of construction, maintenance, supervision and coordination of state-owned land and buildings. This Division, through the Bureau of Rail and Transit, works to preserve and effectively manage railroad corridors, improve rail safety, and support transit services to the public, including elderly and disabled citizens.

The Division of Operations is responsible for the maintenance of state highways and bridges, signs, signals, pavement markings, the NHDOT vehicle fleet, and the operation of the state’s turnpike system. The Division comprises five bureaus: Bridge Maintenance, Highway Maintenance, Mechanical Services, Traffic and Turnpikes. The Bureau of Highway Maintenance oversees six separate highway maintenance districts in the state.

The Division of Project Development plans and designs transportation projects and oversees their construction.

The Division of Administration is responsible for all administrative activities of the Department, including accounting, purchasing, budgeting, personnel, property contracts and information technology services.

The Division of Aeronautics works with aviation agencies at the Federal and local levels to promote and regulate aviation in New Hampshire, assists the state’s airports in their planning and funding efforts and collects aviation revenues.

Fenceline

The goal of the EMS project is to intensively study a unit of the Department that is involved in a daily basis in tasks that have a direct impact on the environment. The lessons learned can be employed for the entire organization and an EMS created for all operational units of the Department.



The Bureau of Traffic was chosen from the other Bureaus within the Operations Division. The Bureau of Traffic has 61 employees. During the summer months when temporary hires are brought aboard, the number of employees increases to approximately 100. The Bureau of Traffic is made up of the Traffic Signal Operation Section, the Project Development and Engineering Section, the Pavement Marking Section and the Signing Section. The Bureau of Traffic is a microcosm of the whole as its operations involve materials handling, employee safety concerns, energy use, vehicle and equipment maintenance, and

coordination with contractors and community officials.

Key Drivers for Adopting an EMS

The factors that led the NH Department of Transportation to adopt an EMS include:

1. Upon recommendation by the Department of Transportation, government entity agrees to the adoption of an EMS as a Supplemental Environmental Project.
2. It is consistent with Department's overall environmental principles.
3. It will improve the Bureau of Traffic's compliance with environmental regulations and it may lead to regulatory benefits,
4. It will improve our employees' environmental performance,
5. The EMS may reduce the costs of operational activities at the Bureau,
6. The adoption of an EMS may be a valuable public relations tool,
7. Gain knowledge of EMS development at the fenceline in order to implement EMS throughout the Department of Transportation

Significant Aspects & Impacts

With the aid of process flow diagrams, the Bureau of Traffic's Implementation Team investigated 32 operational activities. One hundred and four aspects were investigated which resulted in the determination that 21 of the aspects were classified as significant aspects. These 21 significant aspects relate to regulated and non-regulated activities at the fenceline. They include pavement marking operations and paint handling, sign

construction and installation, the use of recycled sign material, reducing the output of solid waste, signal operations, and Dig Safe procedures.

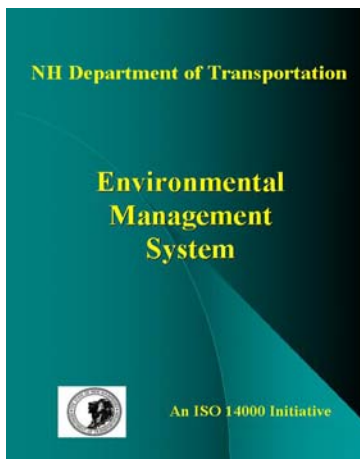
Objectives & Targets

Of the total number of significant aspects, objectives and targets were established for 10 through a rating process. These 10 significant aspects are listed in the following table:

Priority	Activity, Product, or Service	Environmental Aspect	Significant Criteria	Objective	Target
1	Pavement Marking, Paint Delivery	Inspect Emergency Spill Equipment	Regulated	Assure equipment is operational & available	All emergency spill equipment totally functional
2	Pavement Marking, Tote Movement	Potential accident	Regulated (spills over 25 gallons)	Eliminate releases to water and adjacent lands	No tote movement accidents.
3	Pavement Marking, Spill Control	Paint spills	Regulated (spills over 25 gallons)	Eliminate releases to water and adjacent lands	No spills in 2002
4	Dig Safe	Check underground utilities	Regulated	Notify and use Dig Safe before all construction projects	No disruption to utilities during construction
5	Pavement Marking	Inclement weather operations	Resource Consumption, Releases to Water	Reduce the number of releases to water in 2002	Reduce the number of spills by 33% during 2002
6	Sign Installation	Install new signs	Resource Consumption, Solid Waste	Increase use of recycled material and reduce solid waste stream	Increase use of recycled material by 15% during 2002
7	Sign Fabrication	Use of backing material	Resource Consumption, Solid Waste	Increase use of recycled material and reduce solid waste stream	Increase use of recycled material by 15% during 2002
8	Pavement Marking	Paint and glass bead leaks	Resource Consumption, Solid Waste	Prevent paint and glass bead leaks	No leaks during 2002
9	Pavement	Treating waste	Resource	Reduce total	Reduce number

	Marking, Waste Paint Handling	paint	Consumption	gallons of waste paint shipped for treatment	of gallons sent out for treatment by 10% in 2002
10	Pavement Marking, Waste Drum Collection	Forklift operations	Solid waste	Eliminate spillage from dropping barrels	No spills in 2002

Benefits of Adopting an EMS



Based on early feedback from the showings of the EMS video in the Districts, supervisors and patrol foreman appreciate the consistent message that was presented in the field and for the advanced knowledge of a program that they will eventually develop and implement.

During the aspects investigation of the Bureau of Traffic's operations, it was realized that development of the process flow diagrams would serve more than a mechanism for defining the environmental hotspots in the fenceline operations. Supervisors at the Bureau of Traffic have used the process flow diagrams to conduct job hazard analyses to pinpoint tasks where safety could be compromised. The

process flow diagrams have become a valuable safety tool.

The process flow diagrams will become a component of the orientation package for new employees and used to explain the EMS and the safety issues relating to the operations at the Bureau of Traffic. They will also be displayed at all activity sites to serve as quick references for the activity's operations.

