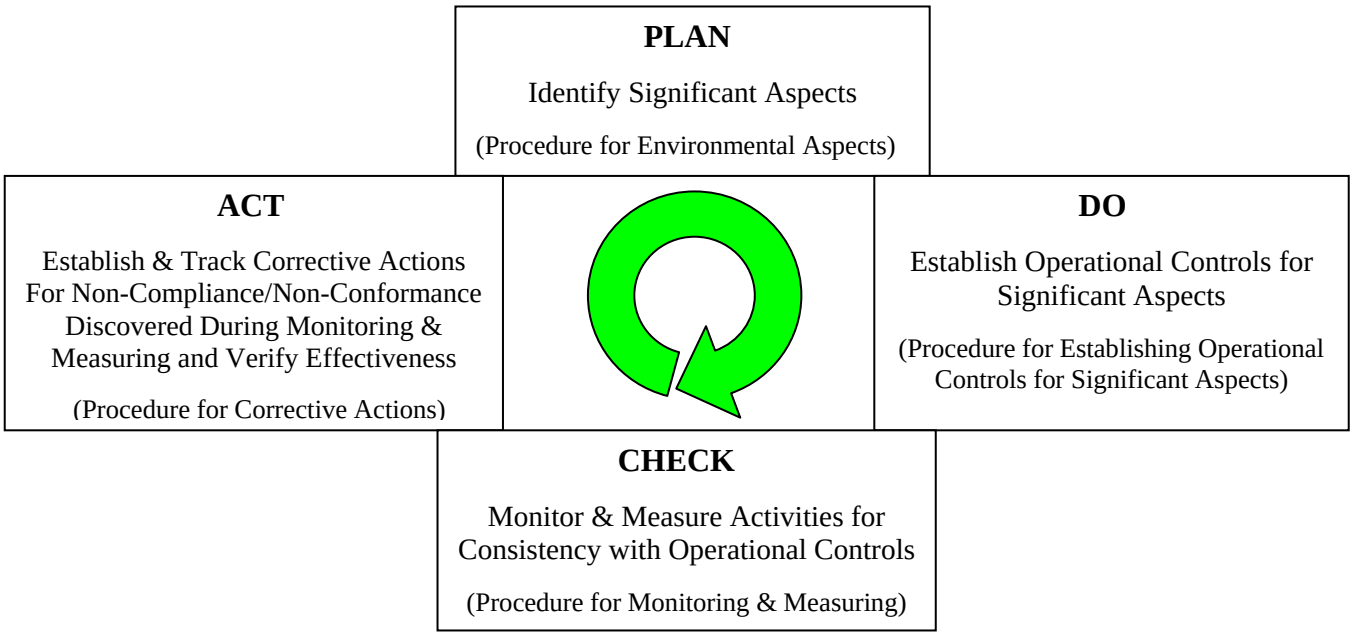
EPA United States Environmental Protection Agency

Healthcare Environmental Assistance Resources

Pollution Prevention and Compliance Assistance for Healthcare Facilities

PLAN - DO - CHECK - ACT
for Operational Controls



PLAN-DO-CHECK-ACT
for Compliance Assurance

PLAN

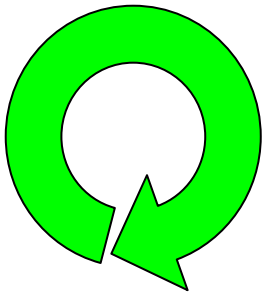
Identify Environmental Requirements

(Procedure for Legal & Other Requirements)

ACT

Establish & Track Corrective Actions for Non-Compliance/Non-Conformance Discovered During Monitoring & Measuring, Gap Analysis, & Multi-Media Compliance Audit

(Procedure for Corrective Actions)



DO

Establish Operational Controls for Regulated Activities/Materials

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

Monitor & Measure Consistency with Operational Controls
(Procedure for Monitoring & Measuring)

Conduct GEMS Gap Analysis Annually
(Procedure for Gap Analysis)

Conduct Baseline Multi-Media Compliance Audit at Least Every 3 Years
(Measuring and Monitoring Procedures)

PLAN - DO - CHECK - ACT
For Objectives and Targets

PLAN

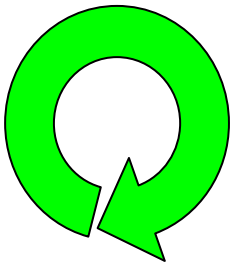
Select Objectives & Targets

(Procedure for Objectives & Targets)

ACT

Implement & Evaluate Corrective Actions Discovered During Monitoring & Measuring

(Procedure for Corrective Actions)



DO

Establish Operational Controls and Measuring & Monitoring for Objectives & Targets

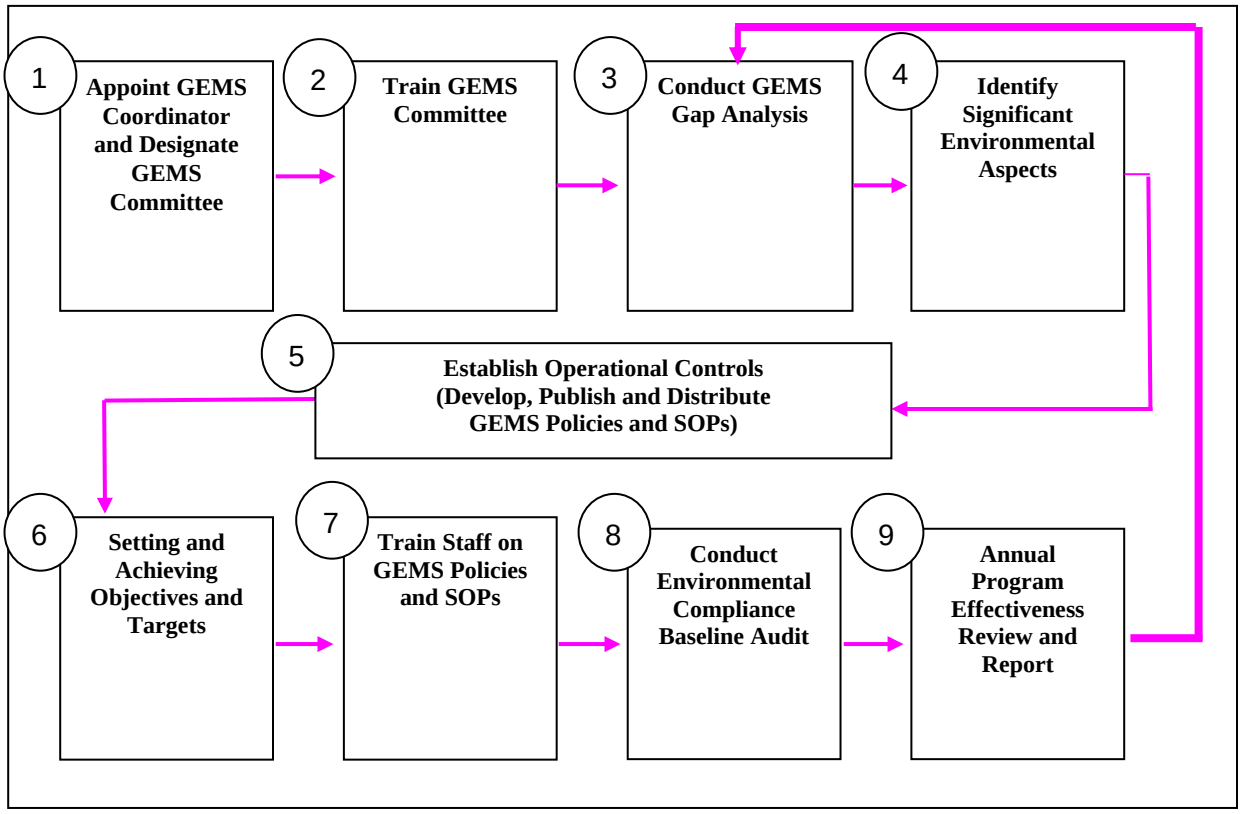
(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

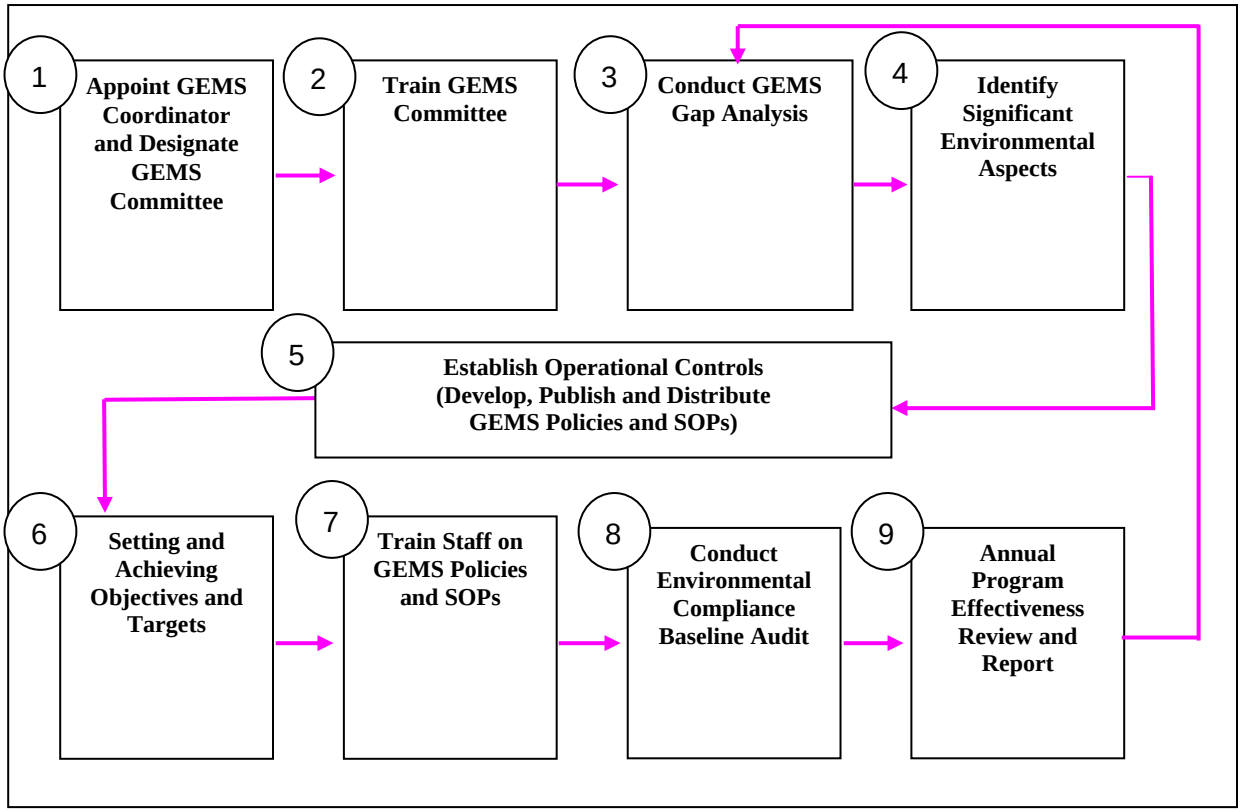
Monitor & Measure Consistency with Objectives & Targets

(Procedure for Monitoring & Measuring)

Nine Steps to Establish a Successful Green Environmental Management System (GEMS)



Nine Steps to Establish a Successful Green Environmental Management System (GEMS)



Document 5B2-8

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Hazardous Material and Waste

1. ***Purpose.*** To provide for the safest methods to minimize or eliminate the potential for hazardous material incidents.

2. ***Policy***. This Medical Center will establish, maintain and coordinate a hazardous material and waste management plan.

3. ***Responsibilities.***

   a. *Director* will support training, and require compliance with policy and all applicable laws.

   b. *Industrial Hygienist* will coordinate program activities, provide information, training and other support to services, verify that manifests are properly filled out, monitor contractors as applicable, report to Environmental Protection Agency (EPA) or State as required, control and inspect waste storage facilities, oversee service waste handling, report to Director or designee, verify compliance with all applicable laws, maintain all records related to hazardous waste, and coordinate shipments of hazardous waste. He/she will receive training in chemical hazards, maintain records that may be required in case of a spill, inform the Fire Department or other designated responder in case of a spill, and coordinate spill response.

   c. *Services* will identify and classify all regularly produced wastes; train all employees producing or handling wastes on the requirements of the policy, the hazards associated with the waste, safe handling and storage techniques, proper labeling and spill response; and place all generated waste in specified storage facility in proper containers with proper labels.

4. ***Identification/Classification of Waste.***

   a. *Regularly Produced Waste.* The Service should characterize this waste as soon as practicable after acceptance of the policy. The characterization should include the rate of waste production, storage requirements for the waste, hazards associated with the waste, applicable EPA waste codes, proper labeling for waste, storage area designated for the waste and person responsible for the waste.

   b. *Unusual Wastes.* These materials should be characterized by their components by the producer. They should be evaluated by a designated person in the service (with the assistance of the Industrial Hygienist) for proper labeling and storage requirements.

5. ***Record Keeping Requirements.*** Services should identify all materials put into the hazardous waste area storage to the person in charge of that storage area. A log should be kept in each storage area identifying each waste by container and source and the dates that wastes are put

into these containers. This log should be maintained as a source of information for the hazardous waste manifests and as information for emergency response in case of a spill.

6. ***Hazardous Waste Storage.***

   a. *Centralized Storage Area*. (Describe the location of storage area, procedure for adding waste to storage, record keeping system and requirements, person in charge of storage area, persons authorized to have access, and required inspections, spill or emergency procedures.)

   b. *Satellite Storage Area*. For each area, describe the same information as for central storage area.

7. ***Training.*** All employees dealing with hazardous waste shall be trained on general chemical hazards and the hazard communication standard, on the hazards of the chemicals and wastes they are dealing with, on proper safety precautions including use of required personal protective equipment, and on the requirements of the hazardous material policy and hazardous waste policy.

8. ***Emergency Spill Procedures.*** Spills of hazardous waste, as with spills of other hazardous materials, should be classified as either small spills of materials within the area where the material is used, or other spills. Services should have a policy or Standard Operating Procedure (SOP) for dealing with small spills of materials or wastes they normally use or produce. Larger spills of hazardous waste or spills outside the area of normal use should be treated as hazardous material spills and should be evaluated and dealt with by trained personnel.

9. ***References.*** 40 CFR 260-265.

10. ***Rescission.***

11. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B1-10

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS)
Monitoring and Measuring Procedures

1. ***Purpose.*** To establish and maintain procedures to accomplish monitoring and measuring activities on a regular basis as part of the Medical Center's Green Environmental Management Systems (GEMS).

2. ***Policy.*** GEMS' monitoring and measuring focuses on the key characteristics of this Medical Center's operations that have a significant impact on the environment. Through monitoring and measuring, it demonstrates:

   - Compliance with environmental regulations and other requirements.
   - Operational control of significant aspects.
   - Conformance with environmental objectives and targets.
   - Continual improvement.

3. ***Responsibilities.***

   a. The *Medical Center Director* shall ensure that adequate resources are provided to maintain effective monitoring and measuring and shall approve GEMS monitoring and measuring procedures.

   b. The *GEMS Committee* is responsible for:

      - Monitoring environmental objectives and targets.
      - Reviewing and approving monitoring and measuring for significant aspects.
      - Tracking and reporting GEMS monitoring and measuring.
      - Ensuring that the appropriate actions are taken on the results of monitoring and measuring activities to ensure an effective program that is continually improving.

   c. The *GEMS Coordinator* is responsible for coordinating the various monitoring and measuring activities and the calibration of environmental monitoring equipment, as well as periodic environmental compliance audits.

4. ***Procedures.***

   a. The GEMS Committee documents the status of objectives and targets at least quarterly in its minutes.

b. Calibration of environmental monitoring equipment will be conducted in accordance with manufacturer's recommendations, and records will be maintained in accordance with the GEMS Records Procedures.

c. As significant aspects are identified, the GEMS Committee reviews and approves monitoring and measuring activities submitted by the Operating Units.

d. Monitoring and measuring activities are those included in the "Check" part of Plan-Do-Check-Act (see Attachments A and B). These activities include:

1) Monitoring and measuring operational controls for significant aspects and objectives and targets. Operational controls and monitoring procedures (including frequency) for each significant aspect are identified by the Operating Unit and are reported to the GEMS Committee. The GEMS Committee approves or revises the procedures. Operational control monitoring reports are submitted by the Operating Units, along with any corrective actions resulting from the discrepancies discovered during the monitoring. These reports are reviewed and approved by the GEMS Committee. Objectives and targets are monitored in the same way.

2) Conducting a baseline multi-media environmental compliance audit as well as follow-up audits at least every three years, using an external audit team. The compliance audit covers federal, state and local environmental regulations and Executive Orders, as well as VA policy and other requirements determined by the GEMS Committee. The GEMS Committee approves the audit tool prior to proceeding with the audit.

5. ***References.*** The Green Environmental Management Systems (GEMS) Guidebook, (Book 6A); and the Environmental Compliance Guidebook, (Book 6B).

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. Plan-Do-Check-Act Process for Operational Controls
B. Plan-Do-Check-Act Process for Environmental Compliance

Distribution:

Attachment A to Document 5B1-10

PLAN – DO – CHECK – ACT

Operational Controls for Significant Environmental Aspects

PLAN

Identify Significant Aspects

(Procedure for Environmental Aspects)

DO

Establish Operational Controls for Significant Aspects

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

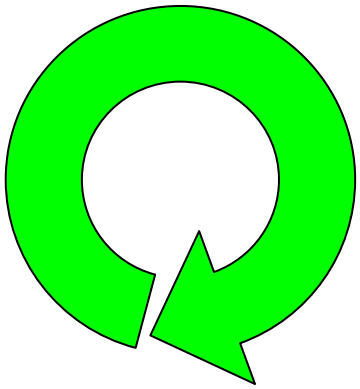
Monitor and Measure Activities for Consistency with Operational Controls

(Procedure for Monitoring and Measuring)

ACT

Establish and Track Corrective Actions For Non-Compliance/Non-Conformance Discovered During Monitoring and Measuring and Verify Effectiveness

(Procedure for Corrective Actions)



Attachment B to Document 5B1-10

PLAN – DO – CHECK – ACT

Environmental Compliance Assurance under GEMS

PLAN

Identify Environmental Requirements

(Procedure for Legal and Other Requirements)

DO

Establish Operational Controls for Regulated Activities/Materials

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

Monitor and Measure Consistency with Operational Controls

(Procedure for Monitoring & Measuring)

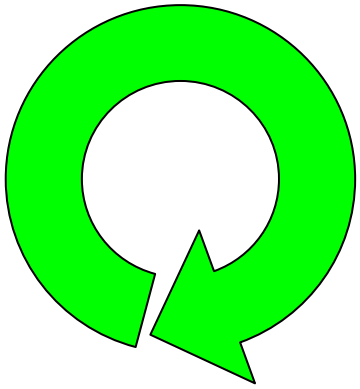
Conduct GEMS Gap Analysis Annually
(Procedure for Gap Analysis)

Conduct Multi-Media Compliance Audit Baseline and at Least Every 3 Years
(Measuring and Monitoring Procedure)

ACT

Establish and Track Corrective Actions for Non-Compliance /Non-Conformance Discovered During Monitoring and Measuring, Gap Analysis, and Multi-Media Compliance Audit

(Procedure for Corrective Actions)



Document 5B1-11

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS) Nonconformance and Corrective and Preventive Action

1. ***Purpose.*** This policy defines the processes that will be implemented for noncompliance, nonconformance, preventive and corrective actions.

2. ***Policy.*** It is the policy of this (Insert Medical Center Name) that nonconformance issues identified from GEMS audits, monitoring, measuring and other reviews will necessitate remedial action. Once remedial action is implemented, additional monitoring protocols shall be established to assure effectiveness.

3. ***Responsibilities.***

   a. The *GEMS Coordinator*, in association with the GEMS Committee, will monitor and review all processes related to GEMS activities to ensure corrective actions are implemented.

   b. The *GEMS Committee* shall assign responsibilities to abate nonconformance items.

4. ***Procedures.***

   a. Identifying and Reporting. Any individual who identifies a potential nonconformance will report the issue to the GEMS Coordinator. The GEMS Coordinator will then process the information through the GEMS Committee for review and action.

   b. Investigation and Analysis.

      1) Once a nonconformance is identified and submitted to the GEMS Committee, the GEMS Coordinator will assign an individual or team to review the issue.

      2) The individual or team will perform an investigation into the nonconformance, referencing all applicable standards.

      3) A causal analysis will be performed to determine the methods of corrective action:

         a) The magnitude of the causal analysis will be determined by the GEMS Coordinator or GEMS Committee.

         b) The objective of performing the causal analysis is to determine the root cause of the process or system failure, not to impose blame or enforce disciplinary action on a person.

   c. Mitigation of Impacts. Once the team has completed the investigation, the report will be delivered to the GEMS Coordinator for review and will then be forwarded to the applicable Service Line Manager for his/her concurrence prior to implementation.

d. Corrective or Preventive Actions.

1) The GEMS Coordinator will assign responsibilities to abate nonconformance items.

2) The investigation report shall address continuous improvement and monitoring processes that will be implemented to assure conformance.

3) Determine the root cause.

4) Develop appropriate corrective and preventive action.

5) Document the corrective and preventive action.

6) Forward the corrective and preventive action to the GEMS Coordinator for implementation and have the Safety Officer concur.

7) The GEMS Coordinator will provide oversight of the implementation of the corrective action and establish realistic deadlines for implementation.

8) The GEMS Committee will track and verify the effectiveness of the corrective or preventive actions. Frequency of reporting shall be identified within the analysis; however, the results of the analysis and the success of the corrective or preventive actions shall be included in the annual report.

5. ***References.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B1-12

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS)
Gap Analysis Program Review

1. ***Purpose.*** To produce a gap analysis to help understand what is already in conformance with the programmatic requirements of GEMS and to evaluate ways to build on existing programs and activities. Determining what GEMS activities are already in place will result in only having to "fill in the gaps" between what is already being done and what needs to be done for the Medical Center GEMS. The primary purpose of GEMS is to bind together existing environmental programs and activities so that efficiency, effectiveness, performance and cost-effectiveness for the entire facility can be achieved.

2. ***Policy.*** A review process of the GEMS program will be in place at this Medical Center as part of a continual improvement program.

3. ***Responsibilities.*** The *GEMS Coordinator* will coordinate the initial and periodic gap analyses of the GEMS program using criteria consistent with the VHA GEMS Guidebook and the ISO 14001 model. The *GEMS Committee* will review the completed gap analysis and develop an implementation plan to address the program gaps.

4. ***Procedures.*** The GEMS Coordinator will designate the team that will conduct the annual GEMS program review. The review team will use the attached GEMS initial review and gap analysis audit tool to conduct these reviews. The completed reviews should identify any "gaps" that are found and make recommendations to address areas not in conformance. The completed review and recommendations should then be forwarded to the GEMS Committee for further review and development of an implementation plan.

5. ***References.*** VHA Green Environmental Management Systems (GEMS) Guidebook, (Book 6A); International Organization of Standards (ISO) 14001 Standards.

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachment:
GEMS Gap Analysis Tool

Distribution:

Attachment to Document 5B1-12

GEMS Gap Analysis Tool

Note: The following Criteria Statements were updated April 1, 2004; therefore, this Tool will vary from the printed version of the Guidebook.

1. ***Category 1 - Environmental Policy.*** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.1 and 5.1, Tabs A and B).

   a. **Policy.** Is there an environmental policy in place that supports pollution prevention, regulatory compliance and continuous environmental improvement?

   b. **Policy.** Is the policy documented, implemented, maintained and communicated to the employees?

2. ***Category 2 - Planning.***

   a. **Environmental Aspects and Impacts.** (ISO 14001, Section 4.3.1; VHA GEMS Guidebook, Sections 2.2, 3.2 and 4.2 and Document 5B1-1).

      1) **Aspects and Impacts.** Has the facility established a procedure to identify the environmental aspects of the activity, products and services over which it has control and influence?

      2) **Aspects and Impacts.** Have significant impacts been determined and considered in setting environmental objectives and targets?

   b. **Legal Requirements.** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.3 and 5.1 and Document 5B1-2).

      Legal. Is there a procedure to identify, access and evaluate federal, state and local legal requirements?

   c. **Objectives and Targets.** (ISO 14001, Section 4.3.3; VHA GEMS Guidebook, Sections 2.4, 2.5 and 3.2 Step 6 and Document 5B1-3).

      1) **Setting Objectives and Targets.** Has a procedure been developed to identify and document environmental objectives and targets for each relevant function and level?

      2) **Setting Objectives and Targets.** Does the procedure consider legal requirements, significant aspects and other operational requirements?

   d. **Plan For Achieving Objectives and Targets.** (Environmental Programs) (ISO 14001, Section 4.3.4; VHA GEMS Guidebook, Sections 2.4 and 2.5 and Documents 5B1-3 and 5B1-4).

      1) **Plan for Objectives and Targets.** Is there a procedure to achieve objectives and targets and identify the means and acceptable timeframes for accomplishment?

2) **Plan for Objectives and Targets.** Does the procedure include a designation of responsibility at each relevant function and level?

3. ***Category 3 - Implementation and Operation*.**

a. **Accountability (Structure and Responsibility).** (ISO 14001, Section 4.4.1; VHA GEMS Guidebook, Sections 2.6, 3.1 and 3.2 Steps 1-2 and Document 5B1-4).

1) **Accountability.** Has top management provided adequate resources? Has top management appointed a GEMS Coordinator and a GEMS Committee to oversee, track and report GEMS status and performance?

2) **Accountability.** Have roles, responsibilities and authorities been defined, documented and communicated to facility staff to ensure effective environmental management?

b. **Training.** (ISO 14001, Section 4.4.2; VHA GEMS Guidebook, Sections 2.7 and 3.2 Steps 2 and 7 and Document 5B1-5).

1) **Training.** Has the organization identified training needs for those workers who may create a significant impact on the environment?

2) **Training.** Does the training include significant environmental impacts, emergency response procedures and nonconformance with standard operating procedures?

c. **Communications.** (ISO 14001, Section 4.4.3; VHA GEMS Guidebook, Section 2.8 and Document 5B1-6).

1) **Communications.** Is there a procedure for internal communication between the various levels/functions of the facility, the GEMS Coordinator and the GEMS Committee?

2) **Communications.** Is there a procedure in place to coordinate and document inquiries from external public, private and regulatory organizations?

d. **GEMS Documentation and Record Keeping.** (ISO 14001, Section 4.4.4, 4.5.3; VHA GEMS Guidebook, Sections 2.9, 2.10 and 2.15 and Documents 5B1-5and 5B1-7).

1) **GEMS Documentation.** Is there a procedure requiring the documenting of the core elements of the GEMS and explaining their interaction with other facility-related documents?

2) **Record Keeping.** Is there a procedure to identify, maintain and dispose of environmental, training and audit records?

3) **Record Keeping.** Are environmental records identifiable, legible, readily retrievable and traceable to activity, product and service?

e. **Operational Control.** (ISO 14001, Section 4.4.6; VHA GEMS Guidebook, Sections 2.11 and 3.2 Step 5 and Documents 5B1-7 and 5B1-8).

1) **Operational Control.** Are the operations aligned with significant environmental aspects and objectives?

2) **Operational Control.** Are procedures in place to communicate the GEMS requirements to suppliers and contractors?

f. **Emergency Response.** (ISO 14001, Section 4.4.7; VHA GEMS Guidebook, Section 2.12 and Document 5B1-9).

Emergency Response. Is there an emergency preparedness and response procedure to recognize and mitigate potential environmental impact?

4. ***Category 4 - Checking and Corrective Action***.

a. **Monitoring and Measurement.** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.13 and 3.2 Steps 8 and 9 and Document 5B1-10).

1) **Monitoring and Measurement.** Is there a documented monitoring and measuring procedure for operations and activities related to significant aspects?

2) **Monitoring and Measurement.** Does the procedure include requirements for calibration and recording of information to track performance, operational controls and conformance objectives and targets?

3) **Monitoring and Measurement.** Has a periodic (every 3 years) and/or baseline environmental compliance audit been conducted?

b. **Corrective and Preventive Action.** (ISO 14001, Section 4.5.2; VHA GEMS Guidebook, Sections 2.14 and 3.2 Step 9 and Document 5B1-11).

1) **Action Plans.** Is there a procedure covering the definition of roles and responsibilities for investigating and determining a cause of nonconformance?

2) **Action Plans.** Does the procedure include action needed to mitigate impact and necessary preventive action?

3) **Action Plans.** Do corrective and preventive action plans address the causes of the deficiency?

4) **Action Plans.** Is the effectiveness of corrective and preventive actions verified before considered completed?

5) **Action Plans.** Are resources assigned to corrective and preventive actions in order to complete them in a reasonable timeframe?

6) **Action Plans.** Are corrective and preventive actions tracked to completion in the GEMS committee?

d. **Gap Analysis.** (ISO 14001, Section 4.5.4; VHA GEMS Guidebook, Sections 2.16 and 3.2 Step 8 and Document 5B1-12).

1) **Gap Analysis.** Does the program have procedures for conducting annual gap analyses of GEMS?

2) **Gap Analysis.** Is the scope based on the environmental importance of the activity and the results of the previous audit?

3) **Gap Analysis.** Are the results reviewed by the GEMS Committee and the recommendations forwarded to top management for review?

5. ***Category 5 - Management Review***. (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.17 and 3.2 Step 9 and Document 5B1-13).

   a. **Annual Review.** Is the management review conducted and documented on an annual basis and reported in the GEMS Committee?

   b. **Annual Review.** Does the GEMS Committee use the gap analysis results to address the need for changes to policy, objectives and other GEMS elements?

   c. **Annual Review.** Is there evidence that the facility director (top management) participates in the annual review (for instance, by signing annual review report)?

Document 5B1-13

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS) Procedure for Annual Effectiveness Review and Report

1. ***Purpose***. This procedure guides the GEMS Committee in evaluating the effectiveness of the GEMS, evaluating performance with respect to the past year's environmental objectives and targets, selecting new objectives and targets for the upcoming year, presenting the draft report and recommendations to the Medical Center Director and publishing the final report via the GEMS Committee minutes.

2. ***Policy.*** The policy of this Medical Center is to conduct an annual evaluation of the effectiveness of the GEMS in order to maintain an effective program that supports continual improvement.

3. ***Responsibilities.*** The *GEMS Committee* evaluates the effectiveness of the GEMS using primarily the following three methods and tools.

   a. GEMS Gap Analysis, with the desirable outcome demonstrating a trend over two or more years toward fewer and less significant gaps.

   b. Environmental Compliance Audit/Inspections, with the desirable outcome demonstrating a trend toward fewer and less significant findings of non-compliance and rapid and effective corrective actions.

   c. GEMS Targets and Objectives, with the desirable outcome demonstrating meaningful objectives with realistic targets being met.

4. ***Procedures.***

   a. At the beginning of each fiscal year, the GEMS Committee ensures that evaluation methods and tools are established/maintained to support the end-of-year GEMS effectiveness evaluation. These will include:

      1) GEMS Gap Analysis.

      2) Environmental Compliance Audits/Inspections.

      3) GEMS Targets and Objectives.

      4) Methods for tracking preventive and corrective actions from GEMS Gap Analysis, Environmental Compliance Audit and other inspections.

   b. The effectiveness of the GEMS is monitored (by methods identified in paragraph 4a above) throughout the year, and corrective and preventive actions are taken to improve its effectiveness as the need is identified.

c. At the end of the fiscal year the GEMS Coordinator drafts an annual report of the effectiveness of the GEMS based on the criteria identified in paragraph 4a above. The evaluation includes thoughtful analyses of successes and opportunities for improvement. The draft is submitted to the GEMS Committee for approval or modification.

d. The GEMS Committee selects meaningful objectives and targets recommended for the upcoming year.

e. The GEMS Committee presents items (identified in paragraphs 4c and 4d above) to the Medical Center Director for modification and/or approval.

f. The Medical Center Director approves the effectiveness report for the past year and the objectives and targets for the upcoming year.

5. ***References.*** GEMS Guidebook (Book 6A); Environmental Compliance Guidebook (Book 6B).

6. ***Rescission.*** None.

7. ***Review Date.***

(Name)
Medical Center Director

Attachment:
Sample GEMS Committee Report of Annual Effectiveness Review

Distribution:

Attachment to Document 5B1-13

S A M P L E

GEMS Committee Report of Annual Effectiveness Review

Excerpt From the Minutes of the GEMS Committee, November 4, 2004
Approved and Signed by the Medical Center Director

1. The Committee found the GEMS effective in its first year, as indicated by:
   - Completion of 60 % of the corrective actions for the GEMS Gap Analysis conducted June 2003
   - Completion of 25% of the corrective actions for the baseline Environmental Compliance Audit, conducted August 2003
   - Achievement of the objectives and targets (as modified at the Jan 14 GEMS Committee Meeting)
2. The Committee recommends the following new objectives and targets for FY 2005:
   - 5 % reduction in lawn management chemical usage in FY 2005 compared with FY 2004 (see attached plan for monitoring and accomplishment)
   - 10 % reduction in hazardous waste generation in the Research Lab (see attached plan for monitoring and accomplishment)
3. The following GEMS dashboard summarizes the status of effectiveness evaluations:

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
Appoint a GEMS Coordinator and a GEMS Committee	Coordinator and Committee will be appointed no later that the end of the first quarter.	Mr./Ms. was appointed the GEMS Coordinator with participants from all organizational units. Mr./Ms., Associate Director, was appointed committee chairman.
Conduct a Gap Analysis to Determine Disparity in our Present Program	Gap analysis will be completed by the end of the second quarter.	The gap analysis was completed February 2004, with new policies developed as needed and routed for comments.
Develop and Implement a GEMS Program	The program will be published and in effect by the end of FY 04.	The newly established written GEMS program was established September 1, 2004.
Environmental Rounds are Conducted Quarterly in all Areas (Patient and Non-Patient) of the Medical Center to Demonstrate Compliance with GEMS.	Surveys conducted 90% of the time and deficiencies are corrected within 30 days.	This performance standard was significantly met during FY 2004. All surveys were performed as scheduled in MCM 00-46, Environmental Rounds and in accordance with the Environment of Care Standards (JCAHO). However, not all deficiencies were abated within 30 days. Although 89% (1030/1154) of the items noted were abated within 30 days, the percentage fell below the stated goal of 100%.