An effort is being made to combine the future training requirements of the Safety and EMS programs. In addition, with recent achievement of the Granite State Quality Commitment Award, exploration is underway to incorporate the quality performance and the training needs to assure receipt of higher quality award levels. Combining the training programs, operational requirements, and documentation controls will help reduce the overall time spent in training and administration of these programs. For example, 127 full and part time positions will need training in these programs. By combining the training requirements, it is estimated that 7.5 hours will be saved each year per employee. This amounts to 127 additional workdays that will be available to perform normal work activities.

Costs

The man-hours associated with the development of the EMS program at the Bureau of Traffic since April 1999 to present are found below.

Personnel

Environmental Management Representatives	3045	hours
Core Team	224	hours
Implementation Team & Other	560	hours
Consultants	80	hours

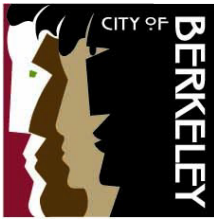
Total**3909 hours**

The labor costs associated with the development of the EMS program at the Bureau of Traffic since April 1999 to present are found below.

Direct Labor Costs**\$96,817****Next Steps**

With the conclusion of the Phase IV elements, the Bureau of Traffic will have completed the ISO 14001 requirements for an objective audit for certification/registration. The Department of Transportation's goal is to seek third party registration in 2002.

The lessons learned by developing and implementing the EMS at the Bureau of Traffic will be employed elsewhere as the EMS program is expanded throughout the New Hampshire Department of Transportation.



**City of Berkeley
Solid Waste Management Division
Department of Public Works
Berkeley, California**



Profile

The City of Berkeley, located on the east shore of San Francisco Bay, offers its 107,800 residents one of California's most interesting and diverse living areas. It is a city that is known for its ability to attract strong individuals with energy, tolerance, and flexibility, and for its ability to encompass change without sacrificing its essential character or quality of life.

The public marina, bay views, international shops and restaurants, and the University of California at Berkeley are but a few of its attractions. Its beautiful setting, pleasant climate, and recreational and cultural activities offer a wide variety of leisure opportunities.

It is also home to other organizations and companies with similar goals, such as Bayer Corporation's Worldwide Biotechnology Center and Biological Products manufacturing facility, which has recently been certified to the ISO 14001 standard.

Fenceline

The City of Berkeley chose the Solid Waste Management Division as a whole to implement the EMS. We believe it is feasible because much of the ground-work for the systems in place have been completed as part of the APWA process. There are 102 employees at the Solid Waste Management Division and approximately 1/4 of them will be involved in implementing new procedures.

The Solid Waste Management Division is Berkeley's municipal waste collection and disposal facility, operating under the Department of Public Works. We have recently undergone a rigorous process to become accredited by the American Public Works Association (APWA) and were successful. Our well-documented internal procedures were recommended by the APWA for best practices.

While it is our belief that everything we do is for the environment, we have learned that there is room for improvement in how we do our work. Our goal is to be certain we're making environmentally friendly decisions and purchases and that the process is part of our organization's culture.

We collect curbside plant debris, refuse, and recyclables for approximately 40,000 residential and/or commercial properties. We operate a transfer station, an oil-recycling depot, and have a contract with Community Conservation Centers to operate a drop-off and buy-back recycling center on site.

Core Team

The core team is made up of several levels of employees of the division with the EMS Project Manager and the EMS Champion. One core team member representing Refuse Truck Drivers, Refuse Workers and Service Employees International Union-Local 790 Maintenance Chapter, one member representing Refuse Supervisors, and two members representing Senior Refuse Supervisors. The Project Manager brought experience from administration and the EMS Champion is the Division Manager and decision maker.

Key Drivers for Adopting an EMS

The City of Berkeley identified several key factors that led to the decision to design and implement an EMS within the Solid Waste Management Division. These factors include:

- Improving employees' participation in the facility's environmental performance
- Improving overall environmental performance
- EMS is consistent with the City's overall environmental principles
- May be valuable marketing tool
- May be valuable public relations tool
- May reduce costs
- May provide competitive advantage

Significant Aspects & Impacts

We surveyed employees from the entire facility. We created process diagrams for each service or program that we did not already have on file and began to identify the environmental impacts our facility has or may have in the future. We found 13 significant aspects related to our operation and ranked them using criteria we developed.

The criteria we chose are: worker health & safety, regulatory compliance, natural resource impact, probable negative environmental impact, public perception (how the public views us), and cost to implement changes. From this list, we developed objectives and targets designed to lessen our impact on the environment for four items.

Targets & Objectives

Target Area: *Public Dumping*

- Eliminate 98 percent of dust particulates
- Reduce kilowatt hours of electricity used annually (save 250Kwh)
- Improve control of hazardous materials being brought on site by 75%

Target Area: *Recycling Collection*

-Increase & improve consumer participation by adding three mailings per year

Target Area: *Refuse Collection*

-Reduce illegal/hazardous materials placed into refuse containers by 10%

Target Area: *Transportation*

-Reduce fuel consumption by 2%

-Decrease fuel emissions TBD

-Reduce # of days pickup scheduled for accounts with multiple pick-ups per week by 5%

Target Area: *Wash Rack*

-Reduce Water Consumption by 25%

Benefits of Adopting an EMS

As we began implementing our environmental management system, we identified serious conditions in need of immediate mitigation. Accidents are common in our industry. While we chose not to incorporate occupational health and safety into our EMS, we found that we were able to meet some of our Cal-OSHA legal requirements incidentally through the documentation of our employee training procedures.



Our efforts at reducing air pollution through the use of bio-diesel in our fleet resulted in the reduction of air pollution for the entire City of Berkeley diesel burning fleet. This included not only the refuse collection fleet, but also buses, and other heavy equipment.

We've gained respect and better cooperation from our Department Director 's staff for budget changes and purchase requests related to environmental improvements.

Members of the core team have enjoyed the unexpected benefit of being consulted by other City of Berkeley departments for input on the City's Mission Statement for its environmental language content, contributing information on an item to the City Council to encourage the City to fund sustainability initiatives and numerous calls from colleagues in the Solid Waste industry from all over the United States inquiring about our environmental management system.

Costs

Costs to develop and implement our EMS were largely limited to staff time. Nearly all costs for new equipment were provided for in our existing budget. An example is the purchase of 5 new solid waste collection vehicles that burn Clean Natural Gas (CNG). The purchase was timed in conjunction with our vehicle replacement cycle and is a normal part of our operating expense. The additional cost of \$50,000 per vehicle that CNG tanks incur, were completely offset by a grant from the Alameda County Waste Management Authority.



Environmental Management Representative:	1,743 hours
EMS Core Team:	1,624 hours
Other:	446 hours

Total internal time devoted amounted to 3,813 hours.

Two years of staff time devoted to EMS development and implementation cost \$93,266.

Next Steps

The Solid Waste Management Division is now more dedicated than ever to its own environmental performance improvements. We have revised our job descriptions to reflect this new ethic. They will require each employee to learn the environmental impact of his/her job and act with responsibility. We have spoken with other agencies and encouraged them to follow our lead and hope to continue doing so.

The Solid Waste Management Division continues to make progress toward hitting its targets and following its objectives. Supervisors are busy rerouting to reduce the number of miles driven daily. A new environmental look has been chosen for our new CNG trucks. A new dust suppression system has been installed in the Transfer Station and we are daily seeking ways to improve.



Louisville and Jefferson County Metropolitan Sewer District

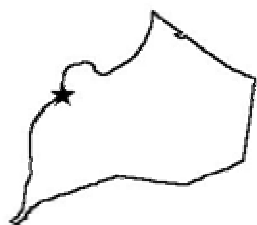
Profile

The Louisville and Jefferson County Metropolitan Sewer District (MSD) is a nonprofit, publicly owned utility serving Louisville and Jefferson County, Kentucky.

Louisville is a medium-sized city located in the Ohio River Valley at the northern border of central Kentucky. The area has a temperate moist-continental climate and receives an average of about 45" (1.14 m) of precipitation annually. Louisville's major employment sectors are retail and wholesale commerce, logistics and transportation, manufacturing and healthcare.

MSD was created in 1947 by Kentucky statute, and is governed by an eight-person board, appointed by the mayor and county judge/executive. MSD provides the following services:

- wastewater collection and treatment
- storm water management and flood control
- enforcement of the local ordinances regulating erosion prevention and sediment control, and hazardous materials management
- Louisville and Jefferson County Information Consortium (LOJIC), a geographic information system (GIS)
- water-quality monitoring, in coordination with the US Geological Survey and the regional Ohio River Sanitation Commission, as well as wetlands inventories, conjunction with the US Army Corps of Engineers.



MSD serves a population of about 600,000. The service area includes over 400 square miles, with 790 miles of streams and tributaries in six watersheds, all draining to the Ohio River.

MSD's 650 employees, plus its consultants and contractors, serve about 175,000 residential, 17,000 commercial and 600 industrial customers within Jefferson and parts of adjacent counties.

MSD owns and operates 6 large (POTW) wastewater treatment plants and 25 remaining small, temporary neighborhood-scale ("package") treatment plants. MSD's wastewater and stormwater collection systems consist of approximately 2300 miles of separate sanitary sewers, 600 miles of old combined sewers, 1000 miles of separate storm sewers and 130

miles of major “improved” drainage ditches. Every year since 1995, MSD has added an average of 4,000 customers and 90 miles of new sanitary sewers to eliminate failing private septic systems and small neighborhood plants in suburban areas.

MSD takes its environmental protection and improvement responsibilities very seriously. MSD signed the CERES Principles (Coalition for Environmentally Responsible Economies) in 1990, and expanded that commitment with its Environmental Policy Statement in 1993. The CERES Principles and Environmental Policy Statement are intended to guide all MSD employees in their day-to-day activities, purchasing decisions and long-range planning.

Implementing the CERES Principles is a progressive process. The following initiatives are examples of the various environmental improvement programs that turn those words into action:

- The Greenways Program, initiated by MSD in collaboration with other agencies and environmental groups in the early 1990s, reestablishes parallel natural riparian corridors with trails for non-motorized recreation and transportation.
- Stream bank protection and restoration with native-species vegetation were integrated into the 1997 Floodplain Management Ordinance.
- The Erosion Prevention and Sediment Control Ordinance, adopted in 2000, curbs construction-related impacts to streams.
- Watershed area management, initiated in 1997, groups various activities within watersheds into integrated teams. Collection system management, combined sewer overflow elimination and control, stormwater drainage, non-point source pollution control, erosion control and flood control measures are coordinated to improve the water quality in each local watershed.
- MSD’s implementation of the Green Lights program won it EPA’s Public-Sector Partner of the Year in 1998. EPA also selected MSD’s Main Office as one of 24 Energy Star Showcase Buildings. The returns on participation in these programs led to MSD’s more recent efforts to reduce process energy consumed by pumps, blowers, motors and compressors.

Links to more information about MSD and its environmental programs include:

<http://www.msdlouky.org>,
<http://www.msdlouky.org/insidemsd/ceres.htm>
<http://www.nhq.nrcs.usda.gov/CCS/kentucky.html>

EMS Pilot Project Fenceline

MSD will eventually include all of its operations in its formal Environmental Management Systems. The initial EMS pilot project fenceline, however, primarily addresses activities at the Morris Forman Wastewater Treatment Plant (MFWTP), the largest wastewater treatment plant in Kentucky. There are presently 85 employees within the fenceline.

MFWTOP uses a high-purity-oxygen, activated sludge process and is currently undergoing significant renovation. More information about the plant may be found at <http://www.msdlouky.org/insidemsd/forman.htm>

The Alternative Solids Project (ASP), now being commissioned, at MFWTP replaces a low-pressure oxidation biosolids processing system with anaerobic digestion followed by pelletization and land application. By-product methane gas will partially fuel the process. Biosolids management will be included in MSD's EMS once ASP is fully operational.