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
		It should be noted that there was no duplication of deficiencies when making rounds the second time in FY 1999.

Environmental Compliance Audits/Inspections		
Compliance Standard	**Compliance Problem**	**Status**
Safe Drinking Water (SDW)	The well exceeds safe drinking water standards.	Standards met as evidenced by _____.
Resource Conservation and Recovery Act (RCRA)	Inspection log not up-to-date.	Standards met as evidenced by _____.
Air Emissions	Boiler exceeds air emission standards in permit.	Standards met as evidenced by _____.

GEMS Targets and Objectives		
Performance Objectives	**Performance Target**	**Status**
Red Bag Waste	Reduce red-bag waste by 3% by weight by end of fiscal year.	Standards met as evidenced by _____.
Pesticide Use	Change practice of scheduled pesticide application to apply when determined necessary by sampling through fiscal year.	Standards met as evidenced by _____.

Submitted by: _____ Date:_____

Approved by: _____ Date:_____

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: _____ **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency of Activity	VAMC Control	TOTAL SCORE

Document 5B1-1

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Procedure for Determining Significant Green Environmental Management Systems (GEMS) Environmental Aspects and Impacts

1. ***Purpose***. The purpose of this policy is to provide a system to consistently identify environmental aspects of Medical Center activities, products and services in order to determine those that may have a significant impact on the environment.

2. ***Policy***. This Medical Center shall ensure that the aspects with significant impacts are considered in setting environmental targets and objectives for environmental performance improvement activities.

3. ***Responsibility***.

   a. The *GEMS Coordinator* is responsible for the centralized collection of environmental aspects and impacts from the Service Line Managers.

   b. The *GEMS Committee* is responsible for:

      1) Analyzing significant aspects and impacts that the Medical Center has control over.

      2) Establishing Medical Center targets and objectives, operational and document controls.

      3) Determining which environmental aspects are significant.

      4) Implementing appropriate control measures.

      5) Controlling all related documents.

4. ***Procedures.***

   a. The GEMS Committee will establish an Environmental Aspect and Impact template to systematically identify those environmental aspects that may have a significant impact on the environment.

   b. The scoring of impacts (Attachment A) will incorporate the following factors:

      - The extent to which the aspect is regulated by law, regulation, Executive Order or other requirements.

      - The degree of risk to any exposed human population or exposed ecosystems.

      - The frequency of the activity.

      - The extent to which the aspect is under the control of the Medical Center.

c. These scores are documented on the GEMS Aspect template (Attachment B), and it is then submitted to the GEMS Committee.

d. The total of the scores will determine which environmental aspects are significant and, therefore, require detailed operational controls. The GEMS Committee will establish the significant aspect cut-off score after review of the templates from the Operating Units.

e. Environmental aspects and impacts will be re-evaluated whenever there are significant changes in materials, activities, procedures or other legal requirements, but at least annually.

5. ***Reference.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. Explanation of Aspects and Impacts Template Scoring
B. GEMS Aspects Template (Blank)

Distribution:

Attachment A to Document 5B1-1

Explanation of Aspects and Impacts Template Scoring

Compliance	
The extent to which the aspect is regulated by law, regulation, Executive Order or other requirement	**Score Assigned**
The aspect is not regulated or is in full compliance.	0
Compliance activity has been initiated.	1
Compliance activity has been scheduled.	2
There is an awareness of non-compliance status, considering compliance options.	3
The aspect is out of compliance and has taken no compliance activity to date.	4

Risk	
The degree of risk to any exposed human populations or exposed ecosystems	**Score Assigned**
Minor risk to human population and/or ecosystems.	0
Moderate risk to sensitive human populations and/or ecosystems.	1
Moderate risk to general human populations and/or ecosystems.	2
High risk to sensitive human populations and/or ecosystems.	3
High risk to the general human population and/or ecosystems.	4

Frequency	
Frequency that this activity occurs	**Score Assigned**
< Once per calendar year	0
Biannually or less	1
Monthly	2
Weekly	3
Daily or more	4

Control	
The extent to which the aspect is under control of the Medical Center	**Score Assigned**
Medical Center has no control or influence.	0
Medical Center has some influence or control.	1
Medical Center has influence parity with other entities with some level of control.	2
Medical Center has significant influence.	3
Medical Center has total control over this aspect.	4

Document 5B1-2

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management System (GEMS)
Procedure for Legal and Other Requirements

1. ***Purpose***. To guide the staff in identifying and accessing the legal and other requirements to which this Medical Center subscribes.

2. ***Policy.*** This Medical Center abides by the environmental regulations promulgated by federal, state and local authorities, as well as the requirements of Executive Orders, VA policy and the Joint Commission for Accreditation of Healthcare Organizations (JCAHO) Standards, National Fire Protection Agency (NFPA) and other industry codes. All Medical Center staff with environmental responsibilities will have access to these codes, standards and regulations.

3. ***Responsibilities.***

   a. *Information Resources Management (IRM)* provides the means for access to electronic databases for legal and other requirements to those staff having environmental responsibilities.

   b. *Operating Units* will identify applicable legal and other requirements for their activities, identify staff having need to access these requirements due to their environmental responsibilities and ensure the identified staff are given access to the regulations, standards and policies.

   c. *GEMS Coordinator* assists Operating Units in identifying and implementing the legal and other requirements.

   d. GEMS Committee reviews the effectiveness of this element of the GEMS and makes improvements when warranted.

4. ***Procedures.***

   a. With the assistance of the GEMS Coordinator, *Operating Units* will track updates to legal and other requirements and incorporate compliance with the new requirements into their activities.

   b. While most of the federal environmental regulations are accessed online, the state and local regulations are accessed via hardcopy. The *GEMS Coordinator* attends periodic meetings with local regulators to keep up-to-date on those requirements and will then pass any information on new requirements on to affected Operating Units.

c. The *GEMS Coordinator* attends basic training and update courses and participates in VHA conference calls and Email groups to stay abreast of the current legal and other requirements.

d. The *Operating Units* with the assistance of the GEMS Coordinator use the following list to identify legal and other requirements affected by the activities of the Operating Unit.

1) Examples of applicable legal and other requirements and further information may be accessed through:

a) US Environmental Protection Agency (EPA) - http://www.epa.gov.

b) Hospitals for a Healthy Environment - http://www.h2e-online.org.

c) (Enter your State) Department of Health and Environment.

d) Center for Disease Control (CDC) - http://www.cdc.gov.

e) City/County Ordinances.

f) Office of the Federal Environmental Executive - www.ofee.gov.

g) Occupational Safety and Health Administration (OSHA) - http://www.osha.gov.

h) VISN Safety/Industrial Hygiene Manager.

i) VHA Directives and Informational Letters (IL).

j) GEMS Guidebook (Book 6A).

k) Environmental Compliance Guidebook (Book 6B).

l) Emergency Management Program Guidebook (Book 8).

m) Executive Orders.

2) Applicable requirements may include, but are not limited to:

a) Water:

- Clean Water Act (33 USC 125 et seq.; 40 CFR 100-140).
- Wild and Scenic Rivers Act (16 USC 1271-1287).
- Safe Drinking Water Act (42 USC 300f et seq.).
- Rivers and Harbors Act, Section 10 (33 U.S.C. 403).
- Clean Water Act, Section 404.

b) Air:

- Federal Clean Air Act (42 USC 7401 et seq.).
- Local Air Pollution Control Agency Regulations.
- National Emissions Standards for Hazardous Air Pollutants (Asbestos) (40 CFR Part 61).

c) Solid Waste:

- Resource Conservation and Recovery Act (42 U.S.C 6901 et seq.).

d) Hazardous Materials and Waste:

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C. 9601 et. seq.).
- National Contingency Plan (40 CFR 300 et. seq.).
- Underground Storage Tanks Resource Conservation and Recovery Act (42 USC 6991 [Subchapter IX]).
- Federal Underground Storage Tank Regulations (40 CFR 280).
- Hazard Communication Standard (OSHA Regulations, 29 CFR 1910; General Occupational Health Standards, WAC 296-24 and Hazardous Waste Operations and Emergency Response 296-62, Part P).
- PCB Management (Toxic Substances Control Act, 15 USC 2605(e); PCB Regulations, 40 CFR Part 761; Dangerous Waste Regulations, WAC CH 173-303).
- Transportation of Hazardous Materials, CDL Requirements (Hazardous Materials Transportation Act, 49 USC 5101 et seq.; DOT Regulations, 49 CFR Part 100 et seq., including 107, 171). Also overlaps with Hazardous Waste Regulations.
- Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 135 et seq.).
- National Fire Code and other local jurisdiction Fire Codes.
- Emergency Planning and Community Right-To-Know Act (EPCRA) (SARA Title III).
- Federal Power Act (16 USC 791a-828).

e) Environmental Review:

- National Environmental Policy Act (NEPA) (42 USC 4321 - 4370).

f) Historical and Archeological:

- National Historic Preservation Act (NHPA) (16 USC 470).
- Archeological and Historic Preservation Act (16 USC 469).
- Regulations Implementing the NHPA (36 CFR Part 800).

g) Other Federal Regulations:

- Endangered Species Act (16 USC 1531 et seq.).
- Executive Orders.

h) Other State and Local Requirements:

- Coastal Zone Management Act (16 USC 1451 et seq.).
- Local Government Noise Ordinances.
- Local Government Land Use and Construction Codes.
- Local Sensitive Areas Ordinance.
- Uniform Fire Code.

i) Other Requirements as may be applicable.

5. ***References.*** GEMS Guidebook (Book 6A); Environmental Compliance Guidebook (Book 6B); Handbook for the Management of Hazardous Waste (Book 6C).

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Attachment B to Document 5B1-3

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form

(Note: Use one form per objective)

Date Oct. 5, 2004

Individual Responsible for Implementation:
Housekeeping Officer and Infection Control Practitioner

Environmental Objective:
To reduce the generation of biohazardous waste.

Related Target(s):
3% reduction by weight of biohazardous waste.

Related Significant Environmental Aspect(s):
Air and land pollution due to disposal of biohazardous waste.

Service Specific Function and/or Department:
Primary Care, Behavior Health, Surgery, Specialty & Diagnostics, Housekeeping

Target Date (Month/Year): *End of Calendar Year*

Frequency of Monitoring:	*Weekly*	*Monthly*	*Quarterly*	*Annually*
(Check one)		*X*		

Action Plan:
Implement biohazard segregation program, implement staff education program, identify areas for biohazard containers, continuous monitoring during environmental rounds.

How will this objective be met? (Attach additional pages as necessary)

1. *Housekeeping will survey all areas of the health care system to determine appropriate placement of biohazard receptacles.*
2. *Infection Control will develop training curriculum and deliver staff education.*
3. *Monitoring will be performed by housekeeping staff during trash removal and surveyed during environmental rounds.*

What operational controls shall be incorporated to achieve this objective?
Strategic placement of waste containers.

How will this objective be tracked? (Attach additional pages as necessary)
All biohazard waste will be weighed prior to transport off-site.

What resources will be required to achieve this objective? (Attach additional pages as necessary)
Purchase of additional municipal and biohazardous waste containers.

Document 5B1-3

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Establishing Objectives and Targets for the Green Environmental Management Systems (GEMS) Program

1. ***Purpose***. To ensure that the organization establishes and maintains documented environmental objectives and targets and has a process to implement the steps necessary to achieve the objective and targets.

2. ***Scope***. This procedure applies to environmental objectives and targets set at all relevant levels within the organization.

3. ***Definitions***.

   a. Environmental Objective - A goal that is consistent with the environmental policies and considers significant environmental impacts and applicable laws and regulations. Objectives are quantified wherever practicable.

   b. Environmental Target - A detailed performance requirement (quantified wherever practical) based on an environmental objective. A target should be met in order for the underlying objective to be achieved.

4. ***General***. The organization establishes environmental objectives and targets in order to implement environmental policies. Objectives and targets also provide a means for the organization to measure the effectiveness of its environmental efforts and to improve the performance of the environmental management system. In establishing environmental objectives, the organization considers:

   a. Applicable laws and regulations (and requirement of other programs, such as …).

   b. Environmental aspects of the organization's activities and products.

   c. Technological, financial, operational and other organizational requirements.

   d. The views of employees and other interested parties.

   Based on the organization's environmental objectives, targets are established for different functions within the organization and for different areas of the facility. For example, the organization may establish an environmental objective to "reduce waste generation by 10% per year." Based on this objective, different areas of the facility might set targets for reducing individual waste streams in order to ensure that the organization's objective might also be translated into individual projects (such as changes in production processes, materials or pollution control equipment) in different facility areas.

5. ***Procedures***.

   a. The *GEMS Committee* is responsible for establishing environmental objectives on an annual basis. To initiate the process, the *GEMS Coordinator* or designee holds a meeting of all staff members to discuss the development of environmental objectives. Objectives are action and prevention-oriented and are intended to result in meaningful improvements in the organization's environmental performance.

   b. *Each Service Line Manager* is responsible for providing input from his or her own function (Fiscal, Engineering, etc.) or shop area (fabrication, assembly, shipping/receiving, etc.). The *GEMS Committee* is responsible for providing input on applicable laws and regulations, significant site environmental impacts and the views of interested parties.

   c. As a starting point, the *GEMS Committee* evaluates performance against environmental objectives for the current year. As part of this effort, the *GEMS Committee* examines the results of its environmental performance evaluations.

   d. Preliminary environmental objectives are developed for further discussion and evaluation. *Each Service Line Manager* is responsible for evaluating the potential impacts of the proposed environmental objectives within their Service Line or department. The organization's *GEMS Committee* reviews proposed objectives to ensure consistency with the overall environmental policy.

   e. Environmental objectives are finalized, based on review comments from the Service Line Managers and employees. *Each Service Line Manager* identifies the impacts of the objectives of their function or shop, establishes targets to achieve the objectives and develops appropriate measures to track progress towards meeting the objectives and targets.

   f. *Each Service Line Manager* is responsible for communicating objectives and targets and the means for achieving them to others in Service Line/Program/department. They will also designate roles and responsibilities of department personnel and provide appropriate training necessary to meet the objectives and targets.

   g. Progress towards the objectives and targets is reviewed on a regular basis at management meetings. The progress is also communicated to employees via bulletin boards and other similar means.

   h. At the end of each calendar year, the *organization's management* reviews its performance with regard to achieving the objectives and targets. This information is used as input in determining the objectives and targets for the succeeding year.

6. ***Steps for Establishing Objectives and Targets.***

   Step 1 The development of objectives and targets result from a comprehensive evaluation of all processes in every department. Collect as much information as possible prior to surveying the area.

Information Sources	**How They Will Help?**
• Process maps • Waste and emission data • Site maps • Compliance audit reports • List of identified environmental aspects and impacts • Communications from interested parties • Others??	• Identify process steps with environmental aspects • Determine current wastes and sources, etc. • Determine if there are any processes that may be seasonal and should be reviewed at a different time of the year.

Step 2 Look at **processes** and **activities** associated with significant environmental aspects. Are there any **other issues** the GEMS Committee should consider, in addition to those listed above as significant impacts?

Process or Activity	**Issues**	**Possible Objectives & Targets**

Step 3 List any new **regulatory requirements** that affect the healthcare environment (or other regulations for which the need for additional actions has been identified).

Regulations; Other Requirements	**Possible Objectives & Targets**

Step 4 Consider inputs from **interested parties**. Any need for additional objectives related to views of neighbors, community groups or other parties?

Inputs from Interested Parties	**Possible Objectives & Targets**

Step 5 Evaluate the lists of **possible objectives developed in Steps 4 - 7**. GEMS Committee determines if these objectives are:

- Reasonable.
- Technologically feasible.
- Consistent with other organizational plans/goals.
- Affordable.

List preliminary objectives and targets based on this exercise:

Selected Preliminary Objectives
•
•
•

Step 6 Determine how you will measure each of the selected preliminary objectives. If you cannot establish an effective way to measure it, put that objective "on-hold" for later consideration. If applicable, evaluate those issues placed "on-hold" in the annual evaluation and determine if it is feasible for implementation in the next year.

Selected Objectives	**Performance Indicator(s)**

Step 7 For each objective that you selected, determine **who** is going to develop the **action plan** (who, what, when, where, how). List these names below:

Selected Objectives	**Responsibility for Action Plan**

7. ***Reference.***

8. ***Rescission.***

9. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. Environmental Objectives and Targets Process Chart
B. Objective and Target Form

Distribution:

Attachment A to Document 5B1-3

PLAN – DO – CHECK – ACT

Environmental Objectives and Targets

PLAN

Select Objectives & Targets

(Procedure for Objectives & Targets)

DO

Establish Operational Controls and Measuring & Monitoring for Objectives & Targets

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

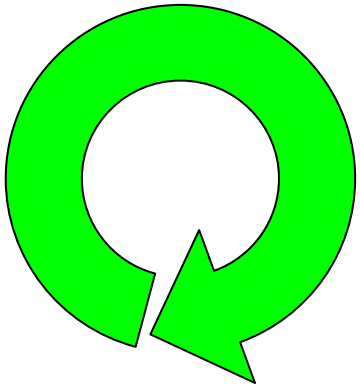
Monitor & Measure Consistency with Objectives & Targets

(Procedure for Monitoring & Measuring)

ACT

Implement & Evaluate Corrective Actions Discovered During Monitoring & Measuring

(Procedure for Corrective Actions)



Document 5B1-4

S A M P L E

Green Environmental Management Systems (GEMS) Responsibility Matrix

	Medical Center Director	**GEMS Coordinator**	**Business Service Line**	**Facility Mgmt. Service**	**Other Service Chief**	**Operating Section**	**Employees**
Communicate the importance of environmental management	L	S			S		
Coordinate auditing efforts		L			S		
Track/analyze new regulations (and maintain library)		L					
Obtain permits and develop compliance plans		L		S	S		
Prepare reports required by regulations		L		S			
Coordinate communications with interested parties		L					
Train employees		S	L	L	L	S	
Integrate environmental management into recruiting practices			L	L	L	L	
Integrate environmental management into performance appraisal process	L		S	S	S	S	
Communicate with contractors on environmental expectations			L	S			
Comply with applicable regulatory requirements	L	L	S	S	S	S	S
Conform with organization's environmental management system requirements	L	L	S	S	S	S	S

	Medical Center Director	**GEMS Coordinator**	**Business Service Line**	**Facility Mgmt. Service**	**Other Service Chief**	**Operating Section**	**Employees**
Maintain equipment/ tools to control environmental impact						S	S
Monitor key processes		S	S	S	L	S	
Coordinate emergency response efforts	L	S					
Identify environmental aspects of products, activities, or services	S	S	L	S	S	S	
Establish environmental objectives and targets	L	S			S		
Develop budget for environmental management		S					
Maintain environmental management records (training, etc.)		L					
Coordinate environmental management document control efforts			S			L	

VHA Environmental Training Program Plan

Training	Agenda	Audience	Forum	Resources
Regulatory Compliance Training				
National Environmental VA Meeting Kick-off	Intro by top VA Management to show environmental commitment; Overview of major statutes and GEMS.	Environmental Coordinators, HQs and VISN Safety/Health, Medical Center Directors/ Associate Directors	4 day (2 day compliance, 2 day GEMS) conference face-to-face in Spring 2004. Taped for future use by VA.	With EPA HQs and Regional help (suggestion to make it a civilian-wide conference and add RCRA training).
Environmental Compliance 101	Overview of major statutes (i.e., RCRA/UST, CAA, CWA, SPCC, [storm water, wetlands] EPCRA, TSCA [Lead, PCBs], SDWA, FIFRA). Compliance with other requirements such as Executive Orders and VA Policy, etc.	Environmental Coordinators, HQs, VISN Safety/Health, Program/Service Managers, Director/Associate Directors	1-1½ day face-to-face in each EPA Region during FY2004 that will be taped for future use by VA.	EPA Regions FFPMs – Region 1 will hold in October 2003.
RCRA Hazardous Waste Mgmt Training and Annual Refresher	Required EPA hazardous waste management training.	Environmental Coordinators, VISN Safety/Health	Distance Learning by VA.	Numerous contractors give course. NETI RCRA Inspector Training CD-ROM.
Identification of Hazardous Waste for Healthcare	Detailed discussion on waste characterization.	Environmental Coordinators, HQs, VISN Safety/Health	1 day - could be broadcast or videotaped.	EPA Region 2 has developed - to be given November 12th.
Required Certification Training	Necessary training to be certified to perform task.	Employees such as HVAC, wastewater treatment, pesticides applicators, boiler plant operators	As required.	Many contractors give course.
Laboratory-Specific Environmental Training	Describes the environmental requirements and best management practices that relate to laboratories such as RCRA, CWA and CAA. At a minimum, it will satisfy the training requirements of RCRA 265.16. Also, covers auditing questions.	Environmental Coordinator, VISN Safety/Health, Laboratory employees, including the Laboratory Program Manager	CD-ROM or interactive video developed by VA.	GEMS guide for small laboratories. Lab 21 Website.

Training	Agenda	Audience	Forum	Resources
DOT training		Environmental Coordinators, Warehouse shippers		
UST Training Module	Review of the underground storage tank requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	UST guidebooks and website. EPA UST presentations. UST auditing protocol.
SPCC Training Module.	Review of the SPCC requirements at a facility. Includes how to develop a SPCC plan and auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	SPCC website. EPA SPCC presentations. SPCC booklets.
Clean Water Act Training Module.	Review of the CWA requirements at a facility such as NPDES, pre-treatment, wetlands and storm water. Includes auditing questions. May want to include security issues as relates to wastewater plants.	Environmental Coordinators, VISN Safety/Health, Wastewater Plant Operators, COTR if construction project	CD-ROM or interactive video developed by VA.	EPA NPDES website. EPA presentations. Construction Compliance Assistance Center.
Toxic Substances Training Module	Describes requirements and best management practices related to Asbestos, Lead-Paint, PCBs and Mercury. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, COTR if demolition/renovation project	CD-ROM or interactive video developed by VA.	EPA Asbestos webpage. Numerous Mercury elimination documents. Auditing Protocol for TSCA.
Facilities Maintenance Module	Environmental Requirements and best management practices that apply to the facilities maintenance operations such as CAA, CWA, SDWA (UIC), FIFRA, RCRA, Universal Waste, TSCA, beneficial landscaping, etc. It must meet the RCRA 260.16 training requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facilities maintenance personnel (e.g., motor pool, paint shop, grounds keeping, HVAC, plumbing, electricians, carpentry, etc.)	CD-ROM or interactive video developed by VA.	EPA's national CA centers.
Clean Air Act Training Module	Review of Clean Air Act requirements that apply to healthcare facilities. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Boiler personnel	CD-ROM or interactive video developed by VA.	EPA Websites. CFC checklists.
Medical Waste Training Module	Review of requirements related to medical waste. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Housekeeping	CD-ROM or interactive video developed by VA.	State Agencies.
EPCRA Training Module	Review of EPCRA requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health	CD-ROM or interactive video developed by VA.	EPA Websites. EPA TRI courses.

Training	Agenda	Audience	Forum	Resources
SDWA Training Module	Review of SDWA requirements. May want to include security issues as related to drinking water plants. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Drinking Water Treatment Plant Operators	CD-ROM or interactive video developed by VA.	EPA Websites.
Dental Environmental Compliance Module	Review of requirements and best management practices related to dental facilities, such as RCRA. Including auditing questions.	Environmental Coordinators, VISN Safety/ Health, Dental personnel	CD-ROM or interactive video developed by VA.	Vermont's Dental Guide.
Pharmacy Environmental Compliance Module	Review of requirements and best management practices related to pharmacies, such as RCRA. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Pharmacy personnel	CD-ROM or interactive video developed by VA.	Pharmacology Website.
Environmental Compliance for Lawyers	Review major environmental laws applicable to VAMCs, state and federal regulator's procedures for inspections, violations, fines and VAMC legal defense strategies.	District Counsel	?	?

Green Environmental Management System Training

GEMS Training For Top Management	Overview of GEMS Elements.	Directors and Associate Directors at VAMC, HQs and VISN level GEMS Coordinators & Auditors	2 Hour broadcast by VA.	Diane Thiel, EPA Region 8 & Gary Chiles.
Designing Your GEMS – Federal Facility Workshop	More detailed discussion of GEMS elements and hands-on workshop with VA examples.	GEMS Coordinators and Auditors	2-day conference. Same as what is offered in Kick-off.	Gary Chiles & Carol Bell (Contractors). May be offered by EPA Regions in near future.
GEMS Element-By-Element Hands-On Training	Detailed discussion of elements – one element at a time with facility-specific help.	GEMS Coordinators, Program/Service Managers (or designated person)	V-TEL by VISN. Done once a month until GEMS complete.	See metal finishing GEMS workshops - Linda Darveau - EPA Region 1.
GEMS Committee	Training on the implementation of the GEMS	GEMS Committee	All GEMS Committee members are required to attend the 4-hour course on the implementation of the GEMS Program.	Power Point presentation located in the GEMS Guidebook.

Training	Agenda	Audience	Forum	Resources
Facility-Specific GEMS Training	Training on facility-specific policies and procedures related to GEMS.	All Employees	A minimum of annually.	GEMS Booklet, Self-learning module, Safety Blitz, etc.
ISO 14001 Lead Auditor Course	Training on how to conduct a GEMS audit.	VISN GEMS Auditor	Classroom for 5 days.	Offered by many contractors.

Pollution Prevention/Environmental Stewardship				
Environmental Preferable Purchasing/ RCRA 6002/ Executive Orders	Training on buying environmentally preferable products and complying with RCRA 6002 and Executive Orders.	Environmental Coordinators, VISN Safety/Health, COTRs, COs, Credit Card Holders, Chief, Acquisition & Materiel Management	CD-ROMs, interactive videos, PowerPoint presentations.	H2E, EPA EPP Program, OFEE. Lyons VA.
Waste Minimization/ Product Substitution	Training on waste minimization at healthcare facilities.	Environmental Coordinators, VISN Safety/ Health, Program/Service Managers, Credit Card Holders, COTRs, COs	CD-ROMs, videos	H2E, EPA Wastewise.
Green Cleaning	Awareness of more environmentally and safer cleaning products.	Environmental Coordinators, VISN Safety/Health, Housekeeping/Laundry	CD-ROMs, videos.	Diane Thiel Region 8, EPA EPP Program, Greening Govt CD EPA Regions 1-3.
Green Building	Awareness of building and renovating in a greener manner.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROMs, videos.	EPA, LEEDS.
Indoor Air Quality	Training on indoor air quality.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROM by VA.	Completed.
P2 Training for Auto Repair Shops	Training on pollution prevention techniques available to auto repair shops/fleet maintenance.	Motor Pool, Environmental Coordinators, VISN Safety/ Health	Video and workbooks.	EPA Region 9 has completed.
Best Management Practices for Outdoor Shooting Ranges	Best management practices for outdoor shooting ranges.	Outdoor shooting ranges if built.	Guidance Document.	EPA Region 2 Guide.

Attachment B to Document 5B1-5

S A M P L E

Green Environmental Management System (GEMS) Training Log

Training Topic	Attendees*	Frequency	Course Length	Course Method	Comments	Date Completed
GEMS Awareness						
Supervisor GEMS Training						
Hazardous Waste Management						
Hazardous Waste Operations						
Spill Prevention and Response						
Chemical Management						
Emergency Response						
Accident Investigation						
Hazardous Materials Transport						
Hazard Communication						
Personal Protective Equipment						
Fire Safety						
Electrical Safety						
Hearing Conservation						
Confined Space Entry						
Lock-out/Tag-Out						

Training Topic	Attendees*	Frequency	Course Length	Course Method	Comments	Date Completed
Blood borne Pathogens						
Job-Specific Training (list)						

***Attendees Code**

1 All Employees
2 Supervisors/Managers
3 Operators
4 Maintenance
5 Laboratory
6 Clinical

Document 5B1-5

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS) Training Program

1. ***Purpose.*** (Insert Medical Center Name) will provide the necessary educational opportunities to assure that all employees are knowledgeable of the Green Environmental Management Systems (GEMS) program and the identified aspects related to his/her specific job tasks.

2. ***Policy.*** It is the policy of this Medical Center to provide effective training to all employees on the implementation and processes associated with GEMS and to monitor staff knowledge to assure an effective program.

3. ***Responsibilities.***

   a. The *GEMS Coordinator* is responsible for the overall development and implementation of the GEMS training program.

   b. The *Education and Training Department* will monitor employee compliance and enforce attendance at required training sessions for all employees in environmental positions as relates to their specific roles in the GEMS program. Employee compliance will be monitored using TEMPO.

   c. *Supervisors* are to ensure that all employees receive appropriate training in GEMS.

4. ***Procedures.***

   a. The *GEMS Coordinator*, in association with the Education and Training Department, shall develop a training program reflective of the design and implementation of the GEMS program. Training will include emphasis on the following:

      1) The importance of conformance to the policy.

      2) Recognition of significant aspects identified by the GEMS Committee.

      3) Individual roles and responsibilities regarding GEMS implementation and operation.

      4) Results of nonconformance.

      5) Environmental Awareness Training to all employees, including implementation in the New Employee Orientation program.

      6) Annual Reporting Requirements.

   b. All employees shall possess the knowledge and skills required to effectively implement the GEMS. Competency shall be monitored by the employee's ability to demonstrate through the implementation process that sufficient education and training has been provided. Monitoring will be performed by annual audits, questionnaires and trending of

staff knowledge. Information pertaining to monitoring of staff knowledge will be processed and reviewed by the GEMS Committee and forwarded to the Environment of Care Committee for review.

c. The GEMS brochure, Green Environmental Management Systems (GEMS), will be made available to all employees, in addition to the basic awareness training that will be provided.

5. ***References.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. VHA Environmental Training Program Plan
B. GEMS Training Log

Distribution:

Document 5B1-6

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management System (GEMS) Communication to External and Internal Parties

1. ***Purpose***. This procedure establishes a process for outreach and communication with external/internal parties regarding the organization's Green Environmental Management Systems (GEMS).

2. ***Policy.*** It is the policy of this VA Medical Center to ensure that the environmental management policy is well documented, implemented and communicated to all employees and is available to the interested public.

3. ***Scope***. This procedure describes how the VA Medical Center receives, documents and responds to communications from external/internal parties. It also describes proactive steps that the organization takes to maintain a meaningful dialogue with external/internal parties on environmental matters.

4. ***Definition***.

   Interested Parties - Individuals or groups with an interest in the environmental impacts of the organization's products, activities or services. These parties include regulators, local residents, employees, customers, environmental groups and the general public.

5. ***Procedures***.

   a. The organization uses a number of mechanisms to ensure effective communication with interested parties. These mechanisms include regulatory filings (such as permit applications and reports), posting of policies and procedures on the VA intranet site, open houses and informal discussions with regulators, community representatives and local business leaders.

   b. To solicit the views of interested parties, the Medical Center may use additional techniques, including (but not limited to) surveys, community advisory panels, newsletters or informal meetings with representatives of external/internal groups.

   c. General rules for external/internal communications require that the information provided by the organization:

      - Be understandable and adequately explained to the recipient(s).
      - Present an accurate and verifiable picture of the organization and its environmental management system, its environmental performance or other related matters.

d. Management of Communications from External/Internal Parties.

1) Inquiries and other communications (received by mail, fax, E-mail, telephone or in person) from external/internal parties concerning the organization's GEMS or environmental performance may be directed to a number of the organization's representatives, including the Facilities Manager, the GEMS Coordinator and the Human Resources Manager. All such communications are reviewed by the GEMS Coordinator or his/her designee to determine the appropriate response.

2) Communication with representatives of regulatory agencies is delegated to the organization's *GEMS Coordinator*, who maintains records of all such communications (both incoming and outgoing). In the absence of the GEMS Coordinator, communications with regulatory officials are delegated to the Chief, Facilities Management.

3) Copies of all other written communications on environmental matters are maintained by the *GEMS Coordinator*. All non-written communications from external/internal parties are documented using telephone logs or similar means. All records of external/internal communications are maintained by the GEMS Coordinated.

4) A record of the responses to all communications from external/internal parties is maintained by the GEMS Coordinator in files designated for that purpose.

e. Outreach to Interested Parties.

1) The organization solicits the views of interested parties on its GEMS, its environmental performance and other related matters. In particular, such outreach is conducted when significant changes at the facility are being considered, such as facility expansion or other actions that might affect the actual or potential environmental impacts of the organization's products, activities or services.

2) As part of the Management Review process, the team designated to conduct the review evaluates proactive efforts to communicate with external/internal parties. Based on this evaluation and other factors, the organization's management determines the need for outreach with external/internal parties in the coming year and how such communications can be carried out most effectively.

f. External Hazard and Emergency Communications. (Note: All external/internal communications regarding emergency response are addressed in the Emergency Management Plan.)

6. ***Reference.***

7. ***Rescission.***

8. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Worksheet: Document Control				
Document	**Who Will Use It**	**Permanent Location**	**Periodic Review Schedule/ Who**	**When Can Be Destroyed**
			/	
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Contact Person:		Date Completed:		

Document 5B1-7

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS) Document and Record Control

1. ***Purpose.*** To develop written procedures to ensure proper management of Green Environmental Management Systems (GEMS) documentation and records.

2. ***Policy.*** The (specify VAMC) will maintain documents and records as recommended in the VHA Green Environmental Management Program guidelines. Documents are policies and procedures that are subject to change and update on a regular basis. Records are documents that record tests, inspections, maintenance, etc., which will not change and will serve to demonstrate past performance.

3. ***Responsibility.*** The GEMS Coordinator is responsible to maintain facility level documents and records per requirements of this Medical Center Memorandum. Program Managers/ Service Chiefs are responsible for maintaining documents and records in a similar manner for their respective area.

4. ***Procedures.***

   a. *GEMS Documents.*

      1) The GEMS Coordinator shall maintain and control the GEMS Manual and all other documents associated with it, such as the environmental objectives and targets and management plans to achieve them.

      2) In maintaining and controlling the GEMS Manual, the GEMS Coordinator shall ensure that the GEMS Manual and its associated documents are publicly available and that updates adding new information and/or removing obsolete information are made to the GEMS Manual immediately following any agreed changes to documents.

      3) The GEMS Coordinator shall preserve an original of all documents and changes, establish and maintain a record of all document changes, and ensure that all documents are numbered, dated with dates of origination or revision and, where necessary, signed and approved.

   b. *Required Records.*

      1) Audits. Copies of all audits (Baseline, Medical Center Self-Audits, Annual and Incident) are kept on file at the GEMS Coordinator's office.

      2) Manifests. Copies of all manifests and bills of lading related to hazardous waste or recycled materials, such as batteries and used oil, shall be kept at the GEMS Coordinator's office.

3) Manuals for all equipment with environmental impacts must be acquired and kept within each using Service.

4) Training.

   a) Copies of records of all environmental training shall be kept with the environmental records and/or in the employee's official electronic training record (TEMPO).

   b) Additional copies shall be kept in accordance with other VA requirements.

5) Annual Reports.

   a) Copies of the GEMS Annual Report shall be kept in the GEMS Coordinator's Office.

   b) Additional copies shall be kept in accordance with other VA requirements.

c. *Location.*

1) The environmental files at the Medical Center should be kept in 3-inch binders for ready access or, if possible, electronically on shared drives.

2) Manifests may be kept in filing cabinets within a drawer specifically designated for environmental records.

3) Manuals shall be kept in a protected location in the work areas or on shared drives accessible to all persons who work in areas of significant environmental impacts.

d. *Revision.*

1) Dated Materials.

   a) Materials that are date-sensitive will be date stamped.

   b) VA Central Office controlled documents shall be kept in accordance with their expiration dates.

2) Annual review: Dated materials are to be reviewed annually, based on the original date stamping, to determine if the document is current.

3) New requirements revise current documents as necessary.

4) Documentation will be updated as outlined in Medical Center Memorandum 00-XXX.

Note: VAMCs that do not have a facility policy on document control will need to create such a policy that addresses the following:

- ***Document Approval and Issue*** *- Authorized personnel, including the VA Medical Center GEMS Coordinator and others appointed by the VA Medical Center Director, shall review VA Medical Center specific environmental documents for adequacy and approve them prior to issuance. Authorized personnel will ensure that environmental documents are made available to appropriate staff.*

- ***Periodic Review of Environmental Documents*** *- The VA Medical Center GEMS Coordinator shall review all environmental documents on an annual basis and update documents, as necessary. Upon issuance of updated documents by VA, VHA and federal, state and local regulators, the VA Medical Center GEMS Coordinator shall replace the outdated documents as soon as feasible and inform appropriate VA Medical Center staff of the availability of the updated documents. Authorized personnel shall review updated documents promptly, remove obsolete environmental documents and archive them in accordance with VA and VA Medical Center procedures.*
- ***Document Changes/Modifications*** *- Changes to documents shall be reviewed and approved by the same functions or organizations that performed the original review and approval, unless specifically designated otherwise. Review and approval of changes to documents shall follow normal VA Medical Center procedures related to document approval.*
- ***Distribution of Copies of Documents*** *- The VA Medical Center GEMS Coordinator is responsible for the distribution of copies of environmental documents via standard VA Medical Center channels. The VA Medical Center GEMS Coordinator shall maintain a distribution list in order to ascertain that staff with environmental responsibilities have been duly informed of the information contained in the document and to ensure that the same staff is advised of changes to any/all documents.*
- ***Legibility*** *- Environmental documents shall be produced and maintained so that they are legible.*
- ***Document Dates*** *- Environmental documents that are part of the VA Medical Center GEMS shall be dated. When documents are revised, the date of revision shall be included on the document.*
- ***Document Maintenance*** *- Environmental documents that are part of the VA Medical Center GEMS shall be maintained in a central location under the control of the VA Medical Center GEMS Coordinator. Environmental documents germane to the operation of VA Medical Center organizations shall also be maintained by the organization under the control of the organization's manager. Environmental documents may also be maintained electronically in accordance with VA Medical Center policy and procedures.*
- ***Retaining Documents*** *- Environmental documents that are part of the VA Medical Center GEMS shall be retained at least for the length of time required by law and/or VA and VA Medical Center Policy. In general environmental documents shall be maintained as*

long as they are current and/or represent applicable VA and VHA policy or guidance that remains in force.

e. *Retention.*

1) VA record retention policies are to be followed.

2) Regulatory: Environmental records shall be retained in accordance with regulatory requirements, but for a minimum of five years.

3) The following documents shall not be disposed of:

a) Manifests for the disposal of hazardous and non-hazardous waste.

b) Records pertaining to the VA Medical Center's involvement in Superfund projects or other projects that involve remediation or removal actions related to environmental contamination and environmental releases.

4) Records related to the environmental investigation conducted in conjunction with real property transactions including, but not limited to, sale and lease.

5. ***Reference.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. Explanation to Policy Writer
B. Document Control Worksheet

Distribution:

Attachment A to Document 5B1-7

Explanation to Policy Writer

I. Purpose

Design a standardized framework your installation will use to develop and organize the various types of documentation required by ISO 14001.

II. Importance

Complete, well-organized documentation is essential for describing, managing, evaluating and improving the Green Environmental Management Systems (GEMS). GEMS documentation provides a written description of your installation's GEMS and directions for how things should be done. Developing GEMS documentation is an ongoing process. Some of the required documentation already exists on your installation - you just need find it, review it and ensure that it is kept current. Other parts of the documentation required by ISO 14001 will take time to develop. The following subsections describe the types of GEMS documentation required.

A. Documentation Hierarchy

Think of GEMS documentation as a tiered system. Four types of GEMS documentation typically constitute the hierarchy. (Records are not considered part of documentation.) As you move down the pyramid, the amount of information, the degree of specificity and the number of pages generally increase.

B. Step-by-Step Guidance

Documentation and records assist employees to perform their jobs in ways consistent with the installation's environmental policy and the goals and objectives of the GEMS. The Standard Operating Procedures (SOPs) should incorporate significant environmental aspects, objectives and targets, and monitoring and measurement procedures into the daily activities or job practices of facility personnel. Environmental personnel should work with unit leaders and supervisors to produce SOPs that support the GEMS. These SOPs give specific, detailed instructions that describe the methods for attaining environmental goals and, hence, complying with environmental policy. Although most SOPs are already in place, reviewing and revising them can be a lengthy process. We recommend you develop a prioritized schedule that starts with environmentally significant processes or activities at your facility and maintain steady progress toward revising the SOPs.

C. GEMS Records

GEMS *records* are considered part of GEMS *documentation*. Documentation describes policies, procedures and other directive information, while records provide a written history of GEMS performance and actions completed (such as training).

Document 5B1-8

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Procedures for Green Environmental Management Systems (GEMS) Operational Controls

1. ***Purpose***. To ensure that operational controls are established so all activities conform to the Green Environmental Management Systems (GEMS) policies, objectives and targets.

   Note: Operational controls include those policies, procedures and instructions in place to minimize the potential environmental impact of the VA Medical Center's activities and processes. Operational controls generally apply directly to the VA Medical Center's processes and activities (e.g., segregation of medical waste, maintenance work, boiler plant operations, etc.). A procedure is a prescribed, sequential series of activities often performed by several individuals or a team (i.e., boiler startup procedures, disposal of contaminated sharps).

2. ***Policy***. It is the policy of this VA Medical Center to establish operational controls for significant environmental aspects.

3. ***Responsibilities***.

   a. The *GEMS Committee* is responsible for ensuring that operational controls are in place for all significant environmental aspects. It also much ensure that the operational controls reflect the actual practice of Operating Units and meet environmental regulations and other requirements. When environmental aspects impact more than one Service Line/Department, the *GEMS Committee* ensures that operational controls are both consistent and coordinated. The *GEMS Committee* directs VA Medical Center organizations to change operational controls to better meet environmental compliance requirements and the requirements of the VA Medical Center GEMS.

   b. *All Medical Center Service Chiefs/Service Line Directors* ensure that the Operating Units under their control develop operational controls and that these controls are consistent across the Service Line with the VA Medical Center GEMS and the direction of the GEMS Committee

   c. *Operating Units* develop operational controls for significant aspects to ensure conformance with the GEMS policies, objectives and targets.

4. ***Procedures.***

   a. The GEMS Committee identifies significant environmental aspects.

b. Operating Units develop and/or review existing operational controls to ensure that they meet GEMS requirements. These are usually contained in written Standard Operating Procedures (SOPs).

c. Operating Units provide operational controls to the GEMS Committee for review and approval.

d. A review of the effectiveness of operational controls is evaluated in the following ways:

- During GEMS gap analysis.
- As a result of an Environmental Compliance Audit.
- By monitoring and measuring the objectives and targets.
- As may occur during facility operation.

e. Corrective actions regarding operational controls are implemented as soon as practical after being identified (see GEMS Procedure for Corrective/Preventive Actions, Document 5B1-11 in this Guidebook).

5. ***Reference.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B1-9

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Green Environmental Management Systems (GEMS)
Emergency Planning and Response

1. ***Purpose.*** To establish and maintain procedures to recognize and mitigate the potential environmental impact associated with emergency response operations.

2. ***Policy.*** It is the policy of this Medical Center to consider the environmental impacts associated with emergency response operations.

3. ***Responsibilities.***

   a. The *GEMS Coordinator* will collaborate with the Emergency Management Committee for all procedures related to the environmental impact associated with emergency response operations, including pollution prevention and mitigation.

   b. All other responsibilities related to emergency management are outlined in the Medical Center Emergency Management Plan.

4. ***Procedures.*** This document references the Medical Center Emergency Management Plan for all procedures associated with emergency response operations. The Emergency Management Plan is an "all-hazards" approach to emergency management. The plan includes a Hazard Vulnerability Analysis accounting for the environmental impact associated with emergency response operations.

5. ***References.*** Emergency Management Program Guidebook, (Book 8).

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution

Document 5B2-1

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Biohazardous Waste Management

1. ***Purpose.*** To establish the policy and procedures for identification, handling, storage and disposal of biohazardous waste at this Medical Center.

2. ***Policy***.

   a. Biohazardous waste will be managed to protect people and the environment while complying with federal, state and local regulations.

   b. Procedures, such as segregation of waste, will be employed to reduce the generation of biohazardous waste. All employees who handle biohazardous waste will practice proper waste segregation procedures as directed in training and by their supervisors.

   c. Individuals required to handle biohazardous waste will receive the appropriate job training and will wear personal protective clothing/equipment as directed in training and by their supervisors.

3. ***Waste Segregation Definitions.***

   a. Biohazardous waste is a category of waste separate from hazardous waste and includes the following:

      1) Microbiology Laboratory Waste - cultures that come in contact with infectious agents.

      2) Pathology Waste - body parts, morgue waste and tissue specimens.

      3) Blood and Body Fluids - any body fluid, secretion, or excretion.

      4) Bulk Blood and Body Fluids - bulk quantities, dripping or pourable, or items saturated with blood or body fluids.

      5) Infectious Waste - any item contaminated with blood or body fluids that could be released in liquid or semi-liquid form if compressed.

   b. The term “sharps” means medical or laboratory articles, including those that are potentially infectious and may cause punctures or cuts.

   c. The following are <u>not</u> included in the definition of infectious waste and should be placed in containers for unregulated (ordinary) waste:

      - Items soiled (but not saturated) with body fluids.
      - Intravenous tubing without needles (needles detached).

- Urinary catheter tubing and bags that have been emptied of liquid.

4. ***Responsibilities:***

   a. *Program Managers/Supervisors*:

      1) Will ensure and document that all employees are receiving appropriate job training related to biohazardous waste procedures for which they are responsible.

      2) Will identify biohazards their employees come in contact with, select appropriate personal protective equipment (PPE) and clothing, and conduct training on the proper use and purpose of the PPE, in accordance with the Occupational Safety and Health Administration (OSHA) PPE Standard and the OSHA Blood borne Pathogen Standard.

   b. *Safety Committee* will review this Medical Center Memorandum annually to ensure compliance with policies, procedures and laws relating to chemical, physical and radioactive hazardous waste.

   c. *Infection Control Committee* will review all Service and VAMC policies and procedures relating to biohazardous waste when initiated and annually thereafter.

   d. Conclusions, actions and recommendations will be reported to the Safety, Occupational Health and Fire Protection Committee.

   e. *Safety Office*:

      1) Maintains the temporary storage facilities to ensure that time constraints, accumulation requirements and proper storage techniques are followed for chemotherapy waste stored in Hazardous Waste Storage.

      2) Participates in monthly Hazard Surveillance Rounds that includes monitoring proper segregation, handling, storage and disposal of biohazardous and hazardous wastes.

   f. *Chief, Facilities Management Service*:

      1) Oversees the shipping and disposal of biohazardous waste.

      2) Leads the monthly inspection team on Hazard Surveillance Rounds that includes the monitoring of proper segregation, handling, storage and disposal of biohazardous and hazardous wastes.

      3) Directs Housekeeping supervisors to conduct periodic surveillance of compliance with biohazardous waste policy and procedures, including PPE and segregation and disposal of waste.

   g. *Infection Control Practitioner*:

      1) Trains staff on infection control procedures including recognition, handling and disposal of biohazardous waste (See Attachment A, Training Topics and Schedule.)

      2) Participates in Hazard Surveillance Rounds.

h. *Radiation Safety Officer:* Oversees the handling and disposal of radiological wastes that are also contaminated with infectious wastes.

5. ***Procedures.***

a. Biohazardous waste will be collected in red plastic bags and placed in collection containers or areas with biohazardous waste labels. All red-bagged waste will be stored and transported separately from other refuse. When red-bagged waste comes in contact with other waste, all the waste will be considered infectious. All infectious waste will be placed in impervious containers at the collection point for pick-up by the contractor for disposal.

b. Clinical staff will place all biohazardous waste in biohazard containers lined with red bags and marked with the biohazard label. Waste that is not biohazardous will not be placed in biohazard containers. Biohazard containers will be kept closed. When containers approach ¾ full, they will be closed and replaced with empty containers by Housekeeping staff.

c. Housekeeping staff will collect biohazardous waste according to the attached schedule (Attachment B) and when notified that a container is approaching ¾ full. During collection and transport to the storage facility, waste containers will be closed. Staff handling the containers will wear disposable gloves. Spills will be cleaned up immediately, and the surfaces decontaminated. Storage areas will be secured from access by unauthorized persons.

d. Before suction canisters and containers of bulk liquid are sent to the collection point, clinical staff will add the isolyzer agent to the container prior to disposal to solidify the liquid and prevent leaking.

e. Biohazardous waste that is also contaminated with more than 3% (by volume) of anti-neoplastic waste will be placed in a covered container, labeled with the yellow "Chemotherapy" sticker, and picked up by Facilities Management drivers and transported to the hazardous waste storage shed. The Facilities Management driver will notify the Supervisor Utility Systems Operator of the delivery of this waste. Facilities Management employees will wear latex or vinyl gloves while handling the sealed containers. If somehow contaminated, these gloves will be disposed of with the waste. In the event of a leak, the employee will notify his/her supervisor, the Safety Office for Incident Analysis, and also the Pharmacy, which will perform proper clean-up procedures. If the person handling the waste material comes in contact with it, the affected area will be flushed with water and the person will report to the Employee Health Unit as soon as possible. See Hazardous Waste Management, Medical Center Memorandum #XX.

f. Biohazardous waste contaminated with radiological waste will be handled and disposed of in accordance with Medical Center Memorandum #XX, Radiological Waste Management.

6. ***References.*** OSHA Blood borne Pathogen Standard, 29 CFR 1910.1030; OSHA PPE Standard, 29 CFR 1910.138; Joint Commission for Accreditation of Healthcare Organizations (JCAHO) Manual for Hospitals; Medical Center Memorandum XX,

Hazardous Waste Management; and Medical Center Memorandum XX, Radiological Waste Management.

7. ***Follow-up Action:*** Chief, Facilities Management Service, and Infection Control
8. ***Rescission.***
9. ***Review Date.***

(Name)
Medical Center Director

Attachments: (*Note: Attachments are to be created by individual facilities according to each one's needs*.)

A. Training Topics and Schedule for Biohazardous Waste
B. Schedule for Replacement of Biohazardous Containers

Distribution:

Document 5B2-10

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Mercury Pollution Prevention Program

1. ***Purpose.*** The goal of a mercury pollution prevention program is to reduce or eliminate identifiable sources of mercury being discharged to the environment.

2. ***Policy.*** It is the policy of this Medical Center to comply with current regulatory requirements concerning the reduction of mercury discharges and its impact on the natural environment.

3. ***Responsibility.*** Pollution prevention and the reduction of mercury discharged to the environment are job responsibilities of all employees.

   a. *Medical Center Director* is committed to the reduction of mercury-containing discharges.

   b. *Safety Manager/Industrial Hygienist* is responsible for the development and implementation of the mercury reduction plan.

   c. *Service Managers* shall:

      1) Identify and inventory possible sources of mercury in their service.

      2) Educate their employees on source reduction possibilities.

      3) Find alternatives to mercury-containing products.

   d. *Chief, Acquisition and Material Management* shall:

      1) Purchase environmentally preferred and recoverable products in accordance with the Federal Pollution Prevention Act.

      2) Work with suppliers to obtain copies of heavy metals analysis reports on products potentially containing mercury.

   e. *Chief, Facilities Management* shall:

      1) Conduct effluent, sludge application site soils and sludge testing requirements as established by Department of Environmental Protection (DEP) rules and permits.

      2) Minimize the release of mercury through the wastewater treatment plant.

4. ***Procedures.***

   a. The most significant opportunity for reduction or prevention of mercury containing discharges is through changes in procurement, operations and/or raw material usage of mercury-containing compounds or products. Substitution of mercury containing materials, changes in work practices, recycling and treatment alternatives should be investigated before relying on the proper disposal option.

   b. Current law prohibits the discharge of mercury into the water in any concentration that increases the natural concentration of mercury in the receiving waters. A mercury

pollution prevention plan that includes source reduction, treatment, monitoring and discharge limitations is required by the (State) DEP.

c. Mercury is monitored in the wastewater effluent, sludge and sludge application site soils in accordance with EPA method 1669 and other approved methods. The wastewater treatment plant operators conduct monitoring and results are maintained and provided to the (State) Department of Environmental Protection.

d. A baseline effluent level has been established by the DEP.

e. Mercury-containing products are prevalent in the hospital. Blood pressure monitors, dental amalgam, thermometers, thermostats, esophageal dilators, Cantor tubes, Miller Abbott tubes, and histology fixatives and stains all may contain mercury. Cleaners, degreasers, ph buffers, vaccines, test kit reagents, fluorescent light bulbs, batteries and other items may also contain mercury. Mercury-free alternatives are available for all of these items.

f. Mercury-containing medical products such as sphygmomanometers, thermometers, esophageal dilators, Cantor Tubes and Miller Abott tubes, and mercury-containing chemicals will be phased out as they are replaced. *Acquisition and Material Management* will assist Service Managers with information on substitutes.

g. *Service Managers* will investigate all hazardous materials purchased that may contain mercury. Since the Material Safety Data Sheet only requires mercury to be listed as a component if it is found in concentrations of 1% or more, all materials that are used in quantities of 55 gallons or greater will be investigated with the manufacturer for trace mercury concentrations.

h. *Facilities Management Service* will ensure that magnetic switches, optic sensors or mechanical switches are used instead of mercury tilt switches, if available, for thermostats, sump pumps or other electrical lighting, power supply switching or resistance heating applications.

i. Low-mercury fluorescent light bulbs will be used in lieu of mercury-containing bulbs. New manometers will be replaced with non-mercury alternatives.

j. *Acquisition and Material Management Service* will consider disposal costs when evaluating a product.

k. Batteries, fluorescent lamps and other mercury-containing materials will be recycled and/or disposed of in accordance with the Hazardous Waste Management Program.

l. *All Service Managers* must ensure that their employees are competent in their ability to properly manage, purchase, handle and dispose of mercury-containing materials and the practices outlined in this policy.

m. Annually, *Acquisition & Material Management* will develop a list of products that contain mercury along with a list of possible substitutes. This substitution list will be provided to all potential purchasers of these materials.

5. ***Training.***

   a. The *Safety Manager* will train all Service Managers in the requirements for mercury reduction.

   b. *A&MM* will train all Service Managers in proper procurement of mercury-free materials.

   c. *Service Managers* will train their employees, at the desired level of competency, in the Mercury Pollution Prevention Program.

6. ***Spills.***

   a. All spills involving mercury-containing products will be handled in accordance with EPA-established clean up guidelines and the state DEP mercury-containing lamp policy. For broken light bulbs, sweep up and place in a closed plastic container with tight fitting lid. For liquid mercury, call the Facility Management Service or local emergency response, as appropriate. They will use mercury-absorbent spill pads or the mercury vacuum based upon the amount spilled.

   b. All mercury spill debris will be collected in tight fitting plastic containers, labeled appropriately and sent to an approved hazardous waste disposal site. Use the Hazardous Waste Management Program for guidance.

7. ***Reference.***

8. ***Rescission.***

9. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-11

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Mercury Reduction Program

1. ***Purpose.*** To establish medical center policy for the reduction (virtual elimination) of any metal mercury in the Medical Center.

2. ***Policy.*** It shall be the policy of this Medical Center that mercury-containing material procurement shall be reduced as much as possible.

3. ***Background.*** Mercury (Hg) is a toxic metal and a natural element commonly seen as a shiny, silver, white, odorless, liquid metal. It is persistent, bio-accumulative and a toxic pollutant that affects the nervous system. All forms of Hg are toxic to humans, but the various forms of organic and inorganic mercury have different toxicity. The organic forms are much more toxic than the inorganic forms. The organic forms are primarily neurotoxins; therefore, exposure can damage the brain and nervous system. Potential exposure to Hg is via inhalation, ingestion and absorption. The most likely routes of exposure are due to inhalation of inorganic Hg after a spill or refilling, exposure or ingestion of methyl mercury.

4. ***Responsibilities.***

   a. *Logistics Program Manager* is responsible for:

      - Conducting a thorough inventory and documenting the number and type of medical and non-medical devices containing mercury within the facility.
      - Replacing mercury sphygmomanometers (blood pressure monitors) with aneroid sphygmomanometers.
      - Replacing Hg thermometers with non-Hg thermometers.
      - Replacing mercury intestinal and esophageal dilators and feeding tubes with alternatives using water, saline or tungsten.

   b. *Engineering Program Manager* is responsible for:

      - Procuring low-mercury fluorescent lights and development of a recycling program for all fluorescent lights.
      - Replacing batteries containing mercury with mercury-free alternatives and/or rechargeable products.
      - Replacing mercury thermostats, pressure gauges, barometers, switches and other building facility equipment with mercury-free alternatives.

   c. *Dental Program Manager* is responsible for:

      - Replacing mercury-containing fixatives and preservatives with mercury-free alternatives.

- Setting up a program for appropriate collection of used amalgam and installation of amalgam separators in sinks and drains in the Dental Clinic.

d. *Housekeeping Officer* is responsible for:

- Replacing bleach and cleaning chemicals containing traces of mercury with mercury-free alternatives.
- Training of housekeeping employees on how to handle a mercury spill at the Medical Center.

e. *Safety Manager/Industrial Hygienist* is responsible for:

- Collecting and storing waste mercury for disposal.
- Providing training and spill equipment for the housekeepers.
- Training employees (as appropriate) in proper handling of mercury-containing equipment.
- Coordinating, as appropriate, testing/analyzation of mercury-containing fluorescent lights.

5. ***Procedures.***

a. All mercury-containing equipment shall not be procured for the Medical Center unless there is no alternative available.

b. *Engineering* will collect and recycle all mercury-containing fluorescent lights in a barrel for shipment to recycling sites.

c. *Dental Assistant* will collect and separate waste amalgam before disposal.

d. Waste mercury will be collected by the *Industrial Hygienist* and disposed of in accordance with federal, state and local regulations.

6. ***References***. VHA Directive 2002-018, April 1, 2002.

7. ***Rescission.***

8. ***Review Date***.

(Name)
Medical Center Director

Distribution:

Document 5B2-12

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Notification of Environmental Incidents (Spills/Releases/Discharges)

1. ***Purpose.*** To ensure that prompt and effective actions are taken to minimize risk to persons, property and the environment in the event of an accidental release, spill or leak of hazardous substances. Also, to identify the persons responsible for preparing a written and telephonic notification to the federal or state Environmental Protection Agency (EPA), Department of Transportation (DOT), and National Response Center (NRC) for spills during transportation of chemical hazards, or the Centers for Disease Control (CDC) for spills during the transportation of biologic hazards.

2. ***Policy.*** It is the policy of this Medical Center to notify the appropriate officials and agencies in case of emergency spills, releases and discharges as required by the Hazardous Materials Transportation Act (HMTA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and SARA (Superfund Amendments and Reauthorization Act). Also, to ensure correct transportation procedures are issued and followed as indicated below.

3. ***Responsibilities.*** The *Safety and Occupational Health Specialist*, as our facility Environmental Compliance Coordinator (ECC), upon notification from any and all contract hazardous chemical or waste transporters used by our facility, will ensure proper notification to the required agencies as outlined in the matrix in the following paragraphs (4d through 4g).

4. ***Procedures.***

   a. *Manifests.* Our facility (generator) will ensure that Hazardous Waste Manifests are properly filled out and completed. This will be certified by the ECC and includes:

      1) State-generated manifests obtained from the receiving State and the originating State, if these states have manifests different from the Federal Uniform Hazardous Waste Manifest.

      2) The facility EPA identification (ID) number recorded on the manifest and a manifest document number (a serially increasing number of five digits) is assigned by the facility (by the generator), if the State or receiving facility does not provide a manifest document number.

      3) The facility site location and emergency contract telephone number provided on all manifests.

      4) At least one certified transporter and a permitted Treatment, Storage or Disposal (TSD) receiving facility for waste is designated on the manifest. The receiving site

address of the TSD facility is recorded on the manifest (not the corporate headquarters or other addresses).

5) Waste descriptions follow Department of Transportation package marking requirements by using the same shipping name, hazard class, identification number, with the word "Waste" appearing before each shipping name. Waste description should also include the EPA designation for the type of waste. The type of container and units of quantity (abbreviated symbols) are designated on the form and if a reportable quantity (RQ) has been established for the waste material, the letters RQ must appear in parentheses before the shipping name.

6) A facility official (generator) signs and dates all manifests, certifying that the shipment has been properly classified, packed, marked and labeled.

b. *Placarding.* The ECC ensures placarding meets DOT requirements for the transportation of chemical or biological hazardous wastes. This includes:

1) The transporter of hazardous waste from the facility has an EPA ID number and a State permit, if that state has enacted a Waste Material Transporter Permit Program.

2) The transporter displays the proper color-coded, diamond-shaped placards for transport, specific to the hazardous characteristics of the shipment (placards may not be required on the vehicles carrying only etiologic agents, materials classified ORM-A, B, C, D, or E, or limited quantities of hazardous materials).

3) The facility Safety Office ensures proper placarding for the transportation of hazardous materials. If the transporter does not have proper placards, the facility either provides proper placards or does not allow the waste to leave the facility (placarding is a joint responsibility of the shipper and transporter).

c. *Training.* The ECC will assure training is provided and documented for contractor employees involved in transportation of chemical or biological hazardous materials as described in the DOT regulation.

d. *Internal Emergency Telephone Numbers.*

Medical Center Spill Response Coordinators (when notification is to be provided):

Name	**Work No.**	**Home No.**

e. *Outside Emergency Telephone Numbers – State.**

1) (State) Underground Storage Tank (UST) Act:

Subject	**Ref. Std.**	**Office/Contact**	**Phone**
USTs	10 CSR 20-10.010	*National Response Center	1-800-424-8802
Leaking USTs		*National Response Center	1-800-424-8802

2) (State) Hazardous Waste Management:

Subject	Ref. Std.	Office/Contact	Phone
Emergency Notification	10 CSR 24	Envir. Emergency Nat. Resp. Center	
Community Right-To-Know (federal agencies exempt)			
Waste Oil	10 CSR 25-11.010	Haz. Waste Program	

f. *Outside Emergency Telephone Numbers - Federal*.*

**1) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (Superfund):

Subject	Ref. Std.	Office/Contact	Phone
Haz. Waste Site Cleanup	40 CFR 302	Superfund Program	

**2) Superfund Amendments and Re-authorization Act (SARA); Title III, Emergency Planning and Community Right-To-Know Act (EPCRA):

Subject	Ref. Std.	Office/Contact	Phone
Sec. 302 Extremely Haz. Sub. (EHS)	40 CFR 355	Emergency Response Program	
Sec. 304 Reportable Quantity for EHS	40 CFR 302	Emergency Response Program	
Sec. 313 Emissions or Release	40 CFR 372	Emergency Response Program	
RCRA Wastes and Codes	40 CFR 261	Emergency Response Program	
		*National Response Center	1-800-424-8802
		RCRA/CERCLA	1-800-424-9346
		TSCA Hotline	1-800-424-9065

*EPA National Response Center (NRC) is the primary federal point of contact for reporting ALL oil, chemical, biological and etiological discharges into the environment anywhere in the United States.

**Releases covering the items marked as such are also associated with a transportation event.

g. If the Spill Response Coordinator determines that the facility has had an outside chemical release in reportable quantity (see Attachment) that could threaten human health or the environment, the Spill Response Coordinator shall notify the EPA National Response Center at 1-800-424-8802.

5. ***References.*** US EPA Title 401 Subpart K, Toxic Substance Control Act; 40 CFR 261, 302, 355, and 372; JCAHO, PTSM Series, Managing Hazardous Materials and Wastes; OSHA 1910.120, Hazardous Waste Operations; and 49 CFR Part 171.15-16, Hazardous Materials Transportation Act.

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachment:
Index of Chemical Classifications

Distribution:

Attachment to Document 5B2-12

Index of Chemical Classifications

The following index identifies 38 common chemicals (in alphabetical order) found in healthcare facilities. The reader may utilize this index to identify the chemical classification and Reportable Quantity (RQ) for each chemical listed. Chemicals not found on the list can be found in 40 CFR Part 302 or on the Material Safety Data Sheet (MSDS).

Chemical Reportable Name	Chemical Classification	Reportable Quantity (RQ)
Acetic Acid	Acid	
Acetone	Flammable Liquid	10 lbs
Acetylene	Flammable Gas	
Alcohol(s)	Flammable Liquid	
Ammonium Hydroxide	Caustic	1,000 lbs
Ammonium Thiosulfate	Caustic	1,000 lbs
Butane	Flammable Gas	
Carbon Dioxide	Nonflammable/Asphyxiant	
Chemotherapeutic Drugs	Carcinogen/Chemo Drugs	1 lb
Chlorine (Gas)	Nonflammable/Asphyxiant	10 lbs
Cyanide	Poisons	10 lbs
Ether	Explosive	100 lbs
*Ethylene Oxide	Flammable Gas/Carcinogen	10 lbs
Freon	Nonflammable/Asphyxiant	
*Formaldehyde	Flammable Liquid/Carcinogen	1,000 lbs
Hydrochloric Acid	Acid	5,000 lbs
Mercury	Toxic-Metal	1 lb
Methylene Chloride	Flammable Liquid	1 lb
Methyl-Ethyl-Ketone	Flammable Liquid	5,000 lbs
Mineral Spirits	Flammable Liquid	

Methyl Methacrylate	Flammable Liquid	
Muriatic Acid	Acid	
Naphtha	Flammable Liquid	1,000 lbs
Nitric Acid	Oxidizer/Asphyxiant	100 lbs
Nitrous Oxide	Nonflammable Gas	
Perchloric Acid	Oxidizer/Acid	
Phenol	Poison	
Phosphoric Acid	Acid	1 lb
Picric Acid	Explosive/Oxidizer/Acid	1,000 lbs
Potassium Hydroxide	Caustic	
Propane	Flammable Gas	
Sodium Hydroxide	Caustic	1,000 lbs
Sulfuric Acid	Oxidizer/Acid	1,000 lbs
Toluene	Flammable Liquid	100 lbs
Trichlorotriflouromethane	Nonflammable Asphyxiant	1,000 lbs
Tetra Hydrofuran	Flammable Liquid	
Trichloracetic Acid	Acid	
Xylene	Flammable Liquid	1,000 lbs

**Note: Ethylene Oxide and Formaldehyde are fully regulated chemicals and are, therefore, addressed with separate Spill Response Guides.*

Document 5B2-13

S A M P L E

Oil Spill Prevention Control and Countermeasure Plan

1. ***General Information.***

   a. Name of Facility/Owner: Department of Veterans Affairs

   b. Site Description: The Department of Veterans Affairs Medical Center is a XXX bed medical, surgical and mental health care hospital with a XXX bed Nursing Home facility, outpatient support services and regional office center. Facilities include a boiler plant, maintenance garage, wastewater treatment plant, hospital building, fire station, shops, offices and housing units. The medical center is located on approximately XXX acres.

   c. Key Contacts: _____

   d. Name of Professional Engineer: _____

      Date of Certification: _____

      License Number: _____

      State of Certification: _____

   e. Management Approval of the Plan: Approved_____ Disapproved_____

      _____ Date:_____

   f. Review Date: December 12, 2004

   g. Amendments:_____ Date:_____

2. ***Purpose.*** The purpose of this contingency plan is to minimize hazards to human health and the environment and to familiarize personnel with the proper procedures should an emergency with oil or other hazardous materials occur. All oil spills shall be reported as required by state and federal agencies.

   a. The Oil Spill Prevention and Countermeasure Plan will establish policy, outline procedures and assign responsibility for the prevention, mitigation and contingency planning for any potential chemical and/or oil material spills on the Medical Center facility that may enter into the environment. This policy incorporates by reference the Hazardous Materials Spill Response Policy for spills that occur within buildings. This policy applies to all Services and to all VA personnel, including employees of the satellite facilities under the control of this Medical Center.

   b. This contingency plan describes the preventive measures taken and the facility's response in the event of the release of oil or hazardous materials. This contingency plan is available for inspection by any local, state or federal representative, employee representatives and supervisory personnel and must be kept in the Environment of Care Manual.

c. This plan should be reviewed annually or upon failure of adequate response in the event of a spill or other incident and shall be amended whenever the list of emergency coordinators and/or the list of emergency equipment change.