The pilot project fenceline also includes district-wide purchasing of fleet vehicles, bulk chemicals, toxic chemicals and certain pumps and motors.

Key Drivers for Adopting an EMS

The following considerations led to MSD's decision to formalize its EMS in 1999:

- An EMS would provide more structure for integrating the CERES Principles into day-to-day operations.
- Improved individual employee performance in fulfilling environmental responsibilities would improve MSD's overall environmental performance.
- MSD's Environmental Auditing Team needed an expanded basis against which operations could be audited, per CERES Principle #10.
- MSD's leadership role in responsible environmental stewardship, locally, as well as in the wastewater "industry", would be furthered.
- The EMS would support MSD's Strategic Business Plan.
- Participating in the EPA's public-sector EMS Pilot Project would provide valuable experience-based technical assistance and training.

Significant Aspects

Choosing significant aspects proved to be thought provoking on two accounts:

- Most activities at a wastewater treatment plant are performed for the immediate purpose of improving water quality and meeting environmental regulatory requirements. MSD also had committed to the voluntary standards of other existing environmental programs, such as Green Lights and the CERES Principles. This inherency posed the possibility that almost all activities at the treatment plant could be considered "significant environmental aspects."
- Input from the plant's staff and neighbors was solicited and used to rank the 10 significance criteria. Both groups started out ranking the same few proposed criteria alike, but soon diverged. To validate both perspectives, the criteria were equated in small, ranked groups.

Including only the aspects that were directly regulated or scored most highly when ranked by the significance criteria still yielded more than 60 environmental significant aspects. They were grouped and distilled to keep the EMS manageable.

Objectives and Targets

MSD set objectives and targets for the following significant aspects (SEA):

1. **Improve the quality of discharges to the Ohio River**, including maximizing wet-weather volumes treated, completing treatment system upgrades, achieving full compliance with permitted effluent concentration limits, maintaining BOD and TSS discharges 25% below permit limits during normal dry-weather operations and eliminating effluent foam violations via improved defoamer control.
2. **Eliminate off-site nuisance-level odors from MFWTP processes**, based on dispersion modeling, via investigating all odor complaints within 24 hours, developing an odor control master plan and related work plan, taking the Zimpro process off-line and maintaining odor incineration, until the Alternative Solids Project (ASP) came on-line.
3. **Model exemplary hazardous materials management practices, by maintaining full compliance with all requirements of the local Hazardous Materials Ordinance and related regulatory programs, and increasing recycling of universal wastes (fluorescent lamps, and Ni-Cd and lead-acid batteries).**
4. **Maximize process energy efficiency**, by installing upgraded equipment to reduce energy consumption per unit of O₂ delivered by the HPO process, install sub-metering, creating and E2 Team to review 2001 CH2MHill energy audit of MFWTP, and developing Phase I of MFWTP E2 Action Plan.
5. **Reduce employee exposure to air pollutants in indoor work areas**, by maintaining zero employee exposure incidents to H₂S above the eight-hour Threshold Limit Value (TLV), performing quarterly air quality monitoring and presenting interpreted results to plant staff on a quarterly basis.
6. **Improve materials purchasing, by replacing toxic or non-biodegradable chemicals with less toxic and/or more biodegradable products where possible.**
7. **Improve Material Safety Data Sheet management, by installing MSDS tracking software, providing additional staff training and installing MSDS Hazcom boxes.**
8. **Increase environmentally preferable purchasing (EPP) practices**, with special attention to energy efficiency (E2), by developing procurement procedures for non-automotive batteries, electric motors and pumps, and purchasing only CNG-fueled passenger cars, pick-up trucks and vans.

Costs

The man-hours associated with the development of the EMS program are found below:

Environmental Management Representatives	1709	hours
Core Team	264	hours
Other	513	hours
Total	2,486	hours

The labor costs associated with the development of the EMS program are found below:

Labor Costs	\$67,102
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Benefits of Adopting an EMS

MSD has seen the following initial benefits from only getting started with formalizing its EMS:

- The employees have an increased awareness, understanding and interest in the environmental impact of their work. The setting of specific objectives and targets has given MSD another way to demonstrate to employees and external stakeholders that its environmental commitment improvement goes beyond adopting broad policies.
- The systematic review of the environmental impacts of plant activities proved valuable even before the objectives and targets were developed. In one case, environmental liability and public relations vulnerabilities were discovered when bid specifications were reviewed due to responsible staff members' participation in the EMS team training; those bid specifications were then clarified and fortified.
- The process of conducting training, defining job duty responsibilities, documenting best procedures, etc. is allowing MSD to catch the little things that might otherwise fall through the cracks of an informal EMS.

Lessons Learned

1. Get upper management support. When the natural human resistance to change rears its ugly head, you'll need the backing of the boss.
2. Include both big-picture and detail-oriented people in project management. Include both managers and shop floor staff on implementation teams.
3. Let employees run with the ball when they get excited about something. Assign tasks on the basis of aptitude and interest, not necessarily the organizational chart.
4. Communicate, communicate and communicate some more.
5. Help overwhelmed middle managers to get started by developing first drafts for their review.

6. Meet with key personnel with concerns, to replace worries with understandings, and to find compromises.
7. Look for quick wins of importance to the implementation team members.

Next Steps

Significant environmental aspects related to biosolids management were identified, but omitted from the EMS until the Alternative Solids Processing facilities could be commissioned. They will be incorporated at its first expansion in late-2002, via the National Biosolids Partnership.



Profile

UMass Lowell is a public university, one of the five campuses of the University of Massachusetts. The campus offers a broad array of programs to its 13,000 full- and part time, undergraduate and graduate students. With a special expertise in applied science and technology and a focus on regional economic and social development, the campus offers an outstanding and well-rounded education to its students, engages in substantial and wide-ranging research, and is deeply involved in the lifeblood of the community. Its colleges are Engineering, Management, Arts and Sciences, Health Professions, and the Graduate School of Education.