3. ***Policy.*** It is the policy of this Medical Center to identify and respond to spills of hazardous materials, oils and/or infectious materials in a rapid and effective manner. Potential exposure to patients, employees, volunteers, visitors, environment and the community are to be minimized by proper clean up and disposal of any accidental spills of oil, hazardous chemicals and/or infectious material. Spillage wastes are to be disposed in accordance with applicable local, state and federal requirements.

4. ***Responsibilities.***

a. *Service Chiefs* who handle, store or use oil or hazardous/infectious materials within their respective Services must have spill prevention and response policies available.

b. *VA Police* will ensure that the affected spill areas are secure from unauthorized entry. Without entering the immediate hazard area, VA Police will isolate the area to ensure the safety of people and the environment in the vicinity of the incident, and will keep people away from the scene and the perimeter, allowing enough room to move and remove equipment that may be necessary to respond to the emergency.

c. *VA Police* and the *Business Service Line* will coordinate communication assistance through the telephone operators and the Medical Administrative Assistant (MAA).

d. *Urgent Care* will provide technical and emergency medical assistance.

e. *Facilities Management Service* will provide Engineering representatives to the area involved in the spill/release.

f. The *Chief or Captain of the Fire Department will be authorized as the Incident Commander*. It is the responsibility of the Incident Commander to determine if the spill or release is reportable to government authorities. A release is defined in 40 CFR 355 as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment of any hazardous chemical, extremely hazardous substance or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substance. The environment is defined in 40 CFR 355 as water, air and land and the interrelationship that exists among and between water, air and land and all living things. To determine if a release is reportable to the National Response Center or the Department of Environmental Protection, the Incident Commander will need to determine if the discharge is in a quantity that may be harmful to public health or the environment.

g. All firefighters or individuals who respond to releases or potential releases for the purpose of stopping the release, will be trained at the Hazardous Materials Technician level. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. Hazardous Materials Technicians shall receive at least 24 hours of training equal to the first responder operations level and in addition the VA will certify competency in the following areas:

1) Knowledge of the emergency response plan.

2) Knowledge or the classification, identification and verification of known and unknown materials by using field survey instruments and equipment.

3) Knowledge of their assigned roles in the Incident Command System.

4) Knowledge of the selection and use of chemical personal protective equipment.

5) Understanding of hazard assessment and risk management techniques.

6) Knowledge of advanced control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit.

7) Knowledge of proper decontamination procedures.

8) Knowledge of proper termination procedures.

9) Knowledge of basic chemical and toxicological terminology and behavior.

5. ***Initial Response Procedures Upon Discovery*.** The exact procedure followed and the personnel involved in spill clean up will depend on the severity of the situation. The employee first observing the spill will follow their Service spill response policy procedures. This employee is responsible for notifying his/her supervisor who, in turn, will assure that the proper procedures are followed. If a chemical spill is such that it is immediately hazardous and cannot be handled by on-site personnel or if it has entered the environment, the emergency line **(911)** shall be called and all pertinent information, such as location, type of material, amount spilled, etc., should be provided.

   a. Internal notification. The telephone operators will notify the following services or sections when requested by a service that is seeking chemical spill or release assistance.

      1) Fire Department.

      2) Safety Office.

      3) Police Section.

   b. The individual who discovers the spill is to:

      1) Cordon off the area to prevent facility personnel unaware of the situation from wandering into the spill area.

      2) Arrange to have utilities and ventilation systems shut down if necessary.

      3) Stand by to provide assistance to the Fire Department and to act as a Coordinator until relieved by someone with more technical experience such as the Safety Manager, the Chief of the Fire Department or Spill Response Agency.

   c. External notification: The Incident Commander will notify the National Response Center and the Department of Environmental Protection for all discharges to the environment if it has been determined that the discharge is in a quantity that will:

      1) Violate applicable water quality standards.

2) Cause a film or "sheen" upon discoloration on the surface of the water or adjoining shorelines.

3) Cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

4) The rule of thumb is if the spill requires a spill pad or pillow, it is reportable to the State Department of Environmental Protection (DEP) and the National Response Center.

6. ***Response Management System Command Responsibilities.***

a. The *Fire Chief or Captain of the Fire Department* will function as Incident Commander unless or until a response agency arrives. The Incident Commander will coordinate all emergency actions:

1) Notify facility employees of emergency situations caused by a release, fire or explosion of oil materials.

2) Take appropriate measures to cope with the emergency.

3) Order evacuation, if necessary.

4) Initiate notification of response agencies according to the nature of the emergency.

5) Arrange for the proper disposal of any recovered materials.

b. The *Medical Center Director or Medical Administrative Assistant* on duty will assume the Emergency Operations Center's responsibilities.

c. The *Medical Administrative Assistant (MAA)* will assume the Emergency Operations Center's responsibilities if the Medical Center Director is not present.

d. The duties of the *VA Police* shall include securing the scene of the incident and directing traffic from the scene.

e. The *Chief, Facilities Management* is responsible for:

1) Supplying all maintenance equipment and personnel required to perform such emergency actions, such as powering down any utilities, turning on/off water mains, providing backhoe operations, etc.

2) Becoming familiar with this Plan as well as the Health and Safety and Emergency Evacuation Plans.

3) Acting as an Incident Commander if the event requires Facilities Management leadership.

7. ***Procedures for the Establishment of Objectives and Priorities for Response to the Incident.***

a. The immediate goals/tactical planning is for fire and explosion prevention control. The oil materials used at this facility can be highly flammable or toxic. Extreme caution must be exercised to prevent an incident from occurring during the transfer, usage or storage of

these materials. Each employee must be familiar with the following preventive measures:

1) Storage and Handling of Flammable Liquids:

   a) No smoking or intense heat sources will be allowed.

   b) Caution must be used to prevent sparking from metal parts.

   c) Waste and virgin material must be properly stored and disposed of.

   d) Containers must be closed except when taking/putting in material.

   e) Metal containers must be grounded when transferring liquids.

2) Fire Fighting Procedures:

   a) Any Medical Center employee may extinguish small fires involving such items as paper, cardboard, etc., that can be extinguished with an ABC fire extinguisher. Anything beyond that, including all fires involving flammable liquids, must be extinguished by the Fire Department. All fires are to be reported to the Fire Department regardless of size, source or type. The Fire Department is responsible for notifying the Safety Office of any fires on the next regular business day.

   b) If evacuation is required, personnel leaving the building will assemble and leave according to the VA Medical Center Emergency Evacuation Plan.

   c) Evacuation must be ordered, if necessary, by the Incident Commander.

b. Mitigating actions: Diking and spill control equipment are located on Unit X of the Fire Department's emergency response vehicles. Additional materials are located in the basement of the Maintenance Garage. All spill residues must be stored in the Hazardous Waste Storage Building X until final disposal. Spill debris must be segregated by type of material, must be contained in leak-tight barrels located on appropriate spill protective devices, and must be logged on the Daily Inspection Sheet found in Building X by the Officer bringing the material to the building.

c. Identification of resources required for response: The Incident Commander will determine the resources necessary to mitigate the spill and is authorized to recommend implementation of the Medical Center's Emergency Preparedness Plan as necessary, or to call in Mutual Aid.

d. Implementation procedures:

   1) Safety Equipment - Spill kits are located in the Maintenance Building, Unit X of the Fire Department, and the Hazardous Waste Storage Building. Spill kits contain the following materials:

      a) Speed-dry, spill pillows and spill pads.

      b) Non-sparking plastic shovel.

      c) Drain cover.

2) Personal protective equipment (Small spill clean up only):

   a) Non-vented chemical splash goggles.

   b) Nitrile gloves.

   c) Tyvek coveralls.

   d) Neoprene overboots.

   e) Self Contained Breathing Apparatus (SCBA).

3) Other equipment:

   a) Caterpillar Backhoe, Maintenance Building X.

   b) Dump trucks, Maintenance Building X.

   c) Front End Loader, Maintenance Building X.

8. ***Sustained Actions.*** For extended clean up or spill response operations, the Emergency Preparedness Plan will be implemented.

9. ***Response Critique and Plan Review Modification Procedures.*** All spills and their responses will be critiqued during the next business day. During the critique of a spill incident, any recommendations will be sent to the Medical Center Director for approval. The Integrated Contingency Plan will be reviewed on a triennial basis. All documentation concerning incidents involving spills of hazardous materials will be documented (using a Reporting an Oil Spill form [Attachment A] and a VA Form 2162) and will be forwarded to the Safety Office.

10. ***Facility and Locality Information.***

    a. Above Ground Storage Tank (AST) System.

       1) The AST system consists of four storage tanks that provide fuel for heating equipment, motor vehicles and maintenance equipment. The tanks are XXX gallon tanks with associated diking used for #2 and #6 fuel oil for the boilers, and XXX gallon tanks used for gasoline and diesel fuel for motor vehicles and maintenance. There are also XXX gallon tanks used for the emergency generators located in the generator buildings, XXX gallon tanks used for generators, XXX gallon diesel tank for generators and XX high voltage oil filled transformers. The XXX gallon tanks are located in structures called dike tanks that act as secondary containment should the primary tank develop a leak. The volume of a dike tank is equal to 110% of the volume of the primary tank. The dike tanks drain into oil water separators. The XXX gallon tanks are fire rated gasoline tanks of double wall construction. All of the tanks are constructed of steel. There is no underground piping associated with the gasoline or diesel tanks; all piping is above ground.

       2) Leak detection: All tanks are readily visible.

       3) Spill prevention: The tanks are filled by a commercial carrier. They connect the fill hose from a pump truck to a fill pipe located at each tank. The fill pipes for tanks 1,

2, 3 and 4 are located in remote spill boxes directly adjacent to the tank. Tanks 3 and 4 are equipped with overfill protection around each fill pipe on the top of the tank. This system ensures that any product spilled during the connection and disconnection of the fill hose will be contained within the spill box. In addition, the piping to the remote spill boxes have shut-off valves and check valves to prohibit product flowing back to the spill boxes after disconnection of the fill hose.

4) Overfill protection: Tanks X-X are equipped with an OPW61FSTOP-1000 AST overfill valve and a Morrison 918 clock gauge with alarm. As an additional overfill safety precaution, the tank vents contain a manifold that will return product to the dike tank in the unlikely event of an overfill situation.

5) Fuel dispenser: The fuel dispenser is located on an island behind Building X and is located on the concrete pad for tanks X and X. The dual product dispenser is supplied by tank X (gasoline) and tank X (diesel). The island is equipped with an automatic fire suppression system with manual deployment capabilities. A remote emergency shut-off switch is located at Building X. The piping to the dispenser contains special valves that will shut off the fuel supply in the event of fire or if the dispenser is knocked over by a vehicle. The dispenser hoses are equipped with breakaway connectors.

b. Emergency Generator Fuel Tanks. Emergency generator fuel tanks are all located inside secondary spill containment greater than 110% of the fuel tank.

c. Quarters Fuel Tanks. All fuel tanks in the quarters utilize secondary spill containment and the basement for tertiary containment.

d. Hazardous Waste Storage Areas. All liquid hazardous waste storage are placed on the spill control diking pallets of at least 110% of the capacity of the drums and kept inside of Building X to prevent accumulation of rainwater. The Hazardous Waste Storage Building has its own spill containment built into the structure.

e. Transformers. All transformers are protected by placement on concrete pads and firmly planted bollards.

f. Miscellaneous storage of containers of 55-gallon drums. All oil, flammable liquids or other hazardous chemicals found in drums of 55 gallons or more are to be placed on spill control pallets of a size equal to 110% of the storage capacity of the drums and stored inside of a building. Spill control devices are to be used for all other smaller containers as appropriate.

11. ***Notification Arrangements with Authorities.*** The Medical Center and the Incident Commander will notify, cooperate and coordinate with local, state and federal authorities or a spill response agency in the event of an incident that could possibly pose a threat to human health or the environment. The Medical Center may need to call on these authorities for assistance in mitigating a fire, explosion or release of oil materials and to keep them informed and up-to-date with regard to any of the hazardous substances or wastes used and stored at the facility. A copy of this plan has been given to the local Fire Department and the local Emergency Planning Committee.

12. ***Incident Documentation.*** All documentation concerning incidents involving spills of hazardous materials will be documented using a VAF 2162, Report of Accident, and the "Reporting an Oil Spill" form (Attachment A), and will be forwarded to the Safety Office.

13. ***Training and Exercises/Drills.***

    a. Training will be given to each supervisor and employee involved in the receipt, possession, use, storage, transfer or disposal of oil materials and waste. A copy of this Plan will be provided and reviewed.

    b. Initial training will be done immediately after hiring and upon assignment to a job involved with oil materials or waste.

    c. Training will be classroom and on-the-job and will be conducted by the Safety Manager or supervisor.

    d. Records of training will be kept until closure of the facility.

14. ***Prevention.*** Inspection schedules:

    a. Daily Inspection.

        1) The *Boiler Operator* will make a general inspection of the main oil storage area (by Building X) as often as possible but not less than once per day. A log will be kept of all inspections.

        2) Any problems or deficiencies must be brought to the immediate attention of the Plant Operations Supervisor and the Fire Chief/Captain, if necessary.

    b. Weekly Inspection. All oil storage tanks greater than 275 gallons are to be inspected weekly by the Plant Operations Supervisor. Copies of all inspection forms are to be maintained for three years from the date of the inspection and are to be kept in the office of the Plant Operations Supervisor. All other tanks will be inspected annually.

Attachments:
A. Reporting an Oil Spill Form
B. Oil Spill Report Form
C. Oil Storage Information Sheet

Attachment A to Document 5B2-13

Reporting an Oil Spill at (Facility Name) VA Medical Center

1. In Event of an Oil Spill, call:

   TELEPHONE OPERATOR **911**

2. Provide the Following Information:

   - **Material Spilled**
   - **Location of Spill**
   - **Estimated Quantity Entering Sewer, Manhole, etc.**

3. Telephone Operators to Inform the Following Personnel:

	Work	Home	Pager
FIRE CHIEF			
CHIEF ENGINEER			
SAFETY MANAGER			

SPILL RESPONSE CONTRACTORS (For external notification) _____

4. Chief, Facility Management, or Safety Manager will notify:

National Response Center		**1-(800) 424-8802**
(State) Emergency Management Agency		_____
(State) Department for	**Air**	_____
	Water	_____
	Waste	_____

FOR SPILLS OF OIL OF ANY SIZE, REPORT TO: **800 482-0777**

FOR SPILLS OF HAZARDOUS MATERIALS: **800 452-4664**

Attachment B to Document 5B2-13

OIL SPILL REPORT

Veterans Affairs Medical Center
(Location)

Operation:_____ Location:_____

Date:_____ Time of Spill:_____

Type of Oil Spilled:_____ Amount of Spill:_____

Did any oil reach a catch basin or sewer? _____ Yes _____ No

Did any oil leave our property? _____ Yes _____ No

Who was contacted:_____ Time:_____

Description of Spill:_____

_____

_____

Did the weather affect the spill?_____

_____

What actions were taken?_____

_____

_____

Actions taken to prevent a recurrence:_____

_____

How was clean-up material disposed of?_____

_____

In-house personnel or contractor who performed clean up:

Name:_____ Signature:_____

Address:_____ Title:_____

Phone:_____ EPA #:_____

Signature of person filing report:_____

Title of person filing report:_____ Date:_____

Reviewed by:_____ Title:_____

Attachment C to Document 5B2-13

S A M P L E

OIL STORAGE INFORMATION SHEET

Veterans Affairs Medical Center
(Location)
(Complete one for each tank)

SERVICE: Engineering

CONTACTS: Chief, Engineering Service
Engineer
Manager, Safety

TYPE OF FACILITY: Aboveground Fuel Oil Tanks

TANK DESIGNATION: AST Number X

LOCATION: Building X

TOTAL CAPACITY: XX,000 Gallons

TYPE OF OIL: No. X Fuel Oil

POTENTIAL FOR EQUIPMENT FAILURE: Overflow During Filling, Transfer Pump and Piping

CONTAINMENT: XX,000 Gallon Steel Dike Tank

INSPECTION AND TESTING: Measures for water contamination. Daily manual check for level of tank, and results are recorded into boiler log. Any irregularities are reported immediately to emergency contacts listed in this plan.

SPILL HISTORY: None

Document 5B2-14

S A M P L E

Pollution Prevention Plan

A. *Pollution Prevention Overview.*

1. The purpose of this Pollution Prevention Plan is to develop a coordinated management strategy to minimize the amount of pollution generated as a result of healthcare delivery and services for the Department of Veterans Affairs (DVA), VA Medical Centers (VAMCs) and Community Based Outpatient Clinics (CBOCs). The plan shall serve to:

   - Establish the current status of waste management at the facility.
   - Set both short and long term goals.
   - Establish a clear policy commitment.
   - Review and document current pollution prevention initiatives in place.
   - Create specific objectives for the coming year.

   A team of designated staff members participate in the Pollution Prevention (P2) effort by overseeing P2 efforts in their respective departments. This team is designated as the Pollution Prevention Team for the VA Medical Center.

   The *Safety Manager/Industrial Hygienist* has been designated as the P2 Team Coordinator and shall serve as the overall coordinator for pollution prevention efforts; as such he/she will document pollution prevention efforts, data collection and progress measurement.

   The P2 Team Coordinator reports to the Green Environmental Management Systems (GEMS) Committee and presents, at least annually, the hospital's P2 progress and program status.

   The P2 program is linked to other important efforts within the organization, including:

   - The JCAHO Standards for the Environment of Care.
   - The Environment of Care Committee and Environment of Care Rounds.
   - Patient Safety and Risk Management.
   - Performance Improvement teams at the Service or Care Line.

2. Mission and Environmental Management Principles.

   a. The VA's mission is "To care for him who shall have borne the battle, for his widow and his orphan" in an environmentally responsible manner by meeting or exceeding all applicable environmental laws and regulations.

b. VA Environmental Management Principles.

1) Top management is committed to improving environmental performance by establishing policies to emphasize pollution prevention and compliance with environmental requirements.

2) The VA implements proactive programs that assures compliance and pollution prevention.

3) The VA develops and implements programs to enable personnel to perform their functions consistent with the agency mission and their environmental responsibilities.

4) Environmental performance measures are developed and employees held accountable.

5) A program for continuous improvement in environmental performance measures is developed and implemented.

This program sets forth the strategic plan for the management of hazardous materials and wastes that pose a significant risk to human health and the environment to assure that they are appropriately handled. In so doing, this program will comply with the regulatory requirements set forth by the Environmental Protection Agency (EPA) under it's Resource Conservation and Recovery Act (RCRA) 40 CFR, Clean Air Act (CAA), Clean Water Act(CWA), and the Department of Transportation (DOT) and other relevant regulations, including the State Hazardous Waste Regulations.

B. ***Organizational Policy Statement.***

1. The Medical and Regional Office Center is committed to improving environmental performance by establishing policies that will emphasize pollution prevention and will ensure compliance with environmental regulations.

2. It is the policy of the VA to implement proactive programs that will identify and address potential compliance problem areas and will utilize pollution prevention approaches to correct deficiencies and improve environmental performance.

C. ***Pollution Prevention Program.***

1. The pollution prevention program is important to:

- Comply with GEMS requirements for environmental compliance and continuous improvement.

- Comply with Joint Commission standards for the environment of care that requires our organization to have a documented management plan that considers hazardous materials and hazardous wastes.

- Reduce the pollution created by hospital activities.

- Improve hospital's community relations.

- Protect the safety and health of employees.

2. Scope of P2 Program: This program applies to the following facilities and entities:

Facility Name	Location
XXXX	XXXX

This program will apply to:

- The handling of all hazardous wastes as defined by 40 CFR part 261.
- The handling of infectious, non-hazardous and radioactive wastes.
- A comprehensive plan to ensure that the VA is fully cognizant of and has procedures for all waste products generated in the process of healthcare delivery.
- The need to evaluate products as they are purchased to ensure that such products do not create sources of environmental harm.

D. ***Key Contacts for Service Hazardous Waste Management and Pollution Prevention.***

Area	Contact	P2 Initiatives/ Coordination
Laboratory	Name:	Ethanol and Clearite reduction Formaldehyde recovery Lab Packs and Laboratory Chemicals Mercury prevention Silver
Pharmacy	Name:	RCRA Hazardous Pharmaceuticals Management Reverse Distribution Program Other
Radiology	Name:	Coordination of recovery of Lead aprons, silver from x-ray film, silver from fixer/developer solutions Track data Champion digital imaging systems
Facilities	Name:	Proper management of cutting oils, freon, solvents, compressed gases, used batteries, waste oil, greasy rags, paints, boiler chemicals, pest management, florescent lamps, mercury switches, paints, etc. Recycling program
Clinical Engineering	Name:	Battery Recycling Mercury Reduction
Information Management	Name:	Cathode Ray Tubes
Dental	Name:	Silver photo processing Mercury amalgam Lead foil
Housekeeping: Chemicals	Name:	Coordinate product substitution Medical Waste Management and Reduction Coordinate laundry program
Acquisition and Material Management	Name:	Affirmative procurement program
Central Sterile Reprocessing	Name:	Coordinate phase out/minimization of Ethylene Oxide

E. ***Related Policies.*** The Pollution Prevention Team will coordinate the development of organizational policies that support and improve pollution prevention activities within the institution. These policies will support the elimination of hazardous substances wherever possible, the minimization of use of substances containing persistent bioaccumulative toxic substances, resource conservation, waste minimization, and a collaborative approach to problem solving with vendors, staff and the community at large.

1. *Hazardous Materials Management*:
    a. Hazardous Materials Management Program.
    b. Hazard Communication.
    c. Respiratory Protection Program.
    d. Asbestos Management.
    e. Industrial Hygiene Survey Program.
    f. Oxygen and Compressed Gas Policy.
    g. Ethylene Oxide Program.
    h. Radiation Safety Committee.
    i. Lead Hazard Control Program.
    j. Waste Anesthetic Gases and Vapors Hazard Control Program.
    k. Formaldehyde Exposure Control Program.
    l. Pesticide Management Program.
    m. Antineoplastic Agents.
    n. Chemical Hygiene Plan.
2. *Environmental Management Program:*
    a. Environmental Management Program.
    b. Hazardous Waste Management Program.
    c. Hazardous Waste Reduction Program.
    d. Hazardous Materials Spill Response Policy.
    e. Spill Prevention and Control Countermeasure Plan (SPCC).
    f. Management of Universal Hazardous Waste.
    g. Mercury Reduction.
    h. Residential Lead Disclosure.
    i. Pollution Prevention Program.
    j. Waste Characterization Sampling and Analytical Work Plan.

F. ***Staff Education and Training for Pollution Prevention.***

1. This VA Medical Center recognizes that for the P2 program to achieve success, staff members need to be educated on how they can participate. Hospital-wide and department-specific inservice presentations will be supported and delivered on a regular basis to ensure that staff members are active participants in meeting pollution prevention goals. Environmental education has been added to the annual mandatory inservice programs that every staff member receives.

2. Service specific programs for staff education on waste management and pollution prevention shall include, but shall not be limited to the following, where appropriate:

    a. New Employee Orientation shall provide an overview of environmentally preferable purchasing, waste management and waste segregation for the service, including recycling.

    b. Mandatory annual inservices shall review waste management programs with all employees.

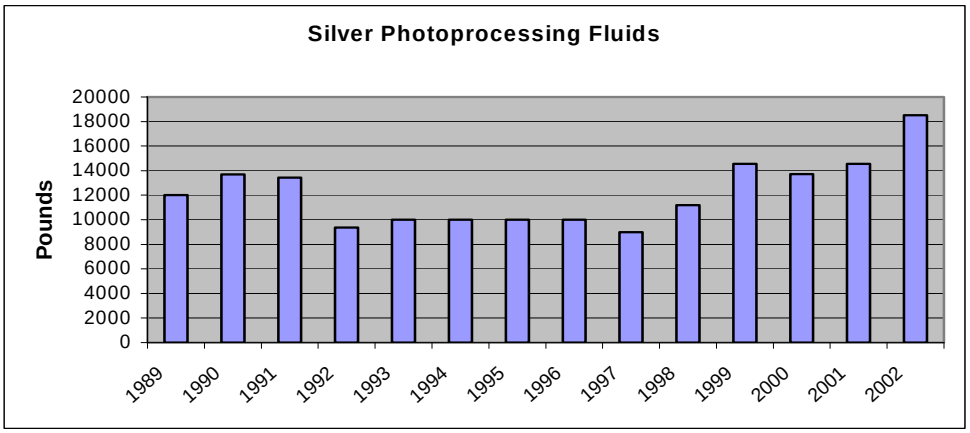
    c. Special training for employees with specific environmental responsibilities including managing waste, detecting and solving problems and regulatory compliance.

    d. Emergency response training for chemical and blood spill clean up and hazard identification.

    e. Specific certifications for Department of Transportation, Occupational Safety and Health Administration, Hazard Communication and Hazardous Material training when appropriate.

G. ***Summary of the VAMC Pollution Prevention Goals and Initiative.***

1. Reduction in the generation of wet chemistry X-ray films developed by 90% by the year XXXX. Waste photo processing liquids from the development of X-rays comprises the largest hazardous waste stream generated at our Medical Center. Liquids with a concentration of greater than 5 parts per million of silver are considered a hazardous waste and must be treated in accordance with Resource Conservation and Recovery Act regulations. The VAMC has a license by rule with the Department of Environmental Protection to recover the silver from these photo-processing fluids before we discharge to our sludge holding tank for land disposal. The wastewater treatment plant has very stringent limitations on the amount of silver we may discharge to VAMC stream, so every effort must be made to keep silver out of our wastewater. Because of the increased amounts of patients that we serve and the increase in X-ray films processed, the total amounts of processing fluids has been steadily increasing the last several years.



Radiology and Clinical Engineering have developed a plan for replacing and eliminating the wet film processors in use in the hospital with the new Digital Radiography equipment. The schedule for replacement and estimates of the effects on photo processing fluids reduction is as follows:

Initiative	Date	Effects
Digital Radiography for chest room. Prints exclusively to dry printer.		95% reduction in chest wet films produced.
New Ultrasound.		95% reduction in ultrasound wet films.
Nuclear Medicine (3 units) and CT DICOM printers.		40% reduction in total wet films produced.
Operating Room Cysto (Urology) System.		80% reduction in OR wet processing.
Portable C-Arm.		90% reduction in C-arm wet films produced.
CR (Computed Radiography) Systems (2).		95% reduction CR wet films.
R/F (Radiographic/Fluoroscopic) Systems (2).		95% reduction in fluoroscopic wet films.
Dental Upgrade for Dental Processor.		90% reduction in Dental generation.

2. Reduction of Mercury-Containing Devices by 90% by FY XXXX Initiative. Mercury is a persistent, bioaccumulative and toxic pollutant that affects the nervous system and is found in many medical and other devices such as sphygmomanometers, thermometers, barometers, switches, electrical components, laboratory chemicals, dental amalgam and fluorescent lamps. Eliminating the purchase of these devices and substitution for mercury-free devices will reduce the release of mercury to the environment.

Identified mercury-containing devices:

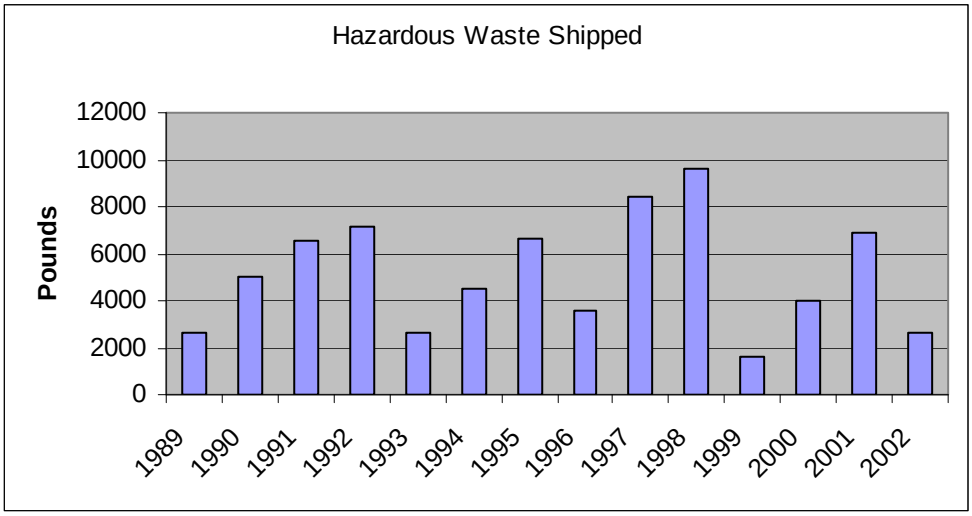
Building	Number of Sphygmomanometers
Building X	209
Building X	5
Building X	5
Building X	5
X CBOC	5
X CBOC	5
X CBOC	5
X CBOC	2
Total	241
Building	Identified Mercury Thermometers
Building X Laboratory	10
Building	Mercury Switches
Building X	60

Problem	Action	Completion Date
Accurate chemical inventory	Memo to all Service Chiefs.	
Identify mercury containing compounds	Request suppliers to provide Certificates of Analysis for large quantity chemicals.	
Substitution of mercury compounds	Service Chiefs to investigate and substitute products.	
Eliminate mercury thermometers	Procurement to stop purchase of mercury thermometers.	
Switch to low mercury fluorescent Lamps	Purchase only low mercury lamps.	
Stop purchase of mercury containing switches, thermostats etc.	Change procurement practices.	
Phase out mercury sphygmomanometers	Establish timeframe for phase out, use a take back program.	

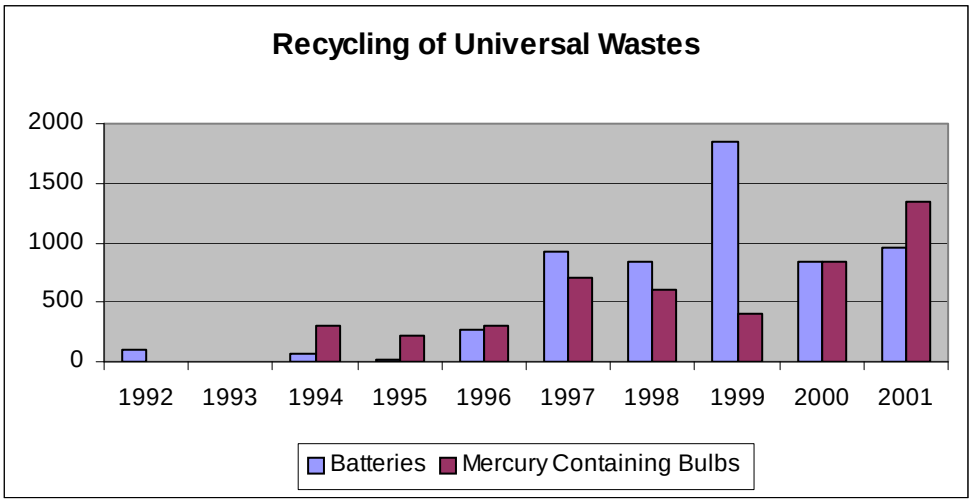
Mercury Amalgam Separators: Dental Offices typically contribute significantly to mercury levels in wastewater treatment plants. The limit at the VAMC wastewater treatment plant is very low--35 parts per trillion. The Dental Suite was built with a chair side trap system to collect mercury amalgam and wastes from the dental chairs and operations. Newer systems provide much more effective means for the collection of these mercury wastes. A major goal to reduce mercury from our wastewater is to replace the amalgam separators with state of the art equipment to reduce the release of mercury to the environment.

3. Reduce the Generation of Miscellaneous Hazardous Waste by 50%. The generation of miscellaneous hazardous waste generally has been a result of poor practices in the acquisition and management of hazardous materials. Service Chiefs will purchase hazardous materials versus non-hazardous materials, purchase quantities that will never be used, improperly store these materials or allow materials to become out of date before

use. As a result of better procurement activities, hazardous wastes in these categories has declined in the last several years. Major cleanout efforts in the paint shop in Facilities Management Service, Laboratory Service and Medical Media have reduced significantly the amounts that will be stored and potentially become waste in the future.



4. Recycle 90% of Universal Wastes. Items such as fluorescent light bulbs containing mercury, batteries containing mercury, lead acid, nickel cadmium or lithium and computer display terminals would normally considered hazardous wastes because of the heavy metals found within. New regulations allow these items to be treated as universal wastes that are exempted from the full scope of the hazardous waste regulations if the generator manages the waste in accordance with the Universal Hazardous Waste regulations. The focus on universal wastes is to recycle more of the wastes under the universal waste regulations rather than simply disposing of it. Initiatives in FY XX include a recycling program with ABC Recycling. Rechargeable batteries are sent to ABC for recycling rather than disposing of them as a hazardous waste. Boxes are strategically placed to allow segregation of different battery types, ease of packaging and ease of shipment. Over 200 pounds were managed this way in XXXX. In FY XX, a substantial collection of Computer Display Terminals that were retired were recycled under the universal waste program.