The campus is comprised of 65 buildings spread across 100 acres on both sides of the Merrimack River, and includes classroom and laboratory buildings, two libraries, a student center, two gymnasiums, two dining halls, a Center for the Performing Arts, an art gallery, and numerous residence halls. State-of-the-art laboratories include such special-interest facilities as the six Sound Recording Technology Program studios, an interactive video lab (one of three in the country) that enables nursing students to simulate medical emergencies, and a manufacturing lab where engineering and management students team up to produce microelectronic components.

The campus is located in the City of Lowell, 30 miles northwest of Boston, near the New Hampshire border. Lowell, which has a population of 103,000, was founded in the early 1800s as an industrial mill city that produced principally cotton goods. Today, the mills are being successfully converted to homes for high tech firms as well as condominiums and apartments. Lowell has enjoyed a steady stream of immigrant inflow for most of its history. The most recent immigrants -- Southeast Asians -- now comprise about 20 percent of the population.



Fenceline

UMass Lowell chose the ‘Olney Building’ as a fenceline for this EMS pilot project due to the potential for adverse environmental impact to the community and municipality, if not managed properly. The Olney Building is primarily a diverse science building containing more than 70 laboratories that support numerous programs for undergraduate and graduate studies.

Olney Building’s occupancy consists of an estimated 1,500 day and evening faculty, students and staff who utilize the building during all hours and days throughout the year.

In conjunction with the educational classrooms and research laboratories, Olney Building also provides to the university a means to accept chemicals and hazardous materials through a dedicated receiving and shipping dock. In conjunction with the services provided by this proactive receiving and shipping program, a dedicated main accumulation room for hazardous materials is integral to the design of this building. The efficient use and reuse of materials on campus is important to UMass Lowell’s program. The Olney Building also serves as the central recycling and reuse point of all recyclables (including vermicomposting) on campus.

Key Drivers for Adopting an EMS

UMass Lowell is educating the future workers and CEOs of our country. Providing these students with training and practical experience in environmental management principals will promote a sense of what “standard environmental operating procedures” should minimally be expected, when they enter their place of employment. Our students will then become the EMS educators for their companies.



In addition, UMass Lowell has adopted an EMS for the following reasons:

- Valuable education, marketing and public relations outreach tool
- Empowers and engages everyone to participate in the management of the building
- Better positions UMass to secure more grants and contracts
- Improve our employees’ participation in the facility’s environmental regulations
- Environmental management professionals are increasingly supporting EMSs
- Availability of government assistance programs to aid in EMS development and implementation makes EMS adoption attractive
- Consistent with the UMass Lowell’s overall environmental leadership principles

Significant Aspects & Impacts (summary)

- Air monitoring and air quality policies
- The purchase, storage, and handling of chemicals
- Ensuring that capital projects and renovations consider ventilation, ADA compliance, and safety issues.
- Training in a variety of areas including the use of equipment, safe use of chemicals and biohazard materials, and site-specific protocols
- Setting building operational policies in such areas as fire response, loss of power, storm warning, hazardous waste regulations, and security policy
- Making elevators safe for the transport of hazardous materials
- Emergency generator operation, fueling, and exhaust
- Accessibility and safety of Olney Hall for physically disabled people
- Integrating recycling wherever possible

Objectives and Targets

The development and implementation of an EMS at UMass Lowell required an understanding that though environmental regulatory requirements are a primary consideration for program development, the need to include general safety concerns was equally important to everyone who participated. The objectives and targets achieved a balance for continual improvement of environmental programs and general safety programs for the building and occupants.



Areas for our first cycle of objectives and targets include:

- A study as to determine if the ventilation systems of the Olney Building as designed are providing good air quality to all occupancies.
- Recycle and reuse a minimum of 200 gallons of organic solvents from the waste streams of the building. This program will reduce our haz waste disposal cost and reduce the amount of weight reflected on our waste generator ID numbers.
- Implementing best practices for lab safety and environmental awareness is the theme throughout our Objectives and Targets put forward by our faculty, students and staff and approved and supported by the administration.

Benefits of Adopting an EMS

People coming together and actively communicating as equal committee members is recognized. Empowering the people as to seek their thoughts and identify environmental

concerns has resulted in many aspects and impacts that EHS professionals would not have been so eager to acknowledge.

We have a clear understanding of the important issues for stakeholders. Mid managers are surprised that some topics are more of a concern than others (I.E. Indoor air quality is the #1 concern for stakeholders... EHS manager thought chemical spill or exposure to potential hazards would be primary concern).

A coming together of employees and administration and openly participating as environmental stewards for this project. A sense of importance to how we do business and how to openly discuss environmental impact to the environment is recognized.

Costs / Labor Resources

The number of hours associated with the development and implementation of the UMass Lowell EMS program are listed below.

Environmental Management Representative.	1128	hours
Core, Steering and Administrative teams.	2163	
Other	1277	
TOTAL hours		4,568 hours

The labor cost associated with the development of the UMass Lowell EMS program is:

Total Internal Labor Cost \$181,163

Next Steps

The University has confirmed that an EMS can be successfully implemented in the highest hazard, most energy consuming and research diverse building on campus. The need for continual improvement by having everyone (faculty, students, staff) collectively working to create best management and work practices cannot be overstated.

The University is preparing for a self-audit of the EMS program and then anticipates contracting with an ISO Registrar during 2002, to begin ISO 14001 review and certification.



CITY OF DETROIT, MICHIGAN



Profile



Detroit, the largest city in the State of Michigan, celebrated its 300th anniversary in 2001. The City government is comprised of 37 different departments and has approximately 18,000 employees. Last year, the White House Millennium Council designated the City of Detroit a Millennium Community, recognizing Detroit's efforts to bring the community together around the national theme,

“Honor the Past– Imagine the Future.”