5. Biohazardous Waste Minimization by 10%. Ongoing education and training on segregation of red bag versus other solid wastes by Environmental Management should decrease the amounts of waste treated as bio-hazardous waste.

6. Increase the Amount of Procurement of Recycled Products and Recycling by 10%. During FY XX, the VA purchased the following recycled materials:

Material	Cost
Structural fiberboard and laminated paperboard	
Recycled content plastic desktop accessories	
Recycled toner cartridges	
Recycled content chipboard and plastic covered binders	
Environmentally preferable plastic trash bags	

The following materials were recycled:

Material	Pounds Recycled
Pallets	20,160
Ferrous (steel, cast iron, tin, no-ferrous, aluminum, brass, copper, lead and appliances)	10,000
Silver	40.4
Paper and corrugated cardboard	226,000

Specific Programs are currently established for the following items:

a. Corrugated Cardboard.

b. Mixed Paper.

c. Toner Cartridges.

d. X-ray and Silver Recovery from Radiology.

e. Sludge from the Wastewater Treatment Plant.

f. Lead Acid Rechargeable Batteries.

g. Ni-Cad Rechargeable Batteries.

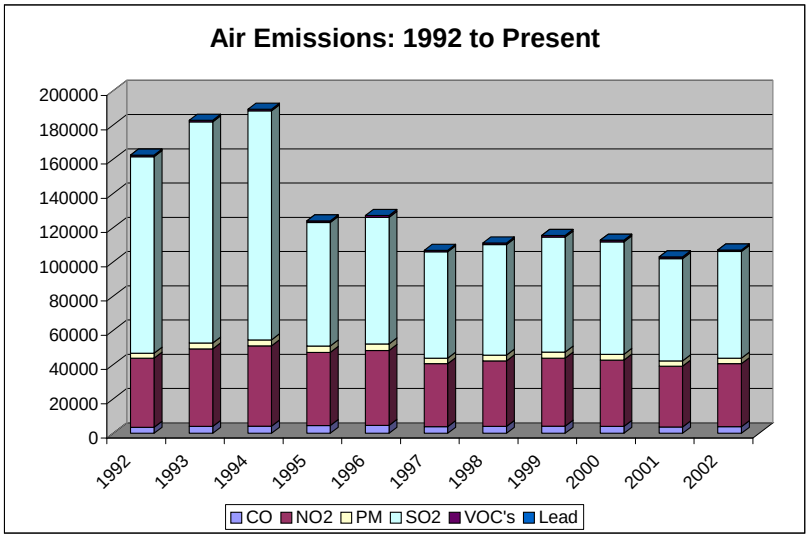
h. Lithium Batteries.

i. Computer Display Terminals.

j. Metals.

k. Pallets.

7. Energy Conservation. Air emissions as a result of burning fuel have continued an overall decline despite increased outpatient visits and additional square footage served. Energy saving projects in the last several years included window maintenance, variable frequency drives, green lights program, energy management systems and soft start motors. Pollution prevention efforts for air emissions include low nitrous oxide burners in the boiler plant and use of low sulfur fuels.



8. Water Conservation. Water conservation efforts have included several major projects that have resulted in reduced water usage. The amount of water treated at the wastewater treatment plant has declined from approximately 130,000 gallons per day to around 83,000 gallons per day.

Project	Water Savings in Gallons
Laundry Project	15,000
Water-Cooled Condensers	30,000

9. Purchasing Initiatives for Pollution Prevention. Products purchased by the VAMC eventually become wastes. Acquisition and Material Management is involved with pollution prevention through product selection. This includes evaluating products for their environmental impact, packaging, type of waste they will become and exploring any vendor information on product disposal. Purchasing will communicate the intent and

need for support in achieving pollution prevention and waste reduction goals to affiliated Group Purchasing Organizations and Vendors on at least an annual basis.

Specific Goals:

- Language will be inserted into our purchasing contracts specifying that mercury containing products and devices will not be acquired.
- The product standards committee will include environmental criteria in their assessment of new products.
- Actively research alternatives to products now being used in the hospital that have been identified as producing Persistent Bioaccumulative Toxins (PBTs) in their manufacture or disposal; products that in their manufacture or disposal may create and release dioxins (e.g., chlorine containing products and PVC containing products and packaging).
- Review the use of chemicals in clinical, diagnostic, facilities, environmental services and other departments to evaluate whether less hazardous materials may be available.

10. Copper Reduction in Wastewater Treatment Plant Effluent. The effluent that the VAMC discharges to VAMC Stream, after extended aeration treatment, solids removal, and disinfection, has historically been an issue with license conditions compliance. Toxic reduction evaluation efforts have included the following initiatives to no avail:

Increased testing of incoming water, stream and effluent
PAC precipitation
Increase food to mass ratios
Decreasing sludge age
Copper pipe removals
Alkalinity adjustments in incoming water
Replacement of copper coiled water cooled condensers
Analysis of chemicals used for copper, below 1%
Water conservation

A trial has been conducted during the latter part of XXXX and the first part of XXXX that has, for the first time, resulted in copper levels in compliance with our license. A major reconfiguration of the wastewater treatment plant will be necessary to achieve sustainable compliance. A project has been designed and will be awarded this year to reduce the size of the oxidation ditch by 50%. Analysis on further improvements will also be undertaken this fiscal year.

Document 5B2-15

S A M P L E

Pollution Prevention And Waste Minimization Plan

1. ***Section 1*** *- Introduction and Regulatory Requirements.*

   a. Introduction.

      1) ***Preventing*** pollution is this VA Medical Center's top environmental priority. The current emphasis on pollution prevention is necessary to meet state and national pollution prevention policy goals, reduce long-term liabilities of waste disposal, save money by reducing the installation's raw material purchases and waste treatment and disposal costs, and protect public health and the environment.

      2) Pollution prevention is a cost-effective means of meeting environmental objectives in an era when hospitals and government agencies are simultaneously subject to stricter standards for pollution control, public criticism of their environmental records and declining budgets. The costs of failing to prevent pollution are dramatically evident when cleanup costs for improper waste disposal practices or material handling can reach hundreds of millions of dollars.

      3) Environmental liabilities increase directly with the volume of hazardous substances and materials in use and increase to a lesser extent as a result of other materials used and the solid waste generated. Reducing these long-term liabilities requires a positive commitment, a sound plan and an aggressive program for modifying past attitudes toward the conservation of all materials. Reducing liabilities also requires actively searching for opportunities to reduce the amount of waste generated and the use of toxic materials, fuels and chemicals while still accomplishing the mission of the VA Medical Center (VAMC).

   b. Regulatory and Policy Requirements. The Federal Pollution Prevention Act of 1990 was enacted on November 5, 1990. Its purposes are as follows:

      - Prevent or reduce pollution at the source whenever feasible.
      - Promote recycling if pollution cannot be prevented.
      - Permit treatment if pollution cannot be prevented or recycling cannot be implemented.
      - Discourage disposal or other releases into the environment.

      This P2 plan is based on current U.S. Environmental Protection Agency (EPA) guidance and is the foundation for complying with:

      - The Federal Pollution Prevention Act of 1990.
      - The Superfund Amendments and Reauthorization Act of 1986 (SARA).

- The Toxic Substances Control Act (TSCA).
- The Clean Air Act Amendments of 1990 (CAAA).
- The Clean Water Act of 1987 (CWA).
- The Montreal Protocol on Substances that Deplete the Ozone Layer.
- Executive Order 12856.

c. Definitions of Pollution Prevention Terms.

1) Under Executive Order 12856, pollution prevention means source reduction and other practices that reduce or eliminate the creation of pollutants through:

   - Increased efficiency in the use of raw materials, energy, water, or other resources.
   - Protection of natural resources by conservation.

2) The Federal Pollution Prevention Act of 1990 defines "source reduction" to mean any practice that:

   - Reduces the amount of any hazardous substance, pollutant or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) before recycling, treatment or disposal.
   - Reduces the hazards to public health and the environment associated with the release of such substances, pollutants or contaminants.

   The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training and inventory control.

3) Under the Act, recycling, treatment and disposal are <u>not</u> included in the definition of pollution prevention. However, some practices commonly described as "in-process recycling" may qualify as pollution prevention. Examples include solvent recycling using an integral still, continuous filtering of a plating bath and recovery of volatile organic compounds (VOCs) from degreasing vents. Recycling that is conducted in an environmentally sound manner share many of the advantages of prevention: It can reduce the need for treatment or disposal and conserve energy and natural resources.

d. Techniques for pollution prevention fall into six categories:

1) Source reduction.
2) In-process recycling.
3) Process modification.
4) Improved plant operations.
5) Input substitutions.
6) Changes in end product.

Before pollution prevention techniques can be used, a waste assessment must be conducted to show where reduction methods implemented by a facility can be most effective.

2. ***Section 2*** - *Commitment Goals and Program Implementation.*

   a. This VA Medical Center is committed to reducing the environmental effects of its activities through an active pollution prevention program. In support of this commitment, the installation's pollution prevention policy statement has been prepared:

Pollution Prevention Policy Statement

This VAMC is committed to an active policy of protecting the environment in all of our activities. This pollution prevention policy statement is based on our commitment to the following:

- Providing a clean and safe environment in our community.
- Ensuring a safe and healthy workplace for our staff.
- Complying with all applicable laws and regulations.
- Efficiently accomplishing our mission.
- Reducing future liability for waste disposal.
- Reducing waste management costs.

To accomplish these objectives, we will implement programs for reducing or eliminating generation of waste through source reduction and other pollution prevention methodologies. This policy extends to air, wastewater and solid and hazardous wastes. In addition to meeting the objectives, there are other important benefits related to pollution prevention.

The VAMC is committed to reducing the weight and toxicity of generated wastes. As part of this commitment, the Medical Center gives priority to source reduction. Where source reduction is infeasible, other pollution prevention methods, such as recycling, will be implemented where feasible. The wastes that cannot be prevented will be converted to useful products or used beneficially, where feasible. Remaining wastes for which no pollution prevention option is warranted will be effectively treated (to decrease volume or toxicity) and responsibly managed. The Medical Center will select waste management methods that minimize present and future effects on human health and the environment.

Pollution prevention is the responsibility of *all* of our staff. This Medical Center is committed to identifying and implementing pollution prevention opportunities through solicitation, encouragement and involvement of all employees.

   b. Pollution Prevention Goals. The long-term goal of the VAMC is to eliminate the use of hazardous materials, eliminate the generation of wastes and eliminate emissions of pollutants to the environment (zero discharge). Achieving the goal of complete elimination is recognized as not being technically or economically feasible. Thus, goals

have been adopted as interim measures with the ultimate goal of achieving zero discharge (Table 2-1).

Table 2-1
VAMC Prevention Goals

Waste Category	Material	Reduction Goal (%)	Base Year	Target Year
Hazardous	Mercury	100%	2001	*2005*
Water	Silver	100%	2001	*2006*
Ozone- Depleting	CFC Group III	100%	1999	*2006*
TRI	Ethylene Oxide[1]	100%	1999	*2006*

1. The Toxic Release Inventory process through the EPCRA program does not apply to hospitals, laboratories, and research facilities; however, the chemicals included in this program are tracked for pollution prevention initiatives.

c. Identification and Evaluation of Pollution Prevention Opportunities. A range of pollution prevention alternatives will be developed and screened for each of the major waste streams and for waste management practices included in the inventory as a whole. Technological, operational and managerial pollution prevention alternatives will be identified.

Pollution prevention alternatives that pass preliminary screening will be evaluated further for technical and economic feasibility. Economic analyses will be performed by comparing potential reductions in treatment and disposal costs with the estimated costs of implementing the change. Improvements in working conditions and worker safety also should be considered.

d. Annual Pollution Prevention Reporting. An annual summary report of the Pollution Prevention Program will be prepared and presented for review to the Environment of Care Committee. The following reporting requirements that relate to pollution prevention may be utilized in lieu of or to supplement pollution prevention activities for data gathering:

- Hazardous Waste Annual Report.
- Annual Workplace Evaluation SAFE data.
- Annual Federal Facilities Compliance Report.

3. ***Section 3*** - *Survey.*

Service	Waste Stream	Types	Disposal Methods	Party
Facility Wide	Cardboard	All	Recycle	CWT
Facility Wide	Oil	All	Recycle	Crystal Clean
Facility Wide	Co-mingled Paper	All	Recycle	CWT
Facility Wide	Excess/Surplus	All	Resell/recycle/donation	Lot Sales/Logistics
Facility Wide	Wood Pallets	All	Donate for reuse	CWT

Facility Wide	Batteries	Lead	Recycle	Crystal Clean
		NiCAD, NiMH	Recycle	Crystal Clean
		Lithium	Recycle	Crystal Clean
		Carbon/Zinc	Haz. Waste	Crystal Clean
		Alkaline	Haz. Waste	Crystal Clean
		Mercury	Haz. Waste	Crystal Clean
	Aerosol Cans	All	Haz. Waste	Crystal Clean
Facilities Management	Fluorescent/HID lamps	All	Recycle	Crystal Clean
	Medical Waste	Infectious	Contract Segregation	BFI
			Waste Minimization	On site training
	CFC/HCFC	R11, R12, R22, 502, 113, 123, 404A, 409A, 134A	Recycle/Reclaim	On site/HVAC
	Air emissions	Boilers	Air	
		Emerg. generators	Air	
	Asbestos	All	Landfill	Waste Management
X-Ray	Film developer	Digital	None	On site
Dental/X-Ray	Film developer	Silver	Silver Recovery - recycle	On site
Dental	Amalgam	Mercury	Haz Waste	Crystal Clean
Laboratory	Xylene	All	Xylene recycler - still	On site
	Organic chemicals		Haz Waste/donation	Crystal Clean
	Inorganic chemicals		Haz Waste/donation	Crystal Clean
	Acids		Haz Waste/donation	Crystal Clean
	Bases		Haz Waste/donation	Crystal Clean
	Organic chemicals		Haz Waste/donation	Crystal Clean
Dietetics	Cooking Grease/Oil	All	Recycle	Bio-De-Grease
Canteen/Dietetics	Cooking Grease/Oil	All	Recycle	Bio-De-Grease
SPD	Ethylene Oxide		None	AMSCO
IRM	Toner cartridges		Recycle	Contract
	CD ROM's		Currently storing/stock piling	Store
Clinical Support	Oil	Lapidary Clinic	Non-Regulated Waste	Crystal Clean

4. ***Section 4*** - *Waste Minimization Opportunities.*

Service	Waste Stream	Waste Minimization Opportunities
Facility Wide	Cardboard/Paper	Minimize extraneous packaging. Recycle.
	Batteries	1. Increase training.
		2. Trade in.
	Shredded Paper	Worm digestion to compost.
	Peanuts	Recycle.

Facilities Management	Oil	Utilize recycled oils.
	Lighting	Switch to low mercury T-8 lamps.
	Leaves/Limbs	Compost.
	Construction	1. Specify & insist on recycling of debris. 2. Purchase recycled materials for renovation/construction projects.
Dental	Film development	Convert to Digital technology.
	Lead film	Digital will eliminate this waste stream.
IRM	Computer equipment	1. Purchase software to swipe hard drives on CPUs turned in. 2. Participate in Federal Prison exchange. 3. Initiate recycling of software CDs. 4. D/C practice of destroying hard drives.
Laboratory	Chemicals	1. Order only required amounts for specific projects. 2. Substitute less hazardous substances where acceptable.
Canteen	Cooking Grease/Oil	Installation of grease traps.
Dietetics	Cooking Grease/Oil	Installation of grease traps.
Voluntary	Aluminum cans	Recycle

5. ***Section 5*** - *Pollution Prevention Implementation Plan.*

   Program Implementation. This plan and the policies and procedures established to implement the plan are developed and approved by the Environment of Care Committee and approved by the Medical Center Director. The Pollution Prevention Program will be supervised by the Safety Section of Facilities Management, in cooperation with applicable Service Lines as needed to develop, evaluate and implement specific pollution prevention projects.

6. ***Section 6*** - *Annual Pollution Prevention Reporting.* Reports on the activities of the pollution prevention and waste minimization program will be accomplished using the following reporting methods and procedures:

   Annually

   VHA Waste Minimization Report:

   VAMC Environmental Officials to VHA Office of Environmental Management

   Hazardous Materials and Waste Program, Annual Evaluation of Effectiveness:

   Safety Officer

   Hazardous Materials Inventory:

   Safety Section of Facilities Management

Document 5B2-16

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Precautions in Handling Carcinogenic Chemicals and/or Cytoxic Agents

1. ***Purpose.*** To establish policies and procedures to assure appropriate steps are taken while handling carcinogenic chemicals or cytoxic agents.

2. ***Policy.*** It is the policy of this medical center to assure that patients and staff are not harmfully exposed to hazardous products and that adequate precautions are taken by Logistics employees to protect patients as well as themselves while handling these products.

3. ***Responsibility.*** It is the responsibility of each employee to be familiar with and follow regulations and policies to prevent accidental exposure to the products outlined in Safety Management Plan and Environment of Care Committee/Program, Medical Center Memorandum XXX.

4. ***Procedures.***

    a. Receipt Process:

        1) Upon receipt of any chemical product where there has been obvious breakage or leakage, the employee must, prior to handling:

            a) Put on protective gloves.

            b) Put on protective mask to inhibit inhalation of powders or aerosols.

            c) Place spilled, broken, or leaking materials in a <u>double</u> red plastic bag and secure.

            d) Identify the type of substance by purchase order (PO) number, etc., to determine appropriate spill response actions. Reference Medical Center Memorandum XXX, Hazardous Material and Waste Spill Response Procedures.

            e) Take appropriate clean-up action.

        2) Do not open any containers without adequate protection if breakage or a spill is suspected. Identify the contents before further handling. If unprotected contact is made, follow procedures listed on the Material Safety Data Sheet (MSDS).

    b. Delivery: Logistics personnel must take precautions when delivering or picking up flammable, hazardous, or toxic chemicals or agents. This will be accomplished by assuring the items are well placed in/on carts, trucks, etc., to prevent them from falling or breaking during transport.

    c. Storage:

        1) Occupational Safety and Health Administration's (OSHA's) Hazard Communication Standard 1910.1200 requires vendors to label containers with:

a) Identification of the chemical.

b) Hazard warnings.

Permanent or temporary storage of these items will be in accordance with these manufacturers' labels.

2) Logistics-stocked items falling into this category will be identified by placing an appropriate color-coded label on the shelf where the item is stored. The master index for these color codes will be posted for easy reference:

a) At the dock door in warehouse.

b) Shipping and Receiving area of Material Distribution Center.

d. Disposal: Disposals will be made in accordance with Medical Center Memorandum XXX, Disposal of Hazardous Chemical Waste, and the appropriate Material Safety Data Sheets (MSDS).

e. Spills: Spills will be handled in accordance with Medical Center Memorandum, Hazardous Material and Waste Spill Response Procedures, and the appropriate MSDS.

f. Shipping: Shipping will be accomplished in accordance with Medical Center Memorandum XXX, Shipping of Hazardous Waste.

5. ***Rescission.***

6. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-17

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Reclamation of Salvageable Material

1. ***Purpose.*** To provide policies and procedures for the reclamation of precious metals.

2. ***Policy.*** It is the policy of this Medical Center to salvage precious metals whenever economically possible. Due to the cost of reclamation, there are some items that contain precious metals that are not cost effective to recycle; some of which include silver paper and EEG electrodes. If you have a question as to whether or not to submit a turn-in for reclamation, contact the Logistics Manager at (insert telephone extension).

3. ***Delegation of Authority.***

   a. The *Logistics Manag*er is responsible for disposition of all precious metals turned in to Logistics as required.

   b. *Service Line Directors* are responsible for notifying Logistics, through the turn-in process, of all excess or salvageable precious metals. These items include: scrap dental gold and amalgam, silver solution from x-ray processors, exposed and "green" x-ray film, hearing aids, laryngectomy and tracheotomy tubes, etc.

4. ***Procedures.***

   a. As items are identified as excess, the using service will prepare an electronic IFCAP VAF 2237 in accordance with procedures outlined in Medical Center Memorandum XXX, to turn in the material and forward to Logistics. This request must contain:

      1) Nomenclature.
      2) Quantity.
      3) Location for pick-up.
      4) Contact person and telephone number.
      5) Ownership of property and who arranged the loan.
      6) Signature of approving official.

   b. This request will be processed by the Supply Technician in Logistics, and Warehouse personnel will pick up the material upon receipt of the paperwork from the Supply Technician.

   c. Warehouse personnel will act on the requisition appropriately and provide a copy to the Service that initiated the turn-in.

   d. The material will be safeguarded in the warehouse until final disposition.

   e. Special handling requirements:

1) X-Ray Film: The used film will be removed from envelopes and packaged in special boxes by Radiology Service. Total weight of these boxes is not to exceed 65 pounds. Each box must be marked with the station name and number: i.e., VA Medical Center, (Location), (Station #), prior to pick-up by warehouse personnel.

2) Silver Recovery from X-Ray Solutions: Logistics is responsible for the collection and processing of these solutions.

3) Scrap Dental Gold and Amalgam:

   a) Turn-ins for these materials should be submitted at least annually, and more often if needed, but not more than quarterly.

   b) The scrap should be weighed on an accurate scale and the weight annotated on the IFCAP 2237. If scrap is not "clean" (teeth, porcelain, etc., attached), this information should also be included and by annotating the IFCAP 2237 that the identified weight includes teeth, etc.

   c) When the warehouse picks up the material, it will be weighed again prior to acceptance jointly by the service that generated the turn-in and warehouse personnel. The weight will be annotated on the requisition as the action and a copy of the requisition given back to the service.

   d) The warehouse will ship out the substances in accordance with Logistics policy.

5. ***Reference.*** VA Directive and Handbook 7345.

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-18

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Reporting Of Environmental Incidents

1. ***Purpose.*** To ensure that prompt and effective actions are taken to report environmental incidents and to identify the persons responsible for notification of such incidents to appropriate officials and agencies.

2. ***Policy.*** It is the policy of this Medical Center to report environmental incidents to the appropriate officials and agencies within the required timeframes.

3. ***Responsibilities.***

   a. *Industrial Hygienist* is the Environmental Coordinator for the Medical Center.

   b. *Safety Manager/Industrial Hygienist* is responsible for notifying the appropriate agency of any reportable incident.

   c. *Supervisory personnel* are responsible for notifying the Industrial Hygienist when an incident occurs.

4. ***Procedure.*** The following procedure will be followed:

   a. Underground Storage Tank Release - Contact the (insert State) Department of Natural Resources (DNR) at (phone) within 24 hours of a confirmed release.

   b. Air Emissions, Boilers, Incinerator and Ethylene Oxide.

      1) The (insert State) DNR shall be contacted before 9:00 a.m. of the next working day at (insert telephone numbers for State, City and County offices as appropriate).

      2) A written report of the incident shall be submitted to the state DNR within 10 days.

   c. Spills into Navigable Waters.

      1) Oil or hazardous material that is discharged greater than the reportable quantity shall be reported to the U.S. Coast Guard (Marine Safety) at (insert telephone number) and (insert State) DNR at (insert telephone number).

      2) Comprehensive Emergency Response Compensation Liability Act (CERCLA) Section 103 and Superfund Amendments and Reauthorization Act (SARA) Title III 304 requires the (insert State) DNR be contacted at (insert telephone number).

5. ***References***. Reporting Releases of Hazardous Substances under the CERCLA, Section 103; and SARA, Title III Section 304.

6. ***Rescission.***

7. ***Review Date***.

(Name)
Medical Center Director

Distribution:

Document 5B2-19

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Silver Recovery Program

1. ***Purpose.*** To update policy for the recovery of silver from x-ray film fixing solution.

2. ***Policy.*** This Medical Center has determined it is in the best interests of the Government to recover precious metals from waste and excess personal property. This program provides for financial compensation for silver recovered, conservation of a valuable natural resource and protection of the environment from a potentially dangerous contaminant.

3. ***Procedure.***

   a. The *Bio-Medical Technician* will operate the unit in accordance with VA Supply Depot instructions. He/she will initiate a work order for any maintenance or repair problems. Silver-laden rotors will be promptly picked up by Material Management Section (MMS) and sent to VA Supply Depot for reclamation.
   b. The *Bio-Medical Technician* will advise MMS of the corrective action necessary for maintenance and repair problems. Facilities Management Service can make adjustments to the equipment but replacement parts will be requested through Material Management Section to the Supply Depot at the Depot's expense.
   c. *Material Management Section* will forward the silver-laden rotors to the Supply Depot in accordance with published guidelines.

4. ***Responsibilities.***

   a. The *Chief, Facilities Management Service,* is responsible for the overall administration of the program and will ensure all Services involved in the program are performing their assigned functions.
   b. The *Bio-Medical Technician* is responsible for the proper operation of the silver recovery unit in accordance with instructions published by the VA Supply Depot.
   c. The *Chief, Facilities Management Service,* is responsible for maintenance and repair of the silver recovery equipment.
   d. The *VA Supply Depot* is responsible for any costs incurred in the maintenance and repair of the silver recovery unit.

5. ***Reference.*** VA Handbook 7345.

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-2

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Affirmative Procurement Program for Recycled-Content Products

1. ***Purpose.*** This medical center is committed to developing an Affirmative Procurement Program to increase the purchase of recycled-content products.

2. ***Policy.*** It is the policy of this medical center to implement a proactive program for procurement of recycled-content products.

3. ***Responsibilities.*** In establishing the Affirmative Procurement Program, contracting officers must require that vendors:

   - Certify that the percentage of recovered materials to be used in the performance of the contract will be at least the amount required by applicable specifications or other contractual requirements, and
   - Estimate the percentage of total material utilized for the performance of the contract that contains recovered materials.

4. ***Requirements.*** Affirmative Procurement (AP) refers to the purchase and use of materials containing recycled or recovered content in the greatest amounts practical, given resource and performance constraints. Executive Order 12873 and The Resource Conservation and Recovery Act (RCRA) Section 6002 requires procuring agencies to review specifications for designated items and revise them to allow procurement of products containing recovered material. RCRA Section 6002 also requires procuring agencies to establish an affirmative procurement program. The Environmental Protection Agency (EPA) has established Comprehensive Procurement Guidelines that identify categories of items to be purchased with recycled content and specify the minimum acceptable recycled content level for items in each category. EPA guideline items include paper and paper products, retread tires, re-refined lubricating oil, building insulation, cement and concrete containing fly ash, engine coolants, structural fiberboard, laminated paperboard, carpet and floor tile, patio blocks, cement and concrete containing granulated blast furnace slag, traffic cones and barricades, playground surfaces and running tracks, hydraulic mulch, yard trimmings compost, office recycling containers and office waste receptacles, plastic desktop accessories, toner cartridges, binders and plastic trash bags.

5. ***Resources.*** Affirmative Procurement requirements should be included in future construction agreements, so contractors will have to use recycled materials in the beginning phase of building. EPA has developed lists of manufacturers and vendors of the items designated in published Comprehensive Procurement Guidelines. These lists will be updated periodically as new sources are identified and EPA becomes aware of changes in product availability. To assist procuring agencies, the lists will be made available at no charge by calling EPA's RCRA Hotline at (800) 424-9346. A publication produced by the Northeast Waste Disposal Authority, EPA Region 9 Offices, and the General Services Administration (GSA) entitled, *Greening the Government: A Guide to Implementing Executive Order 12873 - Closing the*

Circle, outlines acquisition planning and affirmative procurement; standards, specifications and designation of items; agency goals and reporting requirements; and, awareness. The publication also contains information about on-line resources and recycled products markets. For more information, or to get on the mailing list, contact the Office of the Federal Environmental Executive, Mail Code 1600, 401 M Street SW, Washington, DC 20460, (202) 260-1297.

The GSA publishes an *Environmental Products Guide,* which lists items available through its Federal Supply Service. This Guide is updated periodically as new items become available. Copies of the GSA *Environmental Products Guide* can be obtained by contacting GSA's Centralized Mailing List Service in Fort Worth, Texas, or at (817) 334-5215. In addition to the information provided by EPA and GSA, there are other publicly available sources of information about products containing recovered materials. For example, the *Official Recycled Products Guide (RPG)* was established in March 1989 to provide a broad range of information on recycled content products. Listings include product, company name, address, contact, telephone, fax, type of company (manufacturer or distributor) and minimum recycled content. Pricing information is not included. The RPG is available on a subscription basis from American Recycling Market, Inc., (800) 267-0707.

Purchasing products with recycled content "closes the recycling loop" by stimulating demand for recovered materials. This helps to ensure that there will be a viable market for recyclables collected from the facility, and other facilities and organizations. Facilities will meet the requirements of Executive Order 12873 and Section 6002 of RCRA by establishing an Affirmative Procurement Program.

6. ***Procedures.*** Establishment of an Affirmative Procurement Program should include the following action plan:

   - Obtain EPA's Comprehensive Procurement Guidelines from the RCRA hotline at (800) 424-9346.
   - Distribute a list of Affirmative Procurement items to purchasing staff.
   - Train purchasing staff on Affirmative Procurement.
   - Identify items to be procured with various levels of recycled content.
   - Develop and implement a tracking program to monitor compliance and progress.

7. ***References.***
8. ***Rescission.***
9. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-20

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Storm Water Pollution Prevention Plan

1. ***Purpose.***

   a. The Storm Water Pollution Prevention Plan (SWPPP) describes this Medical Center's storm water management program and indicates procedures to eliminate or reduce pollution related to storm water runoff. Storm water accumulated from the hospital's buildings or processes are collected in catch basins/storm sewers that are connected to on-site storm drain systems. These on-site systems are connected to municipal storm drain systems that discharge into the nearby *(insert waterway)*. The *(insert waterway)* discharges into the *(insert river or waterway discharge).*

   b. The Federal Clean Water Act (CWA) authorizes the U.S. Environmental Protection Agency (EPA) to regulate discharges to surface waters of the United States. The EPA promulgated the National Pollution Discharge Elimination System (NPDES) Regulations, 40 CFR Part 122, to regulate surface water discharges.

   c. This policy delineates the procedural guidelines for implementation of this Medical Center's Storm Water Pollution Prevention Plan, identifying the specific measures required for the elimination and reduction of pollution associated with storm water discharge.

   d. *Definition*: "Storm water" means any precipitation or discharge that comes into contact with the facility and its surrounding grounds, equipment and vehicles, and drains from the site, flowing into any nearby water body.

2. ***Policy.*** It is the policy at this Medical Center to maintain full compliance with the EPA requirements specifically associated with the NPDES permitting regulations.

3. ***Procedures.***

   a. This Medical Center is comprised of the following industries or programs that may impact the storm water requirements. Those industries include:

      - 000 total acres.
      - 000 square feet of parking space.
      - *(Insert Number)* Health Care Buildings.
      - *(Insert Number)* Business Occupancy Buildings.
      - *(Insert Number)* Domiciliary.
      - Aquatic Therapy.

- Water Cooled Condensing Units.
- Heating Plant/Boiler Blow-Downs.
- Laundry Discharge.
- Paint Shop/Spray Paint Booth.
- Grounds Shops (Application of herbicides, snow removal chemicals, pesticides, fertilizers, weed control).
- Maintenance Shops.
- Horticultural Therapy (Application of herbicides, pesticides, fertilizers, weed control).

b. All storm water associated with industrial activity, currently discharges to the (insert discharge route) and then to the *(insert waterway)* via the municipal storm drain system. All roof leaders and catch basins lead to an on-site storm drain system connected to the municipal storm drain system. Facilities Management will maintain specific site plan information that identifies the following:

1) Site latitude and longitude coordinates.
2) The location of each storm water collection catch basin.
3) The location of each storm water drain access.
4) The location of existing structural control measures that reduce pollutants in storm water runoff.
5) The location of receiving surface water bodies (the storm water collection system).
6) Locations where materials with potential to pollute are exposed to precipitation.
7) Locations where significant spills have occurred.
8) Locations where significant operations are exposed to precipitation or discharge including:

- Parking areas.
- Vehicle fueling areas.
- Vehicle and equipment maintenance and/or cleaning areas.
- Material loading/unloading areas.
- Locations used for the storage of wastes and routes from the point of generation to the storage areas.
- Storage tanks.
- Storage areas (including damaged vehicle storage areas and recycling areas).
- Direction of flow of storm water runoff.

c. The following routine operations and activities have been identified as potential release of contaminates to storm water runoff. These include:

1) The delivery of fuel to above/below ground storage tanks.

2) The delivery of heating oil to above/below ground storage tanks.

3) The removal of used oil from storage tanks.

4) The practice of parking service trucks and vehicles in open areas of a parking lot where leaking fuels and oil are not contained.

5) The procedure of transferring bulk hazardous materials and hazardous wastes.

6) Cooling tower discharge to roof drains.

7) Draining or discharge of the therapeutic aquatic pool to the storm sewer.

d. The following routine operations and activities have been identified as potential to pollute storm water run-off:

1) Parking.

2) Tank Truck Unloading.

3) Tank truck delivery of fuel oil poses the risk of a spill and also of operational release of oil. Each tank, its containment conditions and location, is specified on the Oil Spill Prevention Control and Countermeasure Plan.

4) Used Oil Tank Unloading.

5) Good handling practices are followed during tank emptying transfers.

6) Landscaping (Maintenance of Turf and Trees).

7) Outside Storage of Vehicles.

8) This Medical Center's vehicles (including transportation buses, service vehicles and employee vehicles) outside. The potential exists for oil or hazardous materials, leaking from the vehicles, to come into contact with storm water.

9) Leaks/Spills of Hazardous Materials or regulated medical waste during Transfer and Storage.

10) The majority of hazardous and biological materials are stored inside facilities. All containers storing hazardous materials located in rooms with floor drains or near exterior doorways should be provided with secondary containment to minimize the migration of leaks and spills into the sanitary sewer or storm water.

e. *Compliance Inspections.* An annual inspection should be performed to determine if maintenance schedules and checklists have been performed. This inspection should be done during a rainfall, if possible. The inspections shall include:

1) Material handling areas and other areas noted as potential sources of pollution, to see evidence of or potential for, pollutants entering the storm water drain system. Storm

water run-off conveyances, erosion control measures and other pollution prevention measures detailed in this plan, to ensure they are adequate, properly implemented, and operating correctly.

2) Equipment needed to implement the plan (e.g. spill response equipment).

3) The results of the inspection and action taken to correct any deficiencies should be filed and reviewed. This form should include:

- Who made the inspection.
- When the inspection was made.
- Observations.
- Corrective actions required.
- Corrective actions taken.
- Date completed.

f. *Storm water Maintenance.* A visual examination of the storm water discharge should be conducted and documented quarterly. Examinations should be conducted during normal duty hours in the daylight hours, during a rainfall or snowmelt runoff event in each of the following periods:

- October through December
- January through March
- April through June
- July through September

g. Visual examinations will be made of water samples collected within the first 30 minutes of when the runoff or snowmelt begins discharging. The examinations must be documented and maintained on-site in the Storm Water Pollution Prevention Plan. The reports will include:

1) Observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen and other obvious indicators of storm water pollution.

2) Probable sources of any observed storm water pollution.

3) Examination date and time.

4) Examination personnel.

5) The nature of the discharge, rainfall or snowmelt.

h. In our continuing efforts to maintain compliance with the regulations set forth by the Storm water Pollution Prevention Plan, the following areas shall be incorporated for the prevention or reduction of storm water pollution:

1) Good Housekeeping.

2) Solid Waste Container Management.

3) Pesticide Application Methods.

4) Preventative Maintenance of Oil Water Separators.

5) Spill Prevention and Response Procedures incorporated into each utility management plan.

6) Inspections of oil containing devices.

7) Employee Training.

8) Sediment and Erosion Control.

4. ***Responsibilities.***

a. *Medical Center Director:* The Medical Center Director has overall responsibility for compliance with the storm water regulations and the implementation of this policy.

b. *Facilities Management*:

1) Maintaining drawings of the locations of catch basins and storm sewer routes.

2) Maintaining historical data related to previous spills.

c. *Safety Management Office:* Responsible for the sampling of storm water and performing analytical analysis to determine compliance with all applicable regulations.

5. ***References.*** 60 Federal Register 50804, Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities; Notice, September 29, 1995.

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-21

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Underground Storage Tanks (USTs)

1. ***Purpose.*** To prevent, detect and correct leaks and spills due to underground storage of petroleum based products as required by the U.S. Environmental Protection Agency (EPA) and (insert State) Department of Natural Resources.

2. ***Policy.*** This Medical Center will adhere to all the requirements established in this policy. Accomplishment and documentation of inspections and tests are essential in keeping our environment free of contamination.

3. ***Procedures.***

   a. Registration. All underground storage tanks that contain petroleum-based products (diesel fuel) are registered with the State Department of Natural Resources (DNR), Division of Water Pollution Control.

   b. Tightness Testing. All our facility's petroleum based underground storage tanks will be tested for tightness as follows:

      1) Upon request from the State DNR or other governmental agencies.

      2) Initially, when the tank is ten years old for tanks containing more than 1,100 gallons, and every five years thereafter until permanently closed.

         This will be initiated in (year) and will again need to be done in (list years).

   c. Leaks. All detected leaks will be handled in the following manner:

      1) All underground storage tanks will, at a minimum, be monitored monthly by the use of a dipstick and results entered in on a permanent log. Recorded usage from meters (where installed) will also be entered, and running totals will be maintained.

      2) In the event that a *suspected* shortage of fuel is noted, daily monitoring will be required until such time that it is determined the recorded shortage is due to either use or loss of fuel. At any time there is a suspected shortage, the *Chief Engineer* will be notified by the Maintenance and Repair Foreman and/or the Utility System Foreman.

      3) In the event that a shortage is determined to be an underground loss, immediate action will be taken to transfer the fuel to other tanks or have the tank pumped out into tank trucks. Arrangements for tankers will be the responsibility of the *Chief Engineer*. If it is suspected or there is any indication that fuel is getting into the sewer system, the local (insert city or municipality) Fire Department will be notified immediately by the supervisor on site.

4) The *Safety and Occupational Health Specialist* will notify the appropriate agencies, i.e., the local Department of Natural Resources at _____ and the (insert State) Department of Natural Resources, Division of Water Pollution Control, at _____.

5) Following the removal of fuel from a leaking tank, testing of the tank and associated piping will be scheduled. This will be accomplished by pressure testing and/or soil sampling by qualified personnel under contract. Following review of the test results, repair or removal of the defective tank or piping will be scheduled.

d. Spills. The following action will be taken in the event of a spill over 25 gallons:

1) Take immediate action to stop and contain the spill.

2) Notify the local DNR at _____.

3) Remove any explosive vapors and all fire hazards in the immediate area.

4) Recover the spilled petroleum.

5) Report the progress to the local and state DNR no later than 20 days after the spill has occurred.

6) Develop and submit a Corrective Action Plan within 45 days of the spill of more than 25 gallons. The plan must identify what damage was done to the environment and if ground water was contaminated (additional studies may be required).

e. Closure. The following procedures will apply when storage tanks are closed for more than twelve months:

1) Notify the state and local DNR 30 days before closure.

2) Determine if leaks have damaged the surrounding environment by means of a tightness test.

3) If no problems are found, the tank can either be removed or abandoned in the ground. In both cases, the tank must be emptied thoroughly. If abandoned, the tank must be filled with sand.

4. ***Responsibilities.***

a. *The Safety and Occupational Health Specialist,* as the Environmental Compliance Officer, will be responsible for implementing this policy in conjunction with the Chief, Engineering Service. He/She will also make the proper notifications as outlined in the above paragraphs.

b. *The Chief, Engineering Service* will be responsible for providing the necessary equipment and manpower needed for tank drainage and recovery of spill products, etc., when possible.

5. ***References.*** U.S. EPA Pamphlet, "Musts for USTs;" VA Circular 00-91-5; "Underground Storage Tanks," U.S. EPA; and 40 CFR, Part 280 and 281.

6. ***Rescission.*** None.

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-22

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Date) **(Location)**

Waste Characterization Sampling and Analytical Work Plan

1. ***Purpose.*** All residuals from the Wastewater Treatment Plant or special wastes that are stored, processed, beneficially used, used agronomically or disposed of in (insert State) must be characterized in accordance with Department of Environmental Regulations, Chapter 405.6.B.

2. ***Policy.*** This Medical Center is responsible for developing a solid waste characterization program to beneficially use sludge from the Wastewater Treatment Plant; however, this program must receive approval from the Department of Environmental Protection (DEP) prior to handling of wastes. This program will determine the chemical and physical characteristics of the wastes and monitor the characteristics on a regular basis.

3. ***Responsibilities.***

   a. The *Chief of Facilities Management Service* is responsible for ensuring that the program elements are implemented.

   b. The *Safety Manager/Industrial Hygienist* will provide consultation and oversight for the implementation of the Waste Characterization Sampling and Analytical Work Plan.

4. ***Procedures.***

   a. All sludge from the Wastewater Treatment Plant will be characterized in accordance with DEP rules. Any statistical analysis performed will be done in accordance with U.S. Environmental Protection Agency (EPA) SW-846, Test Methods for Evaluating Solid Waste, Fourth Edition, Volume II, Chapter 9. If any tests fail the Toxicity Characteristic Leachate Procedure analysis, the biosolids will be handled as a Resource Conservation and Recovery Act (RCRA) waste.

   b. Only laboratories certified for the specific test by the Health and Environmental Testing Laboratory, Department of Human Services, will analyze sludge samples.

   c. Chapter 405 details testing requirements for sewage sludge for land application. Analyses are dependent on factors such as volume of sludge produced, concentrations of pollutants and the type of wastes the plant processes.

   d. Soil Nutrient Analysis: Soil nutrient analysis is required for sludge application areas. Methods for nutrient analysis have been developed for (insert State) in order to best evaluate soils for this region. Analytical methods for soil nutrients are listed in Table 1. Laboratories using these methods should participate in the National Proficiency Testing Program. Interpretive methods used for the initial solid nutrient analysis are equivalent to those used at the (State) Soil Testing Service.

Table 1					
Soil Nutrient Analysis					
Parameter	**Optimum Range**	**Units**	**Method**	**Ref.**	**Selection Rationale**
Ph, soil pH	5.5-6.5 (Forestry) 6.5-7.0 (Grass)				Baseline nutrient
Lime Index	No optimum range				
Available phosphorous	9-13 forest 10-40 grass	Lbs/acre			Baseline nutrient
Available potassium	See % saturation levels	Lbs/acre			Baseline nutrient
Available calcium		Lbs/acre			Baseline nutrient
Available magnesium		Lbs/acre			Baseline nutrient
Cation exchange capacity (C.E.C)	>5	Me/100 gm			Baseline nutrient
Percent (C.E.C) with potassium	2.1-3.0 F 2.8-4.0 G	%			Baseline nutrient
Percent (C.E.C) with calcium	60-80	%			Baseline nutrient
Percent (C.E.C) with magnesium	10-25	%			Baseline nutrient
Acidity	<10	%			Baseline nutrient
% Organic matter	5-8	%			Baseline nutrient

1) Initial Soils Analysis: The parameters listed in Table 1 are analyzed prior to using biosolids on the site.

2) On-going analysis: A minimum of one composite topsoil sample per utilization area is collected at the site prior to utilization each year that a residual will be land applied. Results of the analyses must be received and interpreted by the treatment plant and safety office prior to utilization. These results must be used as a factor in determining the amount of residual to be land applied.

e. Sludge Analysis: Recommendations and requirements for the semiannual residual analysis are listed in Table 2. The land spreading parameters are found in (insert State) regulations. The parameters to be analyzed, their detection limit, units of measure, method number, reference and selection rationale are found in Table 2:

Table 2					
Biosolids Analysis					
Parameter	**Detection Limit**	**Units**	**Method**	**Ref.**	**Selection Rationale**
Arsenic, total	Minimum detection levels are attached	Mg/kg	7062/3050B	SW8	Sewage sludge metal
Cadmium, total		Mg/kg	7130/3050B	SW8	Sewage sludge metal
Calcium, total		Mg/kg	7140/3050B	SW8	Baseline Nutrient
Chromium, total		Mg/kg	7190/3050B	SW8	Sewage sludge metal
Copper, total		Mg/kg	7210/3050B	SW8	Sewage sludge metal
Iron, total		Mg/kg	7380/3050B	SW8	Baseline Nutrient
Lead, total		Mg/kg	7420/3050B	SW8	Sewage sludge metal
Magnesium, total		Mg/kg	7450/3050B	SW8	Baseline Nutrient
Mercury, total		Mg/kg	7471A	SW8	Total inorganic compound
Molybdenum, total		Mg/kg	7481/3050B	SW8	Sewage sludge metal

Table 2 (Continued)					
Biosolids Analysis					
Parameter	**Detection Limit**	**Units**	**Method**	**Ref.**	**Selection Rationale**
Nickel, total		Mg/kg	7520/3050B	SW8	Sewage sludge metal
Potassium, total		Mg/kg	7610/3050B	SW8	Baseline Nutrient
Selenium, total		Mg/kg	7741A/3050B	SW8	Sewage sludge metal
Silver, total		Mg/kg	7760A/3050B	SW8	Precious metal recovery
Sodium, total		Mg/kg	7770/3050B	SW8	Baseline Nutrient
Zinc, total		Mg/kg	7950/3050B	SW8	Sewage sludge metal
CaCO3 Equivalence		%	I.006	AOA	Calcium Carbonate Equivalent
Chloride		Mg/kg	9056	SW8	Baseline Nutrient
pH		su	9040B	SW8	Baseline Nutrient
Phosphorous		Mg/kg	4500P	STM	Baseline Nutrient
Total Solids		%	CLP 4F	CLP	Baseline Nutrient
TVS		%	160.4	EPA	Baseline Nutrient
Ammonia-N(NH4)		Mg/kg	4500NH3B/E	STM	Nitrogen
Nitrate/Nitrite-N (NO3 & NO2)		Mg/kg	9056/4500N)2B	SW8	Nitrogen
Total Carbon		%	Calculation		Baseline Nutrient
TKN		Mg/kg	4500NorgB/NH 3E	STM	Nitrogen

f. The frequency of sampling is outlined in Chapter 405 and in Table 3:

Table 3		
Tons of Sludge Produced	**Sampling and Analysis Frequency**	**Analysis Results-Reports Due on the 15th of the Month**
Biosolids		
<200 dry tons	Twice per year	July, January
Soil Analysis		
	Before utilization	*April or May
* Results are not required to be reported, but must be kept on file and produce if requested by DEP.		

g. Near the end of each land spreading season, a composite soil sample from the same site each year is collected in November and analyzed at the XXXX for the following heavy metals and C.E.C. The results of this analysis are sent to the DEP upon receipt.

Table 4
Parameter
Ag
Cd
Cr
Cu
Hg
Ni
Pb
Zn
C.E.C.

h. In determining whether a sample should be collected using a single grab or composite sampling method, the following factors may be evaluated:

   1) How well the sewage sludge is mixed.

   2) Whether the sample is collected from a single batch of sewage sludge or from a stockpile made up of several batches.

   3) Whether the composition and concentration of the sewage sludge varies over time. The samples will be collected as shown in Table 5.

i. The procedures for decontamination of sampling equipment prior to sampling and between the collection of successive samples are outlined in Table 5 for the sludge and residuals:

Table 5

Sludge Residual Sampling

Parameter	Sample Point	Sample Size (ml)	Grab/ composite	Decon procedure	Documentation
Arsenic, total	Sludge containment vessel is well mixed, and sample taken from 1-2 feet from the top, middle of the tank	600	G	Only new PVC sample containers are use	Chain of custody and log book
Cadmium, total		500	G		
Calcium, total		500	G		
Chromium, total		500	G		
Copper, total		500	G		
Iron, total		500	G		
Lead, total		500	G		
Magnesium, total		500	G		
Mercury, total		400	G		
Molybdenum, total		500	G		
Nickel, total		500	G		
Potassium, total		500	G		
Selenium, total		500	G		
Silver, total		500	G		
Sodium, total		500	G		
Zinc, total		500	G		
CaCO3 Equivalence		500	G		
Chloride		500	G		
pH		500	G		
Phosphorous		500	G		
Total Solids		500	G		
TVS		500	G		
Ammonia-N(NH4)		500	G		
Nitrate/Nitrite-N (NO3 & NO2)		500	G		
Total Carbon		500	G		
TKN		500	G		

And in Table 6 for soils:

Table 6					
Soils Analysis					
Ph	15 separate soil samples are taken from each site and made into one composite sample			Clean cardboard boxes	Chain of custody and logbook
Available phosphorous					
Available potassium					
Available calcium					
Available magnesium					
Cation exchange capacity (C.E.C)					
Percent (C.E.C) with potassium					
Percent (C.E.C) with calcium					
Percent (C.E.C) with magnesium					
Percent (C.E.C) with sodium					
% Organic matter					

j. The sample collection containers, preservation methods, and hold times are found in Table 7: Soil sample containers are 25 cubic inch cardboard boxes supplied by the state soil testing service or the Soils Cooperative Extension.

Table 7			
Parameter	**Container**	**Preservation**	**Hold Time**
ammonia	plastic or glass	Cool 4°C H_2SO_4 pH <2 [aqueous]	28 days
arsenic	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
cadmium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
calcium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
calcium carbonate equivalents	calculation based		
chloride	plastic or glass	none	28 days
chromium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
copper	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
iron	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
lead	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
magnesium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months

Table 7 (Continued)

Parameter	Container	Preservation	Hold Time
mercury	plastic or glass	Cool 4°C pH<2 HNO_3 [aqueous]	28 days
molybdenum	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
nickel	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
nitrate	plastic or glass	Cool 4°C H_2SO_4 pH <2 [aqueous]	28 days
nitrite	plastic or glass	Cool 4°C H_2SO_4 pH <2 [aqueous]	28 days
percent dry solids	plastic or glass	Cool 4°C	7 days
pH	plastic or glass	none	24 hours [liquids]
salt toxicity	plastic or glass	none	6 months
selenium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
silver	Plastic or glass	PH < 2 HNO3 (aqueous)	6 months
sodium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
TCLP (full suite)	glass, PFTE-lined cap	Cool 4°C (for VOC analysis)	14 days (for VOC analysis)
total carbon	amber glass with TFE lined caps	Cool 4°C H_2SO_4 pH <2 [aqueous]	
total kjeldahl nitrogen	plastic or glass	Cool 4°C	28 days
total phosphorus	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
total potassium	plastic or glass	pH<2 HNO_3 [aqueous]	6 months
total volatile solids	plastic or glass	Cool 4°C	7 days
zinc	plastic or glass	pH<2 HNO_3 [aqueous]	6 months

k. To obtain a representative sample of sewage sludge, the sample must be taken from the correct locations and represent the entire amount of waste sludge undergoing aerobic digestion and the lime stabilized batch process. In some situations, the sample point location may have a dramatic effect on the monitoring results. It is important that samples be collected from a location representative of the final sewage sludge that will be land applied. Because the pollutant limits pertain to the quality of the final sewage sludge applied to the land, sludge must be collected after lime stabilization. Samples should be taken from the same point and in the same manner each time a sample collection or monitoring is performed. The sampling location should be safe and accessible.

Table 8	
SLUDGE SAMPLING POINTS	
Sludge Type	**Sampling Point**
Aerobically Digested	Sample from taps on discharge lines from pumps. If batch digestion is used, sample directly from the digester. *Cautions are in order concerning this practice:* If aerated during sampling, air entrains in the sample. Volatile organic compounds may purge with escaping air. When aeration is shut off, solids separate rapidly in well-digested sludge.

l. The sample handling, packaging, and transportation protocols must include the following factors:

1) Sample containers must be packaged to reduce the risk of leakage.

2) They should be held upright and cushioned from shock.

3) Sufficient insulation/refrigerant should be added to maintain 4^{o} C temperature for shipment.

4) Unpreserved samples without heavy contamination are not regulated under DOT. These samples may be shipped packaged as above using a commercial carrier. Transit time should be held to <24 hours.

5) When environmental samples are preserved as recommended, they may be shipped as non-hazardous samples.

m. Adequate documentation of sludge sampling activities is important for general program quality assurance/quality control, and required by most monitoring regulations. Proper sampling activity documentation includes proper sample labeling, chain-of-custody procedures and a logbook of sampling activities. The number of people in the chain of custody should be kept to a minimum to limit the possibility of contamination and to increase accountability.

1) Sample Labeling: Labels and ink should be waterproof. Fix labels to containers with clear waterproof tape. Tape completely around container and over label to prevent accidental label loss or ink smear during shipping and handling. Sample labels should include the following information at a minimum:

- Sample Number (specific to sampling event, i.e., location)
- Type of sample, i.e., grab, 24-hour composite, etc.
- Collector
- *Additional information helpful for sample identification includes:*
- Sampling Organization Name
- Facility Name (being sampled)
- Bottle Number (specific to container)
- Date, Time (24 hour time is preferable, i.e., 1600 vs. 4:00 p.m.)
- Sample Location
- Preservatives
- Analytical Parameter(s)

2) Chain-of-Custody: Each sample shipment requires a chain-of-custody record. A chain-of-custody document provides a record of sample transfer from person to person. This document helps protect the integrity of the sample by ensuring that only authorized persons have custody of the sample. In addition, the chain-of-custody procedure ensures an enforceable record of sample transfer, which is necessary, if the sample results are to be used in a judicial proceeding alleging violations of sludge standards. This document shall record each sample's collection and handling history from time of collection until analysis, as well as the information listed on each sample

bottle. All personnel handling the sample shall sign, date and note the time of day on the chain-of-custody document.

3) Sampling Log Book: All sampling activities shall be documented in a logbook. This book duplicates all information recommended for the chain-of-custody document above, and notes all relevant observations regarding sample stream conditions.

n. A quality assurance (QA) program consisting of the following elements will be initiated at the wastewater treatment plant:

1) Proper collection procedures, equipment, preservation methods and chain of custody procedures to ensure representative samples.

2) Proper sample preparation procedures, instruments, equipment and methodologies used for the analysis of samples.

3) Proper procedures and schedules for calibration and maintenance of equipment and instruments associated with the collection and analysis of samples.

4) Proper record keeping to produce accurate and complete records and reports, when required.

5) Quality control for sample collection includes the use of spiked and split samples, use of specific sampling protocol, proper decontamination of sampling equipment, and the choice of appropriate analytical methods and procedures. Laboratory quality assurance procedures should be available from the laboratory used for analysis.

o. All data reduction, validation and reporting methods including methods of statistical interpretation of analytical results will be submitted to the Safety Office on a semiannual basis. This will include:

1) Any statistical review of analytical results should be described, and all formulas given.

2) Computer spreadsheets used to manipulate data received from a laboratory and a print out of the spreadsheet showing calculation formulas.

Percentages of Organic Nitrogen Mineralized After Sewage Sludge of Various Types Are Land Applied

Table 9				
Years After Sludge Application	**Type of Sewage Sludge**			
	Primary and Waste Activated	**Aerobically Digested**	**Anaerobically Digested**	**Composted**
0 -1	40	30	20	10
1 - 2	20	15	10	5
2 - 3	10	8	5	3
3 - 4	5	4	3	3

5. ***References.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-23

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Waste Minimization Program

1. ***Purpose.***

   a. The Department of Veterans Affairs Medical Center, by virtue of its diverse medical activities and operational support functions, requires the use of materials that may pose a chemical or biological hazard to employees. Use of these materials produce wastes that still retain these hazards.

   b. The Department of Veterans Affairs Medical Center has made a commitment to provide a safe and healthful environment for its patients, visitors, staff and surrounding community. This program is intended to be used for guidance in the management of hazardous and solid wastes.

2. ***Policy.*** This Medical Center will adhere to proper management of waste materials from the time of generation until such time as waste materials are treated or disposed of.

3. ***Responsibilities.***

   a. *Industrial Hygienist* shall be responsible for managing the hazardous waste program.

   b. *Environmental Management Service* shall be responsible for managing the solid waste program.

4. ***Objectives.*** This Medical Center is committed to the establishment of a safe and effective waste minimization program. To achieve this goal, this program strives to meet the following objectives:

   a. Protect the health and well being of the patients, staff, visitors and the community environment.

   b. Develop a system that addresses the identification of hazardous waste and materials from the point of entry into the facility to the point of final disposal.

   c. Provide safe handling, storage, treatment and disposal of hazardous infectious and chemical wastes generated at this facility.

   d. Dispose of hazardous waste in an environmentally sound, responsible and cost-effective manner that complies with federal, state and local requirements.

   e. Comply with federal, state and local regulatory standards, guidelines and requirements.

   f. Enhance coordination and communication among services/divisions and various committees of the VA Medical Center.

5. ***Procedures***. Individual Services are strongly encouraged to consider ways of reducing the volume of chemical waste generated through the redesign of procedures and recycling of materials (see Table 1 for summary of these activities). The Industrial Hygienist will administer a Waste Exchange Program. The program works on the theory that "one man's trash is another man's treasure." Recycling or reusing chemicals instead of disposal will save the Medical Center both the cost of disposal and the cost of new raw material. The Waste Exchange Program contains the following elements:

   a. A list of waste chemicals in the hazardous chemical waste storage area will be sent to all Services approximately one week before the scheduled quarterly pickup.

   b. Any Service or Laboratory that can make use of the waste chemical will be given that chemical (at no charge).

   c. Forming a liaison with state or regional Waste Exchange Programs that will identify potential users or recyclers of the Medical Center's hazardous chemical waste will reduce the quantity of these wastes scheduled for disposal by a Hazardous Chemical Waste contractor.

Table 1

Examples of Waste Minimization Activities	
Method	**Example**
Acquisition	Require purchases to be in small quantities; constraints.
Process	Substitute non-hazardous chemicals for hazardous ones.
Recycling	Commercial recycling firms for waste mercury, solvents, batteries, etc.
Waste Exchange	Identification of surplus or unwanted laboratory chemicals and relocating them to laboratories that can use them.

6. ***References.***

7. ***Rescission.***

8. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-3

S A M P L E

VA Medical Center
(Location)

Meical Center Memorandum ( )
(Date)

Air Quality Management

1. ***Purpose*.** This memorandum establishes VA policy and responsibilities for compliance with air quality and emissions requirements from stationary and mobile sources consistent with the Clean Air Act (CAA) and local and state requirements.

2. ***Background*.** The CAA established National Ambient Air Quality Standards (NAAQS) to protect the health and general welfare of the public. Each state must achieve these standards and develop State Implementation Plans (SIP) that outline plans to achieve and maintain the NAAQS for the Environmental Protection Agency (EPA). Air emission sources are required to comply with the standards and other measures set forth in the individual SIPs. To improve air quality nationwide, the CAA Amendments of 1990 mandated stringent pollution control and prevention measures described within this document.

3. ***Federal Statutes.***

   a. *CAA of 1970*, as Amended (42 USC 7401 *et seq*.)

      1) SIPs implement pollution control programs such as New Source Performance Standards (NSPS), New Source Review (NSR), and National Emission Standards for Hazardous Air Pollutants (NESHAP) at the state and local levels. States may require pollution control and prevention measures that are more stringent than those mandated by the EPA, but they may not allow measures that are less stringent. Federal agencies must comply with federal, state, and local air pollution control regulations.

      2) The 1990 Amendments to the CAA introduced sweeping changes to the legislation, including:

         - Reclassification of non-attainment areas.
         - Regulation of mobile sources.
         - Regulation of listed Hazardous Air Pollutants (HAP).
         - Regulation of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) for acid deposition control.
         - Implementation of an extensive operating permit program.
         - Strengthening EPA and state agency authority, allowing better enforcement of the CAA provisions.

      3) Section 118(a) of the CAA generally waives the Federal Government's sovereign immunity with respect to federal, state and local air pollution control laws and regulations. As a result of this waiver, VA activities are fully subject to the requirements of federal, state and local air pollution control laws, including permitting requirements, and must obey compliance orders issued through administrative or judicial processes.

b. *EPCRA of 1986* (42 USC 11001 *et seq.).* This Act, also known as Title III of the Superfund Amendments and Reauthorization Act (SARA), in addition to the CAA, addresses the release of hazardous substances into the environment and also requires the release reporting of certain extremely hazardous substances to the environment. Certain chemicals subject to the HAPs and risk management provisions of CAA Section 112 are also subject to Title III.

c. *The Alternative Motor Fuels Act (AMFA) of 1988,* as Amended (Public Law 100-494). Congress passed AMFA in 1988 to achieve long-term energy security and to improve air quality. Under AMFA, a portion of the new vehicles, which the federal Government acquires each year, must be alternative fuel vehicles (AFV) in order to encourage the production of these vehicles for consumer use.

d. *The Energy Policy Act (EPACT) of 1992* (Public Law 102-486). EPACT seeks to enhance the Nation's long-term energy security by reducing dependency on imported oil and by improving energy efficiency. EPACT establishes a Federal leadership strategy that encourages automobile manufacturers and fuel suppliers to expand the commercial availability of alternative fuels and vehicles. Under EPACT, federal agencies must acquire increasing numbers of AFVs.

e. *Toxic Substances Control Act (TSCA) of 1976* (15 USC 2601 *et seq.).* In TSCA, the section on Indoor Radon Abatement requires federal departments to conduct a study of radon levels in federal buildings and to provide results of the study to the EPA. The EPA has submitted to Congress a consolidated report on radon levels in federal buildings.

4. ***Requirements.***

a. All VA Medical Centers must have certification that their vehicles have passed local emission testing requirements.
b. Oil and gas-fired heating equipment shall be tuned up at the beginning of each heating season.
c. Dust control methods shall be utilized at all cemeteries where fugitive dust is created. This can be in the form of watering, soil amendments, covers or other suitable methods.
d. All vehicles and grounds maintenance must be tuned in accordance with manufacturer recommendations.
e. All gasoline dispensed must be in conformance with local regulations.

5. ***References.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-4

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Construction Waste Management

1. ***Purpose.*** To outline the policy and procedures to ensure effective management/disposal of any waste generated through approved construction projects at this Medical Center.

2. ***Policy.*** It is the policy of this Medical Center that construction projects shall generate the least amount of waste possible.

3. ***Responsibilities.*** The Subcontractor shall employ processes that ensure the generation of as little waste as possible and shall avoid the generation of waste due to the following:

   a. Over-packaging.
   b. Error.
   c. Poor planning, layout.
   d. Over ordering.
   e. Breakage
   f. Mishandling.
   g. Contamination.
   h. Damage from weather.

4. ***Procedures.***

   a. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged or recycled.

   b. Waste disposal in landfills shall be minimized to the greatest extent possible.

      1) Waste Diversion Goals.

         a) *New Construction:* Minimum ____ of total project waste shall be diverted from landfill.
         b) *Demolition, Major Remodeling:* Minimum____ of total project waste shall be diverted from landfill.
         c) *Interior Remodeling:* Minimum ____ of total project waste shall be diverted from landfill.

      2) The following waste categories, at a minimum, shall be diverted from landfill:

         a) Green waste (biodegradable landscaping materials).
         b) Soil.
         c) Inerts (concrete, asphalt, masonry).
         d) Clean dimensional wood, palette wood.
         e) Engineered wood products: plywood, particle board, I-joists, etc.
         f) Cardboard, paper, packaging.
         g) Asphalt roofing materials.

h) Insulation.
i) Gypsum board.
j) Carpet and pad.
k) Paint.
l) Plastics: ABS, PVC.
m) Beverage containers.

5. ***Description of Work***.

a. Includes:

- Waste Management Plan development and implementation.
- Meetings to discuss goals, issues and training for the Waste Management Plan.
- Techniques to minimize waste generation.
- Sorting and separation of waste materials.
- Reuse of salvaged materials on site.
- Salvage of existing materials and items for reuse or resale.
- Recycling of materials that cannot be reused or sold.
- Record keeping of receipts and records of salvaged, recycled or land filled materials.

b. Related Elements:

- Alternates.
- Construction Waste Management.
- Site Demolition.
- Site Clearing.
- Slope Protection/Erosion Control.
- Asphalt Concrete.
- Crushed Stone Paving.
- Portland Cement Concrete Paving.
- Valve Boxes.
- Storm Sewers.
- Chain Link Fences and Gates.
- Walk, Road and Parking Appurtenances.
- Miscellaneous Landscaping Materials.
- Concrete, Concrete Formwork, and Concrete Reinforcement.
- Cast-in-Place Concrete.
- Unit Masonry.
- Structural Steel.
- Steel Roof Deck/Steel Floor Deck.
- Cold Formed Metal Framing.
- Metal Fabrications.
- Rough and Finish Carpentry.
- Engineered Structural Wood.
- Plastic Lumber.
- Building Insulation.

- Modified Bitumen Roofing.
- Metal Doors.
- Wood and Plastic Doors and Frames.
- Metal Support Systems.
- Gypsum Wallboard.
- Acoustical Treatment.
- Resilient Flooring.
- Tile and Carpet.
- Painting.
- Toilet Compartments.
- Louvers and Vents.
- Signage and Graphics.
- Ductwork and Ductwork Accessories

6. ***Definitions.***

a. *Class III Landfill*: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.

b. *Clean:* Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.

c. *Construction and Demolition Waste:* Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.

d. *Dismantle:* The process of parting out a building in such a way as to preserve the usefulness of its materials and components.

e. *Disposal:* Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

f. *Inert Backfill Site:* A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.

g. *Inert Fill:* A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

h. *Inert Solids/Inert Waste:* Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.

i. *Mixed Debris:* Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

j. *Mixed Debris Recycling Facility:* A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

k. *Permitted Waste Hauler:* A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

l. *Recycling:* The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

1) On-site Recycling. Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.

2) Off-site Recycling. Materials hauled to a location and used in an altered form in the manufacture of new products.

m. *Recycling Facility:* An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.

n. *Re-Use:* Materials that are recovered for use in the same form, on-site or off-site.

o. *Return:* To give back reusable items or unused products to vendors for credit.

p. *Salvage:* To remove waste materials from the site for resale or re-use by a third party.

q. *Source-Separated Materials:* Materials that are sorted by type at the site for the purpose of reuse and recycling.

r. *Solid Waste:* Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

s. *Transfer Station:* A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

7. ***References.***

a. *Guides.* No preference is given to the recycles listed below; they are listed for the convenience of the contractor.

- Dirt/clean fill.
- Green/landscaping waste.
- Concrete, asphaltic concrete.
- Cardboard, paper, packaging.
- Clean dimensional wood, palette wood.
- Usable palettes.
- Metals from banding, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- Carpet and pad.
- Gypsum board.

- Paint.
- Insulation.
- Asphalt shingles.
- Beverage containers.

8. ***Submittals.***

a. *Waste Management Plan.* Prior to any waste removal, the Contractor shall submit their Waste Management Plan to the Medical Center. The Plan shall contain the following:

1) *Analysis* of the estimated job site waste to be generated, including types and quantities.

2) *Proposed alternatives* to land filling. Contractor shall prepare a list of each material proposed to be salvaged, re-used, or recycled during the course of the project.

3) *Methods handling* of materials to be recycled.

i) On site:

- Materials separation
- Materials storage
- Materials protection, where applicable

ii) Off site: Provide name of mixed debris recycling facility; include list of materials to be recycled.

4) *Procedures*. A description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

5) *Landfill Options*. The name of the landfill(s) where trash will be disposed of.

6) *Meetings*. Contractor shall conduct Construction Waste Management meetings. Meetings shall include the Subcontractor, the Project Manager and representatives as designated by the Chief Engineer. At a minimum, waste management goals and issues shall be discussed at pre-bid meetings, pre-construction meetings and regular job-site meetings.

7) *Transportation*. A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.