The City is a thriving business center for many corporations: General Motors Corporation, Ford Motor Company, Daimler Chrysler, Comerica and Compuware are just a few. Detroit City government has taken a number of proactive, bold steps to blend today's fast-paced technological developments with the rich heritage and traditions of the past. The beehive of environmental-related development activities in the City includes brownfield redevelopment, watershed management, the curtailment of illegal dumping and other pollution prevention actions. The City has taken a lead in the creation of the Redevelopment of Urban Sites (REUS) Teams, in collaboration with the State of Michigan. With stakeholders from all levels of government and the private sector, the REUS Team is designed to assist in addressing the environmental needs of the development projects. The City is also successfully working cooperatively with local businesses in various developmental projects. In addition, the Local Emergency Planning Committees (LEPC) and Detroit Emergency Management Council (DEMC) are active in informing and educating their employees as well as citizens.

The City's Department of Environmental Affairs (DEA), which became a charter department of the City in 1997, plays a prominent role in all these activities and extends full assistance to all other departments to bring their operations into environmental compliance. Its mission is to conserve and protect the natural resources of the City of Detroit in the interest of the health, safety, and welfare of the people, to promote improved social and economic conditions in the city, and to protect the limited environmental

resources for the future benefit of the city inhabitants. In addition, the Charter specifically provides that DEA be responsible for:

- Developing and implementing a coordinated and comprehensive environmental policy for the City of Detroit.
- Administering, enforcing, managing and coordinating the City of Detroit's compliance with federal, state and local environmental laws and regulations.
- Coordinating environmental programs for the protection and conservation of land, water and air resources.
- Developing and implementing programs that respond to emergency conditions that impose an immediate danger to the health or safety of the people or environment of Detroit.
- Developing and coordinating policy, programs, and procedures for remediation, redevelopment and reuse of contaminated land sites in the city of Detroit.
- Advising, consulting and cooperating with agencies of the federal, state and local governments in furtherance of the purposes of this chapter;
- Providing technical support and assistance to other city departments in environmental matters including response to federal, state and local governmental enforcement activities.

Fencelines

DEA chose the Recreation Department (DRD) and the Public Lighting Department (PLD) as fencelines or starting points. The DRD employs about 900 people and the PLD is about 300. Both of these departments, on a regular basis, deal with issues concerning solid waste management, hazardous waste management, air quality, water quality, energy, and the use and disposal of toxic chemicals and wastes. Management personnel from the two departments have demonstrated their capabilities in effectively dealing with environmental issues and improving their respective operations.

The DRD consists of three divisions: Recreation, Forestry, and Landscape and Design.



The divisions oversee the beautification, operation and maintenance of 66 parks, 41 playfields, 124 playgrounds, 33 recreation centers, and numerous green belts, boulevards and parkways: a total area of about 5.89 million acres.

The PLD operates from three main locations: the administrative offices, warehouses and shops at 9449 Grinnell; the Mistersky Power Station at 5425 West Jefferson; and the Witkowski Operations Center at 1340 Third Avenue. The department owns and operates 31 substations in addition to a steam plant. It is also responsible for numerous transformer rooms in schools, libraries, police stations and other buildings. The PLD furnishes power to more than 1,800 services, which include the facilities of the City of Detroit, the Board of Education, the United States Government, the Michigan Department of Transportation, Wayne County, and other agencies. The department maintains about 87,000 street and alley lights, several municipal parking lot installations, 1,278 traffic signal installations, and the digital PBX telephone system that serves Police Headquarters, police precinct stations, and Fire Headquarters.

Key drivers for adopting an EMS

The City of Detroit has identified several factors below that contributed to its decision to adopt an EMS. The factors include:

- Adoption of an EMS may reduce City costs.
- Adoption of an EMS may improve City employees' participation in the facility's environmental performance.
- An EMS is expected to improve environmental performance.
- An EMS may improve facility compliance with environmental regulations.
- Insurers may reward EMS implementation.
- EMS adoption may be a valuable public relations tool.
- Environmental management professionals increasingly support EMS's.
- Adoption of an EMS is consistent with City facilities' overall environmental principles.

Significant aspects and impacts



The City of Detroit considered volume, cost, public impact, worker and health safety, and operational impact as criteria for ranking impacts of environmental aspects. Each criterion was assigned numeric values from 1 through 5, with 1 showing the lowest impact and 5 the highest. Each environmental aspect with a cumulative total value of 15 or more for the five categories is considered a significant aspect.

Also, any regulated aspect was considered significant. By following these guidelines, the City identified about 40 significant aspects for PLD-Mistersky and about seven for DRD.

Objectives and targets

The Public Lighting Department identified two sets of significant aspects, designated as PLD's objectives and targets. Control of these aspects – the Continuous Emission Monitoring System (CEMS) and the Waste Management System – will provide a better handle on the management of most of Public Lighting's environmental issues. Similarly, the Recreation Department also evaluated its significant aspects and identified four specific areas as objectives and targets: hazardous waste management, waste oil management, pesticide management and solid waste management. The staffs of both PLD and DRD understand that the proper management of their objectives and targets will improve their environmental performance, and enhance their commitment to environmental policies and Detroit citizens.

Benefits of an EMS

The City of Detroit has greatly benefited from the adoption of Environmental Management Systems in its Recreation and Public Lighting Departments. Below is a list of some benefits:

- *EMS is an employee based project, it gave the employees control over the process.*
- *Gave the Departments the skills to prepare and implement Standard Operating Procedures.*
- *Aided in training employees to be more effective and conscious of their work environment.*
- **Increased performance and at the same time improved safe work practices.**
- *Reduced the amount of waste oil handled and stored at various district offices.*
- *Provided the Departments the opportunity to interact with other municipalities/industries.*
- *The project improved relations among the departments involved.*

Resources

The number of hours associated with the development and implementation of the City of Detroit EMS Project are listed below.

Environmental Management Representatives.	1713	hours
Core Team.	1253	hours

Other	570 hours
TOTAL hours	3,536 hours

The labor cost associated with the development of the City of Detroit EMS program is:

Total Internal Labor Cost \$131,759.45

Next steps

Both PLD and DRD will begin implementing the environmental programs that have been developed (Hazardous Material Management, Waste Oil Management, and Solid Waste Management). Additionally, the Department of Environmental Affairs is planning to create similar Environmental Management Systems at Detroit's Department of Transportation and Department of Public Works.