8) *Waste Management Plan Implementation*.

a) *Manager*. The Subcontractor shall designate an on-site party (or parties) responsible for instructing workers and subcontractors and overseeing and documenting results of the Waste Management Plan for the project.

b) *Distribution.* The Subcontractor shall distribute copies of the Waste Management Plan to the Medical Center Chief Engineer.

c) *Instruction.* The Subcontractor shall provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse and return methods to be used by all parties at appropriate stages of the project.

d) *Separation Facilities.* The Subcontractor shall lay out and label a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

e) *Hazardous Wastes.* Hazardous wastes shall be separated, stored, and disposed of according to local, state and federal regulations.

b. *Reports.*

1) The Contractor shall submit (monthly, quarterly, at end of job) a Waste Management Progress Report. The report shall contain the amount (in tons or cubic yards) of material land filled from the project, the identity of the landfill, the total amount of tipping fees paid at the landfill and the total disposal cost. Include legible copies of manifests, weight tickets, receipts and invoices. Manifests shall be from recycle and/or disposal site operators that can legally accept the materials for the purpose of reuse, recycling or disposal.

2) For each material recycled, reused or salvaged from the project, provide the following:

- Amount (in tons or cubic yards).
- Date removed from the job site.
- Receiving party.
- Transportation cost.
- Amount of any money paid or received for the recycled or salvaged material. Net total cost or savings of salvage or recycling each material. Attach manifests, weight tickets, receipts, and/or invoices. Indicate the project information, including project title, name of company completing form, and beginning and ending dates of period covered by summary form.

9. ***Rescission.***

10. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-5

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Disclosure of Known Lead-Based Paint in Residential Housing

1. ***Purpose.*** This Veterans Affairs Medical Center (VAMC) is committed to disclosing the presence of any known lead-based paint and/or lead-based paint hazards before a lessee occupies a Veterans Affairs (VA) Residential Housing Unit.

2. ***Policy.*** It is the policy of this Medical Center to notify all lessees via a lead hazard information pamphlet and to educate them of potential hazards associated with lead-based paint.

3. ***Responsibilities.*** All employees must perform their functions consistent with regulatory requirements, agency environmental policies and its overall mission:

   a. *The Safety Manager/Industrial Hygienist* will provide information on the Toxic Substance Control Act (TSCA) to managers with responsibility for the program, audit records on a periodic basis and provide consultation in regards to lead-based paint hazards.

   b. *Chief of Facilities Management* will ensure that a process is in place to provide the appropriate information to lessee, ensure the disclosure forms are appropriately completed and ensure that re-disclosure is completed prior to any renovation work or changes in the lease.

   c. *Lessees* will follow the recommendations in the EPA brochure and will notify Chief, Facilities Management, of any peeling or chipping paint and will maintain the apartments in a clean condition.

4. ***Procedures.*** All residential dwellings at the VA Medical Center were built prior to (year) and are considered to contain lead-based paint that may place young children at risk for developing lead poisoning. Lead poisoning in young children may produce permanent neurological damage including learning disabilities, reduced intelligence quotient, behavioral problems and impaired memory. Lead poisoning may also pose a risk to pregnant women. The following procedures will be followed in the disclosure of lead-based paint in residential housing:

   a. At the time the rental agreement is signed, the *Chief of Facilities Management* will provide to the lessee a copy of the pamphlet "Protect Your Family from Lead in Your Home," (EPA747-K-99-01). The Chief of Facilities Management will require the lessee to sign the "Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards" form (Attachment A).

   b. The *Chief of Facilities Management* will maintain all records or reports on lead-based paint and will provide the Safety Office a copy. The *Safety Office* will provide to the Chief of Facilities Management a copy of all analyses for lead-based paint and

materials. The *lessee* will be provided access to all available records and reports pertaining to lead-based paint in residential housing.

c. The *Chief of Facilities Management* will maintain a list of all documents pertaining to lead-based paint in residential housing.

d. Prior to all renovation work in residential housing, the plans will be reviewed and approved by the Safety Office for disruptions of lead-based paint hazards. For all renovations involving greater than two (2) square feet of lead-based paint or other materials, the residents will be re-notified and provided with another EPA pamphlet and a "Lead-Based Paint Pre-Renovation Certification" form (Attachment B).

e. An additional pamphlet will be provided to the resident if there are any changes in the lease or rental agreement. Changes would include rent increases, change in name on the lease, payment method, etc.

f. The *lessee* will acknowledge the receipt of the pamphlet "Protect Your Family from Lead in Your Home" by initialing the disclosure statement.

g. *Facilities Management* will maintain all disclosure statements for a period of thirty years.

5. ***Reference.***

6. ***Rescission.***

7. ***Review Date.***

(Name)
Medical Center Director

Attachments:
A. Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards
B. Lead-Based Paint Pre-Renovation Certification Form

Distribution:

Attachment A to Document 5B2-5

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement. Housing built before 1978 may contain lead-based paint. Lead from paint, paint chips and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing, lessors must disclose the presence of known lead-based paint and/or lead-based paint hazards in the dwelling. Lessees must also receive a federally-approved pamphlet on lead poisoning prevention.

Lessor's Disclosure. Presence of lead-based paint and/or lead-based paint hazards.
[Check (i) or (ii) below]:

_____(i) Known lead-based paint and/or lead-based paint hazards are present in the housing (explain). It is presumed that lead-based paint exists in all residential quarters due to the fact that all were constructed prior to 1978. No records exist or are available pertaining to lead-based paint hazards in residential quarters.

_____(ii) Lessor has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

Records and Reports Available to the Lessor. [Check (i) or (ii) below]:

_____(i) Lessor has provided the lessee with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list of documents available are listed below).

_____(ii) Lessor has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Lessee's Acknowledgment. (Initial):

_____Lessee has received copies of all information listed above.

_____Lessee has received the pamphlet “Protect Your Family from Lead in Your Home”.

Agent's Acknowledgment. (Initial):

_____Agent has informed the lessor of the lessor's obligations under 42 U.S.C. 4852(d) and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy. The following parties have reviewed the information above and certify to the best of their knowledge, that what they have provided is true and accurate.

_____

Lessor Date

_____

Lessee Date

_____

Agent Date

Attachment B to Document 5B2-5

Lead-Based Paint Pre-Renovation Certification

Certification of Receipt of Lead Pamphlet:

I have received a copy of the pamphlet, "Protect Your Family from Lead in Your Home", informing me of the potential risk of the lead hazard exposure from renovation activity to be performed in my dwelling unit. I received this pamphlet before the work began.

_____ _____

Printed Name of Recipient Date

_____

Signature of Recipient

Self-Certification Option (for tenant-occupied dwellings only). If the lead pamphlet was delivered but a tenant signature was not obtainable, you may check the appropriate statement below:

_____ *Refusal to Sign.* I certify that I have made a good faith effort to deliver the pamphlet, "Protect your Family from Lead in Your Home", to the rental dwelling unit listed below at the date and time indicated, and that the occupant refused to sign the confirmation of the receipt. I further certify that I have left a copy of the pamphlet at the unit with the occupied.

_____ *Unavailable for Signature*. I certify that I have made a good faith effort to deliver the pamphlet, "Protect Your Family from Lead in Your Home", to the rental dwelling unit listed below, and that the occupant was unavailable to sign the confirmation of receipt. I further certify that I have left a copy of the pamphlet at the unit by sliding it under the door.

_____ _____

Printed name of person certifying pamphlet delivery Attempted delivery date and time

_____

Signature of person certifying lead pamphlet delivery

_____

_____

_____

Unit address

Note Regarding Mailing Option: As an alternative to delivery in person, you may mail the lead pamphlet to the tenant. Pamphlet must be mailed at least seven (7) days before renovation (document with a certificate of mailing from the post office).

Document 5B2-6

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Energy Management

1. ***Purpose.*** To outline a comprehensive Energy Management Program to ensure energy is conserved and used efficiently, consistent with quality patient care, VHA energy management goals, Executive Order 13123 and availability of resources.

2. ***Policy.*** The Energy Management Program consists of the following elements:

   a. Energy conservation is to be emphasized in the architectural and engineering design of VA facilities, including new construction and remodeling projects.

   b. An Employee Awareness Education Program for energy conservation and to promote energy-wise practices.

   c. Control of all energy utilized for heating, cooling, ventilation, refrigeration, lighting, operating equipment and office equipment.

   d. A Motor Vehicle Management Program to reduce fuel consumption of government motor vehicles.

   e. Procurement and identification of Energy Star® and energy efficient products to ensure we buy products that offer significant energy savings.

   f. On-going technical surveys, audits and monitoring programs established to identify energy efficient improvements by means of operations and maintenance actions and/or energy conservation projects.

   g. Development and maintenance of an up-to-date facility Energy Management Plan. This five-year program forecasts all energy related operating and maintenance actions and projects.

   h. Energy utilization data collection and reporting, and maintenance of historical and reference energy program files, literature and software.

3. ***Responsibilities.***

   a. The *Associate Director* is responsible for providing leadership and support for the Energy Management Program, including overall program coordination, evaluation and monitoring.

   b. The *Chief, Facilities Management* is responsible for the Medical Center's Energy Management Program. As the Facility Energy Supervisor, the Chief, Facility Management, will delegate the everyday overview of the Energy Program to the Energy Manager who is responsible for all energy management efforts.

   c. *Designated Energy Manager* is responsible for:

      1) Promulgating facility directives/controls.

2) Reviewing/approving/disapproving actions that may have a detrimental effect on patient care or essential Medical Center programs.

3) Implementation of feasible energy conservation measures by means of operating and maintenance actions and/or projects; development and updating of the five-year Facility Energy Management Plan; energy utilization data collection and reporting.

4) Maintaining an energy-efficient communications network.

5) Maintaining occupant comfort.

6) Keeping accurate historical data reference literature.

7) Updating/upgrading energy management software programs and files.

d. *Service Chiefs and Supervisors* are responsible for promoting and exercising leadership in effective energy management within their areas of responsibility on a continuing basis. Supervisors are also responsible for reviewing and forwarding to Facilities Management all suggestions for energy conservation that are submitted by employees.

e. *All Employees and Volunteers* are responsible for practicing energy-wise conservation practices. Employees are encouraged to use the incentive awards program for submitting suggestions and proposals for improvement of our energy conservation program.

4. ***Procedures.***

a. *Employee Awareness Program:*

1) Employees are encouraged to take an active role in conserving energy and in identifying and submitting energy-saving ideas and suggestions for consideration.

2) Energy-wise practices and the Energy Management Program will be reviewed and discussed periodically at service and section staff meetings to educate and provide employees with specific knowledge and skills necessary for them to take action in their everyday work that will conserve energy.

3) Educational and promotional articles and items will be published periodically in medical center newsletters, weekly bulletins, etc.

4) Signs will be utilized to remind personnel to turn off lights and equipment, keep doors closed, etc., as appropriate.

5) Helpful hints for all employees:

a) Turn off lights in all unoccupied rooms or spaces, including storerooms, closets and restrooms. Computer systems and other non-essential electrical equipment will be turned off at the close of the business day by using services. Notify Engineering if you think an occupancy sensor would be appropriate to automatically turn lights off during long periods of room inactivity.

b) Report excessively lighted spaces to Facilities Management. Identify light fixtures that could be removed without sacrificing safety or productivity.

c) Do not adjust thermostats or heating/cooling controls - contact the Work Order desk to change room temperatures.

d) Keep windows and doors closed in air conditioned spaces. Disconnect window air conditioning units during the heating season.

e) Dress appropriately for the season and daily weather.

b. *Lighting Procedures:*

1) Lighting will be turned off in unoccupied areas and controlled to meet only specific needs in partially occupied areas.

2) Generally, non-patient area lighting levels will be maintained at approximately 50 foot-candles at workstations, 30 foot-candles in general areas and 10 foot-candles in corridors. Prolonged office work with some visual difficulty may require 75 to 100 foot-candles. Anything over 75 foot-candles may be achieved with supplementary task lighting.

3) Patient areas will be maintained at lighting levels appropriate to patient care as determined by the clinical staff.

4) Lighting levels and control in animal care areas will be as recommended by research staff.

5) Generally, interior finishes having good light reflectance will be utilized.

6) Energy-saving replacement lamps, tubes and ballasts will be utilized. Fluorescent lamps used for general illumination will have color rending greater than 85, with temperature between 3500^{o} K and 5000^{o} K. Services should request approval from the Energy Manager for special lighting applications.

7) Lighting systems and other electrical equipment will be periodically cleaned and appropriate preventive maintenance performed.

8) Preference will be given to the installation of more efficient lighting systems for new construction and remodeled spaces to the extent that projected energy savings will offset higher acquisition and maintenance costs.

9) The purchase of task lights must be approved by the Energy Manager prior to purchase to ensure lights and ballasts are energy efficient.

c. *Heating and Cooling Procedures:*

1) Comfort shading control will be practiced.

2) Dress should be appropriate for the season and daily weather.

3) Convectors, diffusers, registers and grills will be kept clear of obstructions that restrict air movement.

4) Generally, doors and windows will be kept closed when heating and cooling systems are on, especially in air-conditioned areas.

5) Systems and equipment will be shutdown or night-cycled when not needed and/or demand/duty-cycled during periods of low demand.

6) Temperatures in non-patient areas will be maintained at not more than 70-74^{o} F during heating season and not less than 75-78^{o} F during the cooling season. The use of portable heater blowers, threshold heaters, and portable space heaters is **prohibited** unless recommended and approved for a special medical reason. The requesting Service will be required to obtain Space/Utility approval from the Energy Manager prior to procurement and/or installation to avoid the possibility of overloading electrical circuits.

7) Patient areas and animal care areas will be maintained at space temperatures specified by the clinical or research staff.

8) Operations and Maintenance: Temperatures, pressures and flows will be maintained at minimums necessary to meet operating needs. Exhaust air reduction and heat recovery will be maximized. Insulation, caulking, shading control and weather-stripping will be utilized to minimize building envelop transmission losses. Systems and equipment will be periodically cleaned and appropriate preventive maintenance performed. Cooling energy will not be used to achieve the temperature specified for heating, e.g., a warm winter day.

d. *Operating Equipment and Office Equipment Procedures:*

1) Equipment will be turned off when not in use and warm-up time kept to the minimum necessary.

2) Stairs should be used instead of elevators, especially when going down or up only one level.

3) Generally lids will be used when cooking with pots and kettles.

4) Equipment will be periodically cleaned and appropriate maintenance performed.

5) Overall electrical system power factor will be maintained at a minimum of 0.90.

e. *Motor Vehicle Management Program:*

1) Vehicle use will be limited to necessary official business using the most direct efficient routing.

2) Trips will be consolidated and vehicle use pooled whenever possible for most efficient vehicle utilization.

3) Operators will observe posted speed limits in residential/city areas and highway/rural areas. They will observe unposted speed limits as required by local laws.

4) Operators will ensure that vehicle tires are kept properly inflated.

5) Operators will take precautions to protect vehicle gasoline supplies and avoid waste in dispensing fuel.

f. *Energy Efficient Project Design:* Energy efficient designs and specifications will be used for new construction and for construction alterations and retrofits.

g. *Considerations/Procedures for Energy Star® and Energy Efficient Equipment Procurement:*

1) Executive Order 13123, Greening the Government Through Energy Efficient Management, requires the federal government to purchase energy-using equipment which meets "EPA Energy Star" requirements for energy efficiency. These products should be procured when available and practical.

2) If an Energy Star® product is not available, there is still the requirement to save. Products that are in the upper 25% of energy efficiency for all similar products or products that are at least 10% more efficient than the minimum level that meets Federal Standards will be purchased whenever practical.

3) Items that consume power in a standby mode should meet Federal Energy Management Program (FEMP) recommendations for standby power wattage. If FEMP has listed a product without a corresponding wattage recommendation, purchase items that use no more than one watt in their standby power consuming mode. When it is impracticable to meet the one watt requirement, purchase items with the lowest standby wattage practicable.

4) All employees are encouraged to procure products that are energy efficient or water conserving.

h. *Considerations/Procedures for Accelerated Retirement of Inefficient Equipment:*

1) The early retirement of older, inefficient appliances and other energy and water-using equipment is encouraged.

2) The requesting service and the Medical Center Equipment Committee will take into account the availability of the many significant improvements in energy efficiency and water conservation when reviewing the need to replace older, inefficient, operating equipment.

3) The guidelines to determine the cost-effective early retirement of all older equipment will include opportunities to downsize or otherwise optimize the replacement equipment as a result of associated improvements in the building envelop, system or process, efficiency and reductions in pollutant emissions, use of chlorofluorocarbons and other environmental improvements.

4) All equipment requests, new or replacement, will be screened and reviewed by the Energy Manager to ensure compliance with the intent of the Energy Act of 1992.

i. *Operations and Maintenance Procedures:*

1) Good operating and maintenance practices will be followed to:

a) Maintain/improve comfort, health, safety.

b) Extend equipment life.

c) Keep energy consumption down.

d) Reduce repair and replacement costs.

2) Operations and maintenance practices as they relate to energy consumption will be reviewed on an annual basis.

j. *New Construction and Remodeling Project Procedures:*

1) The Energy Manager will review all project documents to ensure new and remodeling projects are designed and constructed to minimize the life cycle cost of the facility by utilizing energy efficiency, water conservation, or solar or other renewable energy technologies.

2) Monitoring and commissioning of newly installed or retrofit equipment will be conducted by the Energy Manager and Project Manager to ensure the new construction meets the requirements of the Energy Act of 1992.

k. *General Conservation Methodology:* The following conservation techniques or operating procedures will be followed in addition to the above items:

1) *Conservation of Heating Fuels.* Insulation of all steam, hot water, condensate lines and water heaters will be maintained in a maximum state of repair. Steam valves will be maintained so that they are capable of shutting off the flow completely. Traps are to be checked frequently and maintained to operate properly. Temperatures in hot water storage tanks will be checked frequently and maintained at the minimum allowable operating temperatures.

2) *Conservation of Electricity.* Electrical equipment, lighting, computer systems, etc., will be turned off at the close of the business day by using services, except in those rooms that remain occupied. If absolutely necessary, computer equipment used to receive information may be left on. Lighting levels will generally follow the foot-candle guidelines listed in the Orange Book (Energy Conservation in the Veteran's Administration, Table 4) and/or the recommended minimum lighting levels published by the Illumination Engineers' Society. The use of electrically operated devices will be kept to an absolute minimum consistent with proper and efficient operations.

3) *Conservation of Water.* All use of water will be kept at an absolute minimum, consistent with proper operations; particularly, hot water, which requires energy to heat. Attention is directed to leaking faucets and/or faucets not properly turned off. Report all leaking faucets to Engineering for immediate repair.

4) *Conservation of Ice.* The use of ice will be kept to a minimum consistent with care of patients and necessary for other operating purposes. Extreme care will be taken to minimize the possibility of contamination of ice by foreign matter. Unnecessary quantities of ice should not be allowed to melt in containers before being used.

5) *Conservation of Air Conditioning.* Where practical, air conditioning equipment will be turned off when not in use. The use of heat-producing equipment in air-conditioned areas will be kept to a minimum consistent with necessary operations. Heat producing equipment should be turned off when not in use.

6) *Conservation of Refrigeration.* Temperatures in deep freeze units (except for ultra-low freezers) should be maintained between -8° and 0° F. Temperatures in coolers should be maintained between 36° and 40° F.

5. ***References.***

a. Energy Policy Act of 1992 (PL 102-486).

b. Executive Order 13123, Greening the Government Through Energy Efficient Management, dated June 3, 1999.

c. Executive Order 13221, Energy Efficient Power Devices, dated July 31, 2001.

d. VA Directive 0055, VA Energy Conservation Program, dated July 28, 2003.

e. VA Handbook 0055, VA Energy Conservation Program Procedures, dated July 28, 2003.

f. VHA Supplement, MP-3, Chapter 2, paragraph 2.18 (Energy Conservation in Existing Buildings), Department of Energy, dated July 15, 1988.

g. Total Energy Management for Hospitals; HHS.

h. Energy Management in Federal, State and Local Government Buildings, The Association of Energy Engineers, dated October 24, 1992.

i. Energy Star®: http://www.energystar.gov.

j. Federal Energy Management Program, http://www.doe.gov

6. ***Concurrences.***

Chief of Staff

Chief, Acquisition and Material Management

Chief, Facilities Management

Associate Director

7. ***Rescission.***

8. ***Follow-Up Responsibility.*** Chief, Projects, Operations and Environmental Management

9. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Document 5B2-7

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Fuel Storage Tanks, Underground (USTs) and Above Ground (ASTs), and Piping Management

1. ***Purpose.*** To establish a policy at this Medical Center for protection of human health and the environment by safeguarding our natural resources and structures from fire, contamination or explosions caused by fuel leaking from underground storage tanks (USTs) or above ground storage tanks (ASTs).

2. ***Responsibility.*** The *Engineering Program Manager*, has the overall responsibility for ensuring that all fuel storage tanks meet all current state and federal UST and AST regulations. The *Program Manager* delegates the responsibility for compliance to Maintenance and Operations Section, Project Section and Safety personnel.

   a. *Engineering Maintenance & Operations (M&O) personnel* are responsible for the compliance requirements for existing regulated USTs and ASTs:

      - Tank Location(s) (*List*)
      - Compliance Date (*Identify*)

      Note: Tanks used for storage of heating oil are exempt from the laws but shall meet the same criteria for leak protection and monitoring.

   b. The *Project Manager* has the responsibility to develop and administer projects for modification of existing tanks and piping, installation of replacement tanks and piping, and installation of additional tanks and piping in accordance with state and federal UST regulations. All tanks installed after December 22, l998, are new tanks and must meet all requirements at time of installation.

   c. The *Safety Manager* has the responsibility to record and report to the regulatory authority at the beginning and end of a UST system's operating life. Also, all suspected or confirmed leaks or spills will be reported.

3. ***Procedures.***

   a. General. All existing fuel storage tanks have been upgraded to comply with current state and federal regulation as of December 22, 1998. All tanks are equipped with electronic leak monitoring systems and are checked in accordance with a prescribed schedule for any leaks.

   b. The *Project Manager* shall develop and administer projects for replacement of existing tanks or installation of additional tanks after December 1998 to meet the following requirements:

l) Certification that tank and piping are installed properly according to industry code, EPA and (State) regulations.

2) Equip the UST with devices that prevent spills and overfills.

3) Protect AST tanks and piping from spills and overfills with dike enclosures sized to fully contain the entire capacity of the tank.

4) Protect metal tanks and piping from corrosion or use all non-metallic materials for tanks and piping.

5) Equip the tank and piping with leak detection and monitoring equipment.

c. The *M&O Section Supervisors* listed in Paragraph 2 will inventory monthly (minimum) by use of a dipstick and enter in a permanent log. Recorded usage from meters will also be entered and running totals will be maintained. Also, these supervisors will maintain leak detection and monitoring systems in fully operational mode and will record scheduled testing of such systems.

l) In the event that a suspected shortage of fuel is noted, daily monitoring will be required until such time that it is determined that the recorded shortage is due to either use or loss of fuel. At any time there is a suspected shortage, the *Engineering Program Manager* will be notified through the appropriate chain of command of supervisors.

2) In the event that a shortage is determined to be an underground loss, immediate action will be taken to transfer the fuel to other tanks or have the tank pumped out into tank trucks. Arrangements for tank trucks will be the responsibility of the *General Foreman of the responsible M&O Section.* If it is suspected or there is any indication that fuel is getting into the sewer systems, the local Fire Department and local Sewer District will be notified by the supervisor on site immediately. *The M&O General Foreman* will notify the *Safety Manager* immediately of a leak or spill.

3) Following the removal of fuel from a leaking tank, the *M&O General Foreman* will arrange for testing of the tank and associated piping. This will be accomplished by pressure testing and/or soil sampling by qualified personnel under contract. Following a review of the test results, repair or removal of the defective tank or piping will be accomplished.

d. The *Safety Manager* will maintain and file the following records to prove the facility's recent compliance status:

l) Leak detection performance:

a) Last year's monitoring results.

b) Copies of performance claims provided by leak detection manufacturers.

c) Records of maintenance, repair and calibration of leak detection equipment.

2) Documents showing that a repaired or upgraded UST system was properly repaired or upgraded per applicable codes and state and federal regulations.

3) For three years after closing a UST, records of the site assessment results required for permanent closure (these results must show what impact the UST has had on the surrounding area).

   a) The *Safety Manager* will report all suspected or confirmed leaks or spills to the EPA and to the (State) Department of Natural Resources (DNR) Laboratory Services Program within 24 hours.

      Note: Petroleum spills and overfills of less than 25 gallons do not have to be reported if immediate action to contain and clean up is done.

   b) Report clean up progress to DNR within 20 days after a leak or spill. Investigate to determine extent of damage to the environment and report to DNR within 45 days after a leak or spill. Develop and submit a corrective action plan (if required) that shows how requirements established by the DNR will be met.

4. ***References.*** Federal Register and EPA Regulations for USTs; U.S. Environmental Protection Agency Booklet, "Musts for USTs," EPA l530/UST/88/008, dated September l988; State Department of Natural Resources, Division of Environmental Quality, Underground Storage Tank Technical Regulations, dated December 22, l988.

5. ***Rescissions***.

6. ***Review Date***.

(Name)
Medical Center Director

Distribution:

Document 5B2-9

S A M P L E

VA Medical Center
(Location)

Medical Center Memorandum ( )
(Date)

Management of Universal Hazardous Wastes

1. ***Purpose.*** A number of devices used in our Medical Center contain mercury or other toxic materials that may pose a hazard to human health or the environment when improperly managed. These devices are universal hazardous wastes; they meet the definition of a hazardous waste, but when disposed of may pose a relatively low risk during accumulation and transport compared to other hazardous wastes. Alternative management practices for universal hazardous wastes have been established by the U.S. Environmental Protection Agency (EPA) and state Environmental Protection Agencies to promote recycling.

2. ***Policy.*** It is the policy of this Medical Center to reduce the amount of toxic substances used, to reduce worker and environmental exposure to the release of toxic substances and to manage universal hazardous waste in the most appropriate fashion.

3. ***Responsibilities.*** A facility-wide management policy involves all Services that use toxic substances and generate universal hazardous wastes. Those responsible for ensuring that this circular is enforced are:

   a. The *Safety Manager/Industrial Hygienist* is responsible for the management of the program, interpretation of regulations, training, management of manifests or bills of lading and transportation.

   b. *Service Chiefs/Line Managers* are responsible for the proper handling, labeling and management of universal wastes until transported to the accumulation site.

   c. *Employees* are responsible for following the contents of this policy.

4. ***Universal Hazardous Wastes.*** The following materials are considered universal hazardous wastes:

   - Mercury Thermostats/Thermometers/Devices
   - Mercury containing lamps
   - Batteries
   - Cathode ray tubes
   - Totally enclosed Polychlorinated Biphenyl (PCB) Ballasts

5. ***Procedures.*** It is extremely important to manage all universal hazardous wastes properly and to prevent releases to the environment. The following procedures will be adhered to:

   a. All employees handling universal hazardous wastes are prohibited from disposing, diluting or treating universal hazardous wastes without proper authority from the Safety Office.

   b. All universal hazardous wastes must be stored in a closed container in good condition that is compatible with the waste. Each container must have a Universal Hazardous

Waste label marked with the date the accumulation started and the date when the container became full.

c. Adequate aisle space must be provided to ensure visual inspection of the condition of all containers.

d. All storage areas must be locked.

e. Each service responsible for generating the waste must inspect the storage area weekly and document using the log in Attachment A. All items must be filled out on the log, including the number and types of universal hazardous waste items.

f. The Safety Office must be notified the day the universal hazardous waste container becomes full. Wastes must be shipped at least 90 days from the full date.

g. The best alternative for many universal hazardous wastes is to use a manufacturer who will take back their product for recycling. This reduces the cost of universal hazardous waste disposal.

h. All employees who handle universal hazardous wastes must be trained in proper handling, storage, packaging and in the contents of this program.

i. The Safety Office will collect all inspection logs and retain all records pertaining to the handling and disposal of universal hazardous wastes. Manifests, universal bills of lading, and certificates of recycling will also be maintained in the Safety Office.

j. All spills of universal hazardous waste must be reported to the Safety Office.

6. ***References.***

7. ***Rescission.***

8. ***Review Date.***

(Name)
Medical Center Director

Attachment:
Hazardous Waste Collection Form

Distribution:

Attachment A to Document 5B2-9

Hazardous Waste Stored for Collection

Date to Storage	Person Responsible	Waste Material	Waste Phase	Waste Amount	Container Size/Type	Container Number

Attachment A to Biohazardous Waste Reduction Plan

Municipal and Biohazardous Waste Container Location List

Container #	Container Location
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Attachment A to Report of Annual Effectiveness Review

S A M P L E

Biohazardous Waste Reduction Plan

1. ***Introduction and Scope.***

   a. *Purpose*. This plan sets forth the procedures for achieving the environmental objective of biohazardous waste reduction. It adds to, without replacing, the local policy and procedures for segregation and disposal of biohazardous waste at this Medical Center. Because the disposal of biohazardous waste has a significant impact on the environment, this GEMS Committee has selected the objective of reducing biohazardous waste by 10% (by weight) this calendar year. Procedures for achieving this objective and target appear below.

   b. *Causal Analysis of Improper Waste Segregation.* The GEMS Committee conducted a waste stream analysis of the waste disposed of in biohazardous waste containers and determined that about 20% was not biohazardous waste. This means that it could have been disposed of as municipal waste which would have saved this facility $18,000 last year. When red-bagged waste comes in contact with non-biohazardous waste, all the waste is considered biohazardous waste; therefore, the solution is proper segregation before disposal. A causal analysis directed the GEMS Committee to the following critical elements to proper waste segregation: Correctly identifying biohazardous waste and properly disposing of biohazardous waste. The first element speaks to employee education and behavior management, and the second element involves the availability of the proper waste containers.

2. ***Implementation Procedures to Accomplish Goal.*** The procedures identified in the Biohazardous Waste Management Medical Center Memorandum #XX remain in effect with the following additions for this calendar year:

   a. Forty-eight additional containers for municipal and biohazardous waste will be placed in the identified locations to facilitate proper waste segregation. (See the Attachment A, Municipal and Biohazardous Waste Container Location List.)

   b. Monitoring the proper placement of waste containers and the proper segregation of waste will be conducted monthly during regularly scheduled hazard surveillance rounds by the hospital team and weekly by the Housekeeping supervisor. Segregation errors and missing containers will be logged by both, and corrective actions will be instituted, tracked and reported monthly to the GEMS Committee. (See Attachment B, Waste Segregation and Waste Container Placement Log and Report Form.).

   c. Hospital-wide trends in proper segregation (as determined by reduced error rates) and in reduction of biohazardous waste will be charted quarterly. Progress in reduction of biohazardous waste will be posted in the Canteen.

d. All VAMC employees who come in contact with biohazardous waste will receive refresher training on waste segregation and disposal from the Infection Control Practitioner within 60 days of the date this plan is approved. Supervisors of employees not meeting this requirement will meet with the Associate Director.

e. The Infection Control Practitioner will design, develop and present the refresher training and will submit the list of topics covered to the GEMS Committee.

f. The Infection Control Practitioner will submit a list of employees requiring refresher training and report the status of refresher training on a monthly basis until complete.

g. The GEMS Committee will consider a group award for special contribution to this successful effort. Nominations for the award will be considered at the end of the year when the annual program evaluation indicates the objective and target were exceeded.

Attachments:
A. Municipal and Biohazardous Waste Container Location List
B. Waste Segregation and Waste Container Placement Log and Report Form

Submitted by: _____ Date:_____
Chairperson, GEMS Committee

Approved by: _____ Date:_____
Medical Center Director

Attachment B to Biohazardous Waste Reduction Plan

Waste Segregation and Waste Container Placement Log and Report Form

Date	Problem	Location	Corrective Action	Date Fixed	Date Rechecked

Attachment B to Report of Annual Effectiveness Review

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form

(Note: Use one form per objective)

Date October 5, 2004

Individual Responsible for Implementation:
Housekeeping Officer and Infection Control Practitioner

Environmental Objective:
To reduce the generation of biohazardous waste.

Related Target(s):
3% reduction by weight of biohazardous waste.

Related Significant Environmental Aspect(s):
Air and land pollution due to disposal of biohazardous waste.

Service Specific Function and/or Department:
Primary Care, Behavior Health, Surgery, Specialty and Diagnostics, Housekeeping

Target Date (Month/Year): *End of Calendar Year*

Frequency of Monitoring:	*Weekly*	*Monthly*	*Quarterly*	*Annually*
(Check one)		*X*		

Action Plan:
Implement biohazard segregation program, implement staff education program, identify areas for biohazard containers, continuous monitoring during environmental rounds.

How will this objective be met? (Attach additional pages as necessary)

1. *Housekeeping will survey all areas of the health care system to determine appropriate placement of biohazard receptacles.*
2. *Infection Control will develop training curriculum and deliver staff education.*
3. *Monitoring will be performed by housekeeping staff during trash removal and surveyed during environmental rounds.*

What operational controls shall be incorporated to achieve this objective?
Strategic placement of waste containers.

How will this objective be tracked? (Attach additional pages as necessary)
All biohazard waste will be weighed prior to transport off-site.

What resources will be required to achieve this objective? (Attach additional pages as necessary)
Purchase of additional municipal and biohazardous waste containers.

Document 5B3-1

S A M P L E

GEMS Committee Report of Annual Effectiveness Review

Excerpt From the Minutes of the GEMS Committee, (Insert date of meeting)
Approved and Signed by the Medical Center Director

1. The GEMS Committee found the GEMS program to be effective in its (first, second, etc.) year, as indicated by:
   - Completion of _____% of the corrective actions for the GEMS Gap Analysis conducted (insert date).
   - Completion of _____% of the corrective actions for the baseline Environmental Compliance Audit, conducted (insert date).
   - Achievement of the objectives and targets set at GEMS Committee Meeting (insert date) and as modified at the (insert date) GEMS Committee Meeting.