Massachusetts Department of Environmental Protection Wall Experiment Station

Profile

Wall Experiment Station is located along the Merrimack River within the City of Lawrence, MA. The City of Lawrence, with a population of over 70,000, is an older, urban, industrialized city whose history parallels that of the country as a whole. Originally a rural farming town, the city was transformed into a major industrial center when Boston entrepreneurs developed huge textile mills on the Merrimack River to use the power of its waterfalls. The mill owners built canals, a dam, reservoir and boarding houses, creating one of the first industrial complexes in the country. Originally residents came from other parts of New England to work in the mills. Subsequently the city became an entry point for immigrants eager to enter the mill workforce. With newcomers from the Dominican Republic, Puerto Rico, Vietnam and Cambodia, Lawrence continues to be a proud and diverse city. Today Lawrence remains an urban center with 35% of its economy still manufacturing-based. Despite global trends that have seen manufacturing industries move south and overseas, the city is still a hub of textile and apparel companies.

Fenceline

Massachusetts Department of Environmental Protection (MA DEP) chose the Wall Experiment Station as its fenceline. MA DEP's historic Sen. William X. Wall Experiment Station (WES), formerly the Lawrence Experiment Station, was founded in 1887 by the MA State Board of Health to conduct research leading to the development of practical methods for treating sewage, industrial waste and public drinking water supplies. The investigations conducted at WES laid the foundation for modern methods of wastewater treatment and drinking water purification. WES is internationally recognized as one of the first laboratories in the world dedicated to environmental research. In 1975, WES was designated as a National Historic Civil Engineering Landmark by the American Society of Civil Engineers. The current facility, built in 1952 along the Merrimack River lies within the heart of Lawrence, houses 42 scientists, engineers and support personnel in a 22,000 square foot brick structure.

Today WES's mission is to provide technical and laboratory support for all MA DEP programs (e.g., resource protection, waste prevention and waste site cleanup). Activities conducted at WES include analyses of water, wastewater, air, soil, hazardous waste, fish and other samples involved in environmental contamination cases. Two organizational units located at WES include the Division of Environmental Analysis (DEA) within the Bureau of Strategic Policy and Technology and the Air Assessment Branch (AAB) within the Bureau of Waste Prevention. WES receives professional guidance from DEP's Laboratory Advisory Committee, which is chaired by Dr. Oscar C. Pancorbo, WES Director, and includes representatives from EPA, state, university and commercial laboratories. WES is recognized among the scientific community as a national leader in developing environmental analyses and identifying priority pollutants.

Key Drivers for Adopting an EMS

The Massachusetts Department of Environmental Protection identified several key drivers for adopting an EMS at the Wall Experiment Station. MA DEP predicted that an EMS would help reduce cost at the Wall Experiment Station. In addition, the EMS was consistent with the facility's overall environmental principles and MA DEP believed that adopting an EMS would build upon these principles and improve environmental performance. Key drivers for adopting an EMS exist in MA DEP's commitment to promoting Environmental Management Systems (EMS) by:

- Leading by example – developing an EMS for our lab facility
- Encouraging the use of EMS in our program areas and
- Raising staff awareness of value in EMS.

The WES EMS will provide an opportunity for DEP to:

- Learn first hand what it takes to implement an EMS
- Prevent/reduce environmental impacts
- Reduce operational exposure
- Demonstrate leadership among the lab community.

Benefits of Adopting an EMS

- Increased awareness of EMS by laboratory community.
- Greater awareness and understanding about EMS by a large number of DEP staff (approx. 200).
- Deeper understanding of EMS elements and process by DEP project managers and key staff.
- Enthusiasm among project staff about minimizing impacts to the environment, resource conservation and operational improvements.
- Key staff received project management training in DEP's "Management System for Environmental Excellence".
- Enhanced cross-program communication (between Bureaus, Boston/Lawrence staff, EPA XL project staff, management and staff).

Florida Gulf Coast University- Fort Myers, FL

Profile

Florida Gulf Coast University (FGCU) is located in Southwest Florida in Lee County and within seven miles of the town of Fort Myers. Southwest Florida is one of the fastest growing regions of the continental United States, having doubled in population every decade for the last 50 years. FGCU's service area includes Charlotte, Collier, Glades, Hendry, and Lee counties with currently over 700,000 residents.

Florida Gulf Coast University opened in 1997 as the 10th university in the Florida State University system. As it enters its 4th year in the fall of 2000, it has approximately 3,600 students, 210 full-time faculty, 260 staff, and 13 major buildings. It received provisional accreditation as a new academic institution in 1999 and currently has 2 doctoral, 12 masters, and 24 bachelors degree programs.

Initial priorities of FGCU were to establish strong instructional technology initiatives allowing distance learning; a strong interdisciplinary focus, especially in the College of Arts and Sciences; and a strong environmental studies focus.

Fenceline

The land selected for the FGCU campus has included some major environmental challenges. First, the property given by Alico Properties was not identified for development in Lee County's Growth Management Plan. In addition, much of the land selected for the campus footprint was at least seasonally wet and would require fill, as well as both on site and offsite mitigation. There were also concerns about the use of the site by such endangered species as the Florida panther. In addition, concerns were expressed that the University would act as a catalyst for rapid growth in the Estero Bay watershed.

Ultimately, 430 acres of the 760 acre campus site were designated as green space, mitigation areas, or as restored/created wetlands. FGCU has created a strong undergraduate environmental studies program and, in 1999, created a President's Environmental Task Force to evaluate FGCU's progress on its environmental mission and its opportunities for national visibility/leadership in the environmental area. The Task Force made 17 major recommendations, one of which was to initiate an Environmental Management Systems (EMS) Project at FGCU in cooperation EPA.

FGCU has chosen four fenceline issue areas: solid waste, stewardship of mitigation/greenspace areas, energy efficiency, and purchasing. FGCU has created a core team of campus leaders/facilitators representing academic, operations, and planning areas as well as task forces around each of the four fenceline issue areas.

The Solid Waste "fenceline" includes all aspects of solid waste including current sources; current production, handling, and disposal; contractors; current staff and responsibilities; reduction, reuse, and recycling opportunities; educational needs and opportunities;

integration of staff, student, and faculty activities; and analyses of what is currently working and what needs to be accomplished.

The Stewardship of Greenspace and Mitigation Lands “fenceline” includes current regulations and university permit obligations; current contractors working on mitigation and monitoring; current and updated master plan; current staff responsibilities; ongoing ecosystems management methods, opportunities, and challenges; identification of future resource needs and sources; educational needs and opportunities; integration of staff, student, and faculty activities; and analyses of what is currently working and what needs to be accomplished.

The Energy Efficiency “fenceline” includes current methods and processes of integrating energy efficiency into cooling plant operations and new buildings; opportunities to increase energy efficiency in new buildings without increasing costs significantly or limiting space; opportunities to work with appropriate staff, faculty, key decision-makers, contractors, subcontractors, and outside experts to increase energy efficiency in new and current buildings educational needs and opportunities; integration of staff, student, and faculty activities; and analyses of what is currently working and what needs to be accomplished.

The Purchasing “fenceline” includes current methods and procedures for purchasing supplies, equipment, building materials, and buildings themselves used in campus academic and operations areas; contractual arrangements with service vendors on campus; future opportunities to reinforce solid waste and energy efficiency progress through purchasing processes and procedures; integration of staff, student, and faculty activities and efforts; and analyses of what is currently working and what needs to be accomplished.

Key Drivers for Adopting an EMS

FGCU’s ultimate goal with regard to EMS is to become the first academic institution in the nation with such a program integrated into academic, operations, and planning areas of the university. Other key drivers for their EMS adoption include:

- EMS adoption may be a valuable marketing tool
- EMS adoption may be a valuable public relations tool
- Adoption of an EMS may provide a competitive advantage (e.g. privatization issues)
- Adoption of an EMS may improve our employees’ participation in the facility’s environmental performance
- Adoption of an EMS is consistent with the facility’s overall environmental principles
- Strengthens understanding and cooperation of all university personnel toward achieving FGCU environmental goals

Benefits of Adopting an EMS

Through its adoption of an EMS, Florida Gulf Coast University has benefited in a number of areas. These include:

- Public Relations benefits: community supportive of FGCU's initiative with EPA
- Potential project opportunities with local public agencies in FGCU's service area
- National visibility for FGCU: growing interest in FGCU's environmental initiatives including EMS project with EPA

Resources

The number of hours associated with the development and implementation of the FGCU EMS Project are listed below.

Environmental Management Representatives	2,450 hours
Core Team	1,700 hours
Other	1,350 hours
TOTAL hours	5,500 hours

The labor cost associated with the development of the FGCU EMS program is:

Total Internal Labor Cost \$188,900

Little Blue Valley Sewer District - Independence, MO

Profile

The Little Blue Valley Sewer District is a quasi-public agency, created in 1968 to protect the health of people, and to preserve the aquatic environments of the Little Blue and Missouri Rivers, through effective conveyance and treatment of wastewater. Our mission is to provide excellent wastewater services, which protect the public health and improve the environment of our region. In serving thirteen communities and two counties in the Little Blue River and Middle Big Creek watersheds, the District strives to be a strong partner in regional planning and resource sharing, anticipating and responding to both environmental and economic needs. The system is designed to serve a population of 350,000 people and currently conveys and cleans 14 billion gallons of wastewater per year.

The Little Blue Valley Sewer District is governed by a Board of Trustees made up of the Jackson County Executive and Legislators, the Cass County Presiding Commissioner and Mayors of customer communities. The Board meets monthly for conduct of District business. The Board of Trustees is supported in its work by a Mayors Advisory Board, a Technical Advisory Committee, the Middle Big Creek Subdistrict Advisory Board and a Planning Advisory Committee. The District plans and implements its responsibilities through a Strategic Planning and Management process that involves customers and stakeholders in setting policies and plans.

A total capital investment of over \$194 million during the life of the District has built a wastewater conveyance, metering and treatment system designed to convey 350 million gallons of wastewater per day, with a current treatment capacity of 40 million gallons per day. Missouri Department of Natural Resources permits and rules regulate District activities. An Executive Director and staff of forty-nine personnel provide administrative, financial, operations, maintenance, engineering and technical services in support of District operations.

The District charges customer cities for actual costs of operation, maintenance, rehabilitation, and financing of debt, based on volume of wastewater conveyed and treated. The Board of Trustees approves an annual budget in September of each year. The 1999-2000 fiscal year projected costs total \$11.07 million, for a cost of 63.7 cents per 1000 gallons of wastewater conveyed and cleaned.

Fenceline

The District chose its entire organization to be included in the “fenceline” which includes 49 employees

Key Drivers for Adopting an EMS

The Little Blue Valley Sewer District adopted an EMS for a number of reasons, including the following:

- Adoption of an EMS may reduce our costs
- Adoption of an EMS may provide a competitive advantage (e.g. privatization issues)
- Adoption of an EMS may improve our employees' participation in the facility's environmental performance
- Adoption of an EMS may improve environmental performance
- Adoption of an EMS may improve facility compliance with environmental regulations
- Adoption of an EMS is consistent with the facility's overall environmental principles
- Supports Missouri Quality Award Goal
- Supports several strategic goals

Project Status

The Little Blue Valley Sewer District ceased its efforts to implement an EMS close to two-thirds of the way through the initiative. At that time the facility was trying to address historical problems with its treatment process. The LBVSD Board of Directors determined that the treatment system needed to be upgraded to eliminate the current problems. A shift in organizational focus toward design and implementation of a new treatment system was required. As such LBVSD had to put its EMS efforts on hold until the new treatment system has been put in place. The Little Blue Valley Sewer District anticipates resuming its EMS activities upon completion of the new treatment system.

Appendix C:

Information Sources



www.peercenter.net



www.getf.org



www.epa.gov/ems

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