2. The GEMS Committee recommends the following new objectives and targets for FY (insert upcoming FY): (Note: Attach objectives and targets form for each new objective identified.)
   - _____% reduction in (insert area identified as a new objective) compared with FY (insert previous FY). (See attached plan for monitoring and accomplishment.)
   - _____% reduction in (insert area identified as a new objective). (See attached plan for monitoring and accomplishment.)
   - (List as many as identified by the GEMS Committee. Include a plan for monitoring and accomplishing each item.)

3. The following dashboard summarizes the status of GEMS effectiveness evaluations:

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
Appoint a GEMS Coordinator and a GEMS Committee	Coordinator and Committee will be appointed no later that the end of the first quarter.	Mr./Ms. was appointed the GEMS Coordinator with participants from all organizational units. Mr./Ms., Associate Director, was appointed committee chairman.

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
Conduct a Gap Analysis to Determine Disparity in our Present Program	Gap analysis will be completed by the end of the second quarter.	The gap analysis was completed February 2004, with new policies developed as needed and routed for comments.
Develop and Implement a GEMS Program	The program will be published and in effect by the end of FY 04.	The newly established written GEMS program was established September 1, 2004.
Environmental Rounds are Conducted Quarterly in all Areas (Patient and Non-Patient) of the Medical Center to Demonstrate Compliance with GEMS.	Surveys conducted 90% of the time and deficiencies are corrected within 30 days.	This performance standard was significantly met during FY 2004. All surveys were performed as scheduled in MCM 00-46, Environmental Rounds and in accordance with the Environment of Care Standards (JCAHO). However, not all deficiencies were abated within 30 days. Although 89% (1030/1154) of the items noted were abated within 30 days, the percentage fell below the stated goal of 100%. It should be noted that there was no duplication of deficiencies when making rounds the second time in FY 1999.

Environmental Compliance Audits/Inspections		
Compliance Standard	**Compliance Problem**	**Status**
Safe Drinking Water (SDW)	The well exceeds safe drinking water standards.	Standards met as evidenced by _____.
Resource Conservation and Recovery Act (RCRA)	Inspection log not up-to-date.	Standards met as evidenced by _____.
Air Emissions	Boiler exceeds air emission standards in permit.	Standards met as evidenced by _____.

GEMS Targets and Objectives		
Performance Objectives	**Performance Target**	**Status**
Red Bag Waste	Reduce red-bag waste by 3% by weight by end of fiscal year.	Standards met as evidenced by _____.
Pesticide Use	Change practice of scheduled	Standards met as evidenced by

GEMS Targets and Objectives		
Performance Objectives	**Performance Target**	**Status**
	pesticide application to be applied when determined necessary by sampling through fiscal year.	_____.

Attachments:

A. (Insert name(s) of plan(s) for monitoring and accomplishing objective(s) in paragraph 2. Sample Biohazardous Waste Reduction Plan provided as a guide.)
B. GEMS Objective and Target Form(s) (one for each objective identified. Sample provided for biohazardous waste.)

Submitted by: _____ _____
Chairperson, GEMS Committee Date

Approved by: _____ _____
Medical Center Director Date

Document 5B3-2

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form (Blank)

(Note: Use one form per objective)

Date _____ **Individual Responsible for Implementation**:
Environmental Objective:
Related Target(s):
Related Significant Environmental Aspect(s):
Service Specific Function and/or Department:
Target Date (Month/Year):
Frequency of Monitoring:
Action Plan:
How will this objective be met? (Attach additional pages as necessary)
What operational controls shall be incorporated to achieve this objective?
How will this objective be tracked? (Attach additional pages as necessary)
What resources will be required to achieve this objective? (Attach additional pages as necessary)

Document 5B3-2

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form (Blank)

(Note: Use one form per objective)

Date _____ **Individual Responsible for Implementation**:
Environmental Objective:
Related Target(s):
Related Significant Environmental Aspect(s):
Service Specific Function and/or Department:
Target Date (Month/Year):
Frequency of Monitoring:
Action Plan:
How will this objective be met? (Attach additional pages as necessary)
What operational controls shall be incorporated to achieve this objective?
How will this objective be tracked? (Attach additional pages as necessary)
What resources will be required to achieve this objective? (Attach additional pages as necessary)

Document 5B

S A M P L E

VA Medical Center **Medical Center Memorandum ( )**
(Location) **(Date)**

Green Environmental Management Systems (GEMS) Policy

1. ***Purpose***.

   a. Executive Order 13148, Greening the Government Through Leadership in Environmental Management, directs that federal agencies have a governing environmental policy in place for the operation of its facilities. The Executive Order also requires that VHA facilities develop and implement environmental management systems. The objectives of an environmental management system are to ensure that facilities are in full compliance with environmental regulations and are operated and managed in such a way as to result in the continual improvement of the environmental program.

   b. This VA Medical Center policy facilitates the use of its Green Environmental Management Systems (GEMS) to attain continual improvement in environmental programs.

2. ***Policy***.

   a. The mission of the VA Medical Center (insert medical center name) is to deliver quality healthcare to our nation's veterans. In order to accomplish this mission, the VA Medical Center recognizes that it must operate so as to protect both the environment and the health and safety of patients, employees and visitors. This Memorandum establishes a governing environmental policy to accomplish this mission.

   b. In accomplishing its mission of providing quality healthcare to our nation's veterans it is this VA Medical Center's policy to:

      1) Develop and implement a VA Medical Center GEMS that will meet both the requirements of EO 13148 and the guidance provided by Veterans Health Administration.

      2) Be a good steward of the environment by complying with federal, state and local environmental laws and other requirements, preventing pollution, minimizing waste, conserving cultural and natural resources and continually improving environmental programs.

      3) Utilize sustainable practices to eliminate, minimize or mitigate adverse environmental impacts.

      4) Evaluate the operation of the VA Medical Center to incorporate actions into facility planning and procedures to reduce environmental vulnerabilities.

5) Integrate pollution prevention, waste minimization, resource conservation and environmental compliance into VA Medical Center operations, purchasing, planning and decision-making, wherever practical. Source reduction is the pollution prevention method of choice, followed by recycling, treatment of wastes and proper disposal.

6) Use natural resources efficiently, and maintain the protect plant and wildlife habitat consistent with the VA Medical Center's mission.

7) Recognize that the development and construction at the VA Medical Center must consider the unique conditions of the environment of which the facility is a part.

8) Train VA Medical Center staff as needed to carry out the environmental responsibilities of their positions.

9) Solicit input, as appropriate, from stakeholders including staff, patients, visitors and the local community regarding environmental matters affecting the operation of the VHA facilities.

3. ***Responsibilities***. All VA Medical Center employees must perform their functions consistent with regulatory requirements, VA environmental and other policies and its overall mission.

   a. *Medical Center Director* is responsible for implementation of the VA Medical Center GEMS. The Medical Center Director appoints key personnel, including the GEMS Coordinator and GEMS Committee members, to develop and implement the GEMS.

   b. *GEMS Coordinator:*

      1) Is the key member of the VA Medical Center GEMS Committee with technical expertise in environmental management systems and environmental technology and regulatory compliance.

      2) Coordinates the development and implementation of the VA Medical Center GEMS across organizational elements.

   c. *GEMS Committee*:

      1) Oversees development and implementation of the GEMS.

      2) Identifies significant aspects.

      3) Sets targets and objectives and approves the plan to achieve them.

      4) Approves the corrective action plans.

      5) Monitors progress on achieving targets and objectives, implementation of GEMS, completion of corrective action plans and effectiveness of GEMS.

      6) Submits an annual report on the effectiveness of the GEMS to the Medical Center Director for approval.

      7) Is responsible for ensuring that all aspects of this policy and implementation of the GEMS program maintain full compliance with all environmental laws, regulations and related statutes and other environmental requirements.

4. ***Procedures***. Procedures to implement GEMS are published separately and include:
   a. Procedure for Determining Significant GEMS Aspects and Impacts.
   b. GEMS Legal and Other Requirements.
   c. Establishing Objectives and Targets for GEMS Program.
   d. GEMS Responsibility Matrix.
   e. GEMS Training Program.
   f. GEMS Communications to External and Internal Parties.
   g. GEMS Document and Record Control.
   h. Procedures for GEMS Operational Controls.
   i. GEMS Emergency Planning and Response.
   j. GEMS Monitoring and Measuring Procedure.
   k. GEMS Nonconformance and Corrective and Preventive Action.
   l. GEMS Gap Analysis Program Review.
   m. GEMS Procedure for Annual Program Effectiveness Review and Report.
5. ***Reference***. Executive Order 13158, Greening the Government Through Leadership in Environmental Management.
6. ***Rescission.***
7. ***Review Date.***

(Name)
Medical Center Director

Distribution:

Acknowledgements

This Guidebook was possible because of the devoted attention of the personnel and management of the

Center for Engineering & Occupational Safety and Health (CEOSH)
St. Louis, Missouri

We would like to thank the following individuals for their efforts in developing this Guidebook and also for the support provided by their facility management:

***Arnold Bierenbaum**, Director, Safety & Technical Services, VACO, Washington, DC*

***Tina Beckner**, Technical Information Specialist, CEOSH, St. Louis, MO*

***Tom Boos**, Safety Management Specialist, VAMC, Topeka, KS*

***Donald Campbell**, Environmental Engineer, NCA, VACO, Washington, DC*

***Keith Davidson**, Safety and Occupational Health Manager, VAMC, Sheridan, WY*

***Mary (Bernie) Foster**, Technical Information Specialist, CEOSH, St. Louis, MO*

***Michael Frydach**, Biomedical Engineer Trainee, CEOSH, St. Louis, MO*

***Jim Holland**, VISN 15 Network Safety Manager, St. Louis, MO*

***William Kulas**, Safety Officer, VAMC, Togus, ME*

***Victoria Lay**, Safety/Industrial Hygiene Trainee, CEOSH, St. Louis, MO*

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***Diane Lynne**, Attorney Advisor, U.S. EPA Headquarters, Washington, DC*

***Linda L. Martin**, Director, OSH Program Support, CEOSH, St. Louis, MO*

***Freddie Martinez**, Storage Specialist, VACO, Washington, DC*

***Barbara Matos**, Environmental Program Specialist, VACO, Washington, DC*

***Ruben McCullers**, Environmental Scientist, U.S. EPA Region 7, Kansas City, KS*

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***John (Jack) Staudt**, VHA Environmental Engineer, VACO, Washington, DC*

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* Denotes Chairperson

In addition to the members of the GEMS Guidebook workgroup, we wish to acknowledge the important contributions of the following dedicated environmental professionals who critiqued the Guidebook manuscript and offered suggestions for improvement:

Edward Pinero, *Deputy Federal Environmental Executive, Office of Federal Environmental Executive-White House Task Force on Waste Prevention and Recycling*
Kathleen Malone, *Federal Facility Program Manager, U.S. EPA Region 2*
Anne Fenn, *Federal Facility Program Manager, U.S. EPA Region 1*
Gregory Winters, *Industrial Hygienist, VA Central Office*

We would like to thank Medical Center, VISN and VHA Central Office professional Safety and Engineering individuals who made contributions to and reviewed this Guidebook.

We would like to thank Ms. Lesa Hall-Young, Medical Illustrator, VA Medical Center, Durham, NC, for her graphic design work for the guidebook cover.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Administration** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Electrical Equipment	Energy Consumption	Use of Natural Resources	1	1	4	2	**8**
Files and Records	Paper Usage, Potential Usage of Non-Recycled Paper	Use of Natural Resources	1	1	4	2	**8**
Copying	Toner Usage	Use of Natural Resources	1	2	2	2	**7**
Filing/Storage	Cardboard Usage	Use of Natural Resources	1	1	3	2	**7**

VHA Environmental Training Program Plan

Training	Agenda	Audience	Forum	Resources
Regulatory Compliance Training				
National Environmental VA Meeting Kick-off	Intro by top VA Management to show environmental commitment; Overview of major statutes and GEMS.	Environmental Coordinators, HQs and VISN Safety/Health, Medical Center Directors/ Associate Directors	4 day (2 day compliance, 2 day GEMS) conference face-to-face in Spring 2004. Taped for future use by VA.	With EPA HQs and Regional help (suggestion to make it a civilian-wide conference and add RCRA training).
Environmental Compliance 101	Overview of major statutes (i.e., RCRA/UST, CAA, CWA, SPCC, [storm water, wetlands] EPCRA, TSCA [Lead, PCBs], SDWA, FIFRA). Compliance with other requirements such as Executive Orders and VA Policy, etc.	Environmental Coordinators, HQs, VISN Safety/Health, Program/Service Managers, Director/Associate Directors	1-1½ day face-to-face in each EPA Region during FY2004 that will be taped for future use by VA.	EPA Regions FFPMs – Region 1 will hold in October 2003.
RCRA Hazardous Waste Mgmt Training and Annual Refresher	Required EPA hazardous waste management training.	Environmental Coordinators, VISN Safety/Health	Distance Learning by VA.	Numerous contractors give course. NETI RCRA Inspector Training CD-ROM.
Identification of Hazardous Waste for Healthcare	Detailed discussion on waste characterization.	Environmental Coordinators, HQs, VISN Safety/Health	1 day - could be broadcast or videotaped.	EPA Region 2 has developed - to be given November 12th.
Required Certification Training	Necessary training to be certified to perform task.	Employees such as HVAC, wastewater treatment, pesticides applicators, boiler plant operators	As required.	Many contractors give course.
Laboratory-Specific Environmental Training	Describes the environmental requirements and best management practices that relate to laboratories such as RCRA, CWA and CAA. At a minimum, it will satisfy the training requirements of RCRA 265.16. Also, covers auditing questions.	Environmental Coordinator, VISN Safety/Health, Laboratory employees, including the Laboratory Program Manager	CD-ROM or interactive video developed by VA.	GEMS guide for small laboratories. Lab 21 Website.
DOT training		Environmental Coordinators, Warehouse shippers		

Training	Agenda	Audience	Forum	Resources
UST Training Module	Review of the underground storage tank requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	UST guidebooks and website. EPA UST presentations. UST auditing protocol.
SPCC Training Module.	Review of the SPCC requirements at a facility. Includes how to develop a SPCC plan and auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	SPCC website. EPA SPCC presentations. SPCC booklets.
Clean Water Act Training Module.	Review of the CWA requirements at a facility such as NPDES, pre-treatment, wetlands and storm water. Includes auditing questions. May want to include security issues as relates to wastewater plants.	Environmental Coordinators, VISN Safety/Health, Wastewater Plant Operators, COTR if construction project	CD-ROM or interactive video developed by VA.	EPA NPDES website. EPA presentations. Construction Compliance Assistance Center.
Toxic Substances Training Module	Describes requirements and best management practices related to Asbestos, Lead-Paint, PCBs and Mercury. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, COTR if demolition/renovation project	CD-ROM or interactive video developed by VA.	EPA Asbestos webpage. Numerous Mercury elimination documents. Auditing Protocol for TSCA.
Facilities Maintenance Module	Environmental Requirements and best management practices that apply to the facilities maintenance operations such as CAA, CWA, SDWA (UIC), FIFRA, RCRA, Universal Waste, TSCA, beneficial landscaping, etc. It must meet the RCRA 260.16 training requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facilities maintenance personnel (e.g., motor pool, paint shop, grounds keeping, HVAC, plumbing, electricians, carpentry, etc.)	CD-ROM or interactive video developed by VA.	EPA's national CA centers.
Clean Air Act Training Module	Review of Clean Air Act requirements that apply to healthcare facilities. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Boiler personnel	CD-ROM or interactive video developed by VA.	EPA Websites. CFC checklists.
Medical Waste Training Module	Review of requirements related to medical waste. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Housekeeping	CD-ROM or interactive video developed by VA.	State Agencies.
EPCRA Training Module	Review of EPCRA requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health	CD-ROM or interactive video developed by VA.	EPA Websites. EPA TRI courses.
SDWA Training Module	Review of SDWA requirements. May want to include security issues as related to drinking water plants. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Drinking Water Treatment Plant Operators	CD-ROM or interactive video developed by VA.	EPA Websites.

Training	Agenda	Audience	Forum	Resources
Dental Environmental Compliance Module	Review of requirements and best management practices related to dental facilities, such as RCRA. Including auditing questions.	Environmental Coordinators, VISN Safety/ Health, Dental personnel	CD-ROM or interactive video developed by VA.	Vermont's Dental Guide.
Pharmacy Environmental Compliance Module	Review of requirements and best management practices related to pharmacies, such as RCRA. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Pharmacy personnel	CD-ROM or interactive video developed by VA.	Pharmacology Website.
Environmental Compliance for Lawyers	Review major environmental laws applicable to VAMCs, state and federal regulator's procedures for inspections, violations, fines and VAMC legal defense strategies.	District Counsel	?	?

Green Environmental Management System Training

GEMS Training For Top Management	Overview of GEMS Elements.	Directors and Associate Directors at VAMC, HQs and VISN level GEMS Coordinators & Auditors	2 Hour broadcast by VA.	Diane Thiel, EPA Region 8 & Gary Chiles.
Designing Your GEMS – Federal Facility Workshop	More detailed discussion of GEMS elements and hands-on workshop with VA examples.	GEMS Coordinators and Auditors	2-day conference. Same as what is offered in Kick-off.	Gary Chiles & Carol Bell (Contractors). May be offered by EPA Regions in near future.
GEMS Element-By-Element Hands-On Training	Detailed discussion of elements – one element at a time with facility-specific help.	GEMS Coordinators, Program/Service Managers (or designated person)	V-TEL by VISN. Done once a month until GEMS complete.	See metal finishing GEMS workshops - Linda Darveau - EPA Region 1.
GEMS Committee	Training on the implementation of the GEMS	GEMS Committee	All GEMS Committee members are required to attend the 4-hour course on the implementation of the GEMS Program.	Power Point presentation located in the GEMS Guidebook.

Training	Agenda	Audience	Forum	Resources
Facility-Specific GEMS Training	Training on facility-specific policies and procedures related to GEMS.	All Employees	A minimum of annually.	GEMS Booklet, Self-learning module, Safety Blitz, etc.
ISO 14001 Lead Auditor Course	Training on how to conduct a GEMS audit.	VISN GEMS Auditor	Classroom for 5 days.	Offered by many contractors.

Pollution Prevention/Environmental Stewardship

Environmental Preferable Purchasing/ RCRA 6002/ Executive Orders	Training on buying environmentally preferable products and complying with RCRA 6002 and Executive Orders.	Environmental Coordinators, VISN Safety/Health, COTRs, COs, Credit Card Holders, Chief, Acquisition & Materiel Management	CD-ROMs, interactive videos, PowerPoint presentations.	H2E, EPA EPP Program, OFEE. Lyons VA.
Waste Minimization/ Product Substitution	Training on waste minimization at healthcare facilities.	Environmental Coordinators, VISN Safety/ Health, Program/Service Managers, Credit Card Holders, COTRs, COs	CD-ROMs, videos	H2E, EPA Wastewise.
Green Cleaning	Awareness of more environmentally and safer cleaning products.	Environmental Coordinators, VISN Safety/Health, Housekeeping/Laundry	CD-ROMs, videos.	Diane Thiel Region 8, EPA EPP Program, Greening Govt CD EPA Regions 1-3.
Green Building	Awareness of building and renovating in a greener manner.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROMs, videos.	EPA, LEEDS.
Indoor Air Quality	Training on indoor air quality.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROM by VA.	Completed.
P2 Training for Auto Repair Shops	Training on pollution prevention techniques available to auto repair shops/fleet maintenance.	Motor Pool, Environmental Coordinators, VISN Safety/ Health	Video and workbooks.	EPA Region 9 has completed.
Best Management Practices for Outdoor Shooting Ranges	Best management practices for outdoor shooting ranges.	Outdoor shooting ranges if built.	Guidance Document.	EPA Region 2 Guide.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: _____ **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency of Activity	VAMC Control	TOTAL SCORE

Worksheet: Document Control				
Document	**Who Will Use It**	**Permanent Location**	**Periodic Review Schedule/ Who**	**When Can Be Destroyed**
			/	
			/	
			/	
			/	
			/	
			/	
			/	
			/	
			/	
Contact Person:		Date Completed:		

Attachment A to Document 5B1-1

Explanation of Aspects and Impacts Template Scoring

Compliance	
The extent to which the aspect is regulated by law, regulation, Executive Order or other requirement	**Score Assigned**
The aspect is not regulated or is in full compliance.	0
Compliance activity has been initiated.	1
Compliance activity has been scheduled.	2
There is an awareness of non-compliance status, considering compliance options.	3
The aspect is out of compliance and has taken no compliance activity to date.	4

Risk	
The degree of risk to any exposed human populations or exposed ecosystems	**Score Assigned**
Minor risk to human population and/or ecosystems.	0
Moderate risk to sensitive human populations and/or ecosystems.	1
Moderate risk to general human populations and/or ecosystems.	2
High risk to sensitive human populations and/or ecosystems.	3
High risk to the general human population and/or ecosystems.	4

Frequency	
Frequency that this activity occurs	**Score Assigned**
< Once per calendar year	0
Biannually or less	1
Monthly	2
Weekly	3
Daily or more	4

Control	
The extent to which the aspect is under control of the Medical Center	**Score Assigned**
Medical Center has no control or influence.	0
Medical Center has some influence or control.	1
Medical Center has influence parity with other entities with some level of control.	2
Medical Center has significant influence.	3
Medical Center has total control over this aspect.	4

Attachment A to Document 5B1-10

PLAN – DO – CHECK – ACT

Operational Controls for Significant Environmental Aspects

PLAN

Identify Significant Aspects

(Procedure for Environmental Aspects)

DO

Establish Operational Controls for Significant Aspects

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

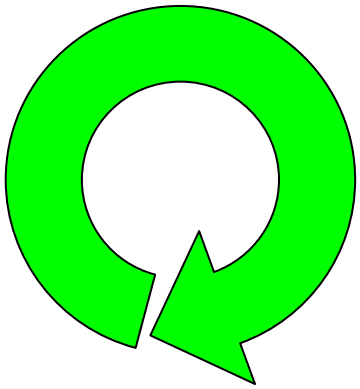
Monitor and Measure Activities for Consistency with Operational Controls

(Procedure for Monitoring and Measuring)

ACT

Establish and Track Corrective Actions For Non-Compliance/Non-Conformance Discovered During Monitoring and Measuring and Verify Effectiveness

(Procedure for Corrective Actions)



Attachment A to Document 5B1-3

PLAN – DO – CHECK – ACT

Environmental Objectives and Targets

PLAN

Select Objectives & Targets

(Procedure for Objectives & Targets)

DO

Establish Operational Controls and Measuring & Monitoring for Objectives & Targets

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

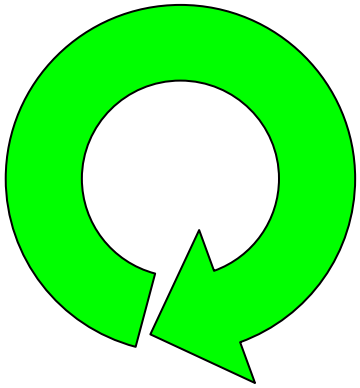
Monitor & Measure Consistency with Objectives & Targets

(Procedure for Monitoring & Measuring)

ACT

Implement & Evaluate Corrective Actions Discovered During Monitoring & Measuring

(Procedure for Corrective Actions)



Attachment A to Document 5B1-7

Explanation to Policy Writer

I. Purpose

Design a standardized framework your installation will use to develop and organize the various types of documentation required by ISO 14001.

II. Importance

Complete, well-organized documentation is essential for describing, managing, evaluating and improving the Green Environmental Management Systems (GEMS). GEMS documentation provides a written description of your installation's GEMS and directions for how things should be done. Developing GEMS documentation is an ongoing process. Some of the required documentation already exists on your installation - you just need find it, review it and ensure that it is kept current. Other parts of the documentation required by ISO 14001 will take time to develop. The following subsections describe the types of GEMS documentation required.

A. Documentation Hierarchy

Think of GEMS documentation as a tiered system. Four types of GEMS documentation typically constitute the hierarchy. (Records are not considered part of documentation.) As you move down the pyramid, the amount of information, the degree of specificity and the number of pages generally increase.

B. Step-by-Step Guidance

Documentation and records assist employees to perform their jobs in ways consistent with the installation's environmental policy and the goals and objectives of the GEMS. The Standard Operating Procedures (SOPs) should incorporate significant environmental aspects, objectives and targets, and monitoring and measurement procedures into the daily activities or job practices of facility personnel. Environmental personnel should work with unit leaders and supervisors to produce SOPs that support the GEMS. These SOPs give specific, detailed instructions that describe the methods for attaining environmental goals and, hence, complying with environmental policy. Although most SOPs are already in place, reviewing and revising them can be a lengthy process. We recommend you develop a prioritized schedule that starts with environmentally significant processes or activities at your facility and maintain steady progress toward revising the SOPs.

C. GEMS Records

GEMS *records* are considered part of GEMS *documentation*. Documentation describes policies, procedures and other directive information, while records provide a written history of GEMS performance and actions completed (such as training).

Attachment A to Document 5B2-13

Reporting an Oil Spill at (Facility Name) VA Medical Center

1. In Event of an Oil Spill, call:

   TELEPHONE OPERATOR **911**

2. Provide the Following Information:

   - **Material Spilled**
   - **Location of Spill**
   - **Estimated Quantity Entering Sewer, Manhole, etc.**

3. Telephone Operators to Inform the Following Personnel:

	Work	Home	Pager
FIRE CHIEF	_____	_____	_____
CHIEF ENGINEER	_____	_____	_____
SAFETY MANAGER	_____	_____	_____

SPILL RESPONSE CONTRACTORS (For external notification) _____

4. Chief, Facility Management, or Safety Manager will notify:

National Response Center		**1-(800) 424-8802**
(State) Emergency Management Agency		_____
(State) Department for	**Air**	_____
	Water	_____
	Waste	_____

FOR SPILLS OF OIL OF ANY SIZE, REPORT TO: **800 482-0777**

FOR SPILLS OF HAZARDOUS MATERIALS: **800 452-4664**

Attachment A to Document 5B2-5

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement. Housing built before 1978 may contain lead-based paint. Lead from paint, paint chips and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing, lessors must disclose the presence of known lead-based paint and/or lead-based paint hazards in the dwelling. Lessees must also receive a federally-approved pamphlet on lead poisoning prevention.

Lessor's Disclosure. Presence of lead-based paint and/or lead-based paint hazards.
[Check (i) or (ii) below]:

_____(i) Known lead-based paint and/or lead-based paint hazards are present in the housing (explain). It is presumed that lead-based paint exists in all residential quarters due to the fact that all were constructed prior to 1978. No records exist or are available pertaining to lead-based paint hazards in residential quarters.

_____(ii) Lessor has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

Records and Reports Available to the Lessor. [Check (i) or (ii) below]:

_____(i) Lessor has provided the lessee with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list of documents available are listed below).

_____(ii) Lessor has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Lessee's Acknowledgment. (Initial):

_____Lessee has received copies of all information listed above.

_____Lessee has received the pamphlet “Protect Your Family from Lead in Your Home”.

Agent's Acknowledgment. (Initial):

_____Agent has informed the lessor of the lessor's obligations under 42 U.S.C. 4852(d) and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy. The following parties have reviewed the information above and certify to the best of their knowledge, that what they have provided is true and accurate.

_____

Lessor Date

_____

Lessee Date

_____

Agent Date

Attachment A to Report of Annual Effectiveness Review

S A M P L E

Biohazardous Waste Reduction Plan

1. ***Introduction and Scope.***

   a. *Purpose*. This plan sets forth the procedures for achieving the environmental objective of biohazardous waste reduction. It adds to, without replacing, the local policy and procedures for segregation and disposal of biohazardous waste at this Medical Center. Because the disposal of biohazardous waste has a significant impact on the environment, this GEMS Committee has selected the objective of reducing biohazardous waste by 10% (by weight) this calendar year. Procedures for achieving this objective and target appear below.

   b. *Causal Analysis of Improper Waste Segregation*. The GEMS Committee conducted a waste stream analysis of the waste disposed of in biohazardous waste containers and determined that about 20% was not biohazardous waste. This means that it could have been disposed of as municipal waste which would have saved this facility $18,000 last year. When red-bagged waste comes in contact with non-biohazardous waste, all the waste is considered biohazardous waste; therefore, the solution is proper segregation before disposal. A causal analysis directed the GEMS Committee to the following critical elements to proper waste segregation: Correctly identifying biohazardous waste and properly disposing of biohazardous waste. The first element speaks to employee education and behavior management, and the second element involves the availability of the proper waste containers.

2. ***Implementation Procedures to Accomplish Goal.*** The procedures identified in the Biohazardous Waste Management Medical Center Memorandum #XX remain in effect with the following additions for this calendar year:

   a. Forty-eight additional containers for municipal and biohazardous waste will be placed in the identified locations to facilitate proper waste segregation. (See the Attachment A, Municipal and Biohazardous Waste Container Location List.)

   b. Monitoring the proper placement of waste containers and the proper segregation of waste will be conducted monthly during regularly scheduled hazard surveillance rounds by the hospital team and weekly by the Housekeeping supervisor. Segregation errors and missing containers will be logged by both, and corrective actions will be instituted, tracked and reported monthly to the GEMS Committee. (See Attachment B, Waste Segregation and Waste Container Placement Log and Report Form.).

   c. Hospital-wide trends in proper segregation (as determined by reduced error rates) and in reduction of biohazardous waste will be charted quarterly. Progress in reduction of biohazardous waste will be posted in the Canteen.

d. All VAMC employees who come in contact with biohazardous waste will receive refresher training on waste segregation and disposal from the Infection Control Practitioner within 60 days of the date this plan is approved. Supervisors of employees not meeting this requirement will meet with the Associate Director.

e. The Infection Control Practitioner will design, develop and present the refresher training and will submit the list of topics covered to the GEMS Committee.

f. The Infection Control Practitioner will submit a list of employees requiring refresher training and report the status of refresher training on a monthly basis until complete.

g. The GEMS Committee will consider a group award for special contribution to this successful effort. Nominations for the award will be considered at the end of the year when the annual program evaluation indicates the objective and target were exceeded.

Attachments:
A. Municipal and Biohazardous Waste Container Location List
B. Waste Segregation and Waste Container Placement Log and Report Form

Submitted by: _____ Date:_____
Chairperson, GEMS Committee

Approved by: _____ Date:_____
Medical Center Director

Attachment A to Biohazardous Waste Reduction Plan

Municipal and Biohazardous Waste Container Location List

Container #	Container Location
1	
2	
3	
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Attachment B to Document 5B1-10

PLAN – DO – CHECK – ACT

Environmental Compliance Assurance under GEMS

PLAN

Identify Environmental Requirements

(Procedure for Legal and Other Requirements)

DO

Establish Operational Controls for Regulated Activities/Materials

(Procedure for Establishing Operational Controls for Significant Aspects)

CHECK

Monitor and Measure Consistency with Operational Controls

(Procedure for Monitoring & Measuring)

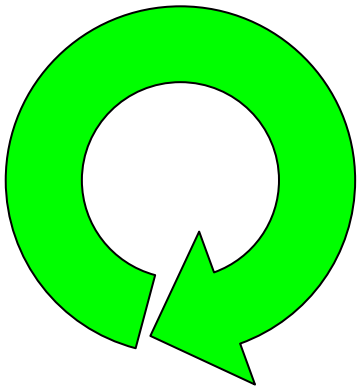
Conduct GEMS Gap Analysis Annually
(Procedure for Gap Analysis)

Conduct Multi-Media Compliance Audit Baseline and at Least Every 3 Years
(Measuring and Monitoring Procedure)

ACT

Establish and Track Corrective Actions for Non-Compliance /Non-Conformance Discovered During Monitoring and Measuring, Gap Analysis, and Multi-Media Compliance Audit

(Procedure for Corrective Actions)



Attachment B to Document 5B1-3

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form

(Note: Use one form per objective)

Date Oct. 5, 2004

Individual Responsible for Implementation:
Housekeeping Officer and Infection Control Practitioner

Environmental Objective:
To reduce the generation of biohazardous waste.

Related Target(s):
3% reduction by weight of biohazardous waste.

Related Significant Environmental Aspect(s):
Air and land pollution due to disposal of biohazardous waste.

Service Specific Function and/or Department:
Primary Care, Behavior Health, Surgery, Specialty & Diagnostics, Housekeeping

Target Date (Month/Year): *End of Calendar Year*

Frequency of Monitoring:	*Weekly*	*Monthly*	*Quarterly*	*Annually*
(Check one)		*X*		

Action Plan:
Implement biohazard segregation program, implement staff education program, identify areas for biohazard containers, continuous monitoring during environmental rounds.

How will this objective be met? (Attach additional pages as necessary)

1. *Housekeeping will survey all areas of the health care system to determine appropriate placement of biohazard receptacles.*
2. *Infection Control will develop training curriculum and deliver staff education.*
3. *Monitoring will be performed by housekeeping staff during trash removal and surveyed during environmental rounds.*

What operational controls shall be incorporated to achieve this objective?
Strategic placement of waste containers.

How will this objective be tracked? (Attach additional pages as necessary)
All biohazard waste will be weighed prior to transport off-site.

What resources will be required to achieve this objective? (Attach additional pages as necessary)
Purchase of additional municipal and biohazardous waste containers.

Attachment B to Document 5B1-5

S A M P L E

Green Environmental Management System (GEMS) Training Log

Training Topic	Attendees*	Frequency	Course Length	Course Method	Comments	Date Completed
GEMS Awareness						
Supervisor GEMS Training						
Hazardous Waste Management						
Hazardous Waste Operations						
Spill Prevention and Response						
Chemical Management						
Emergency Response						
Accident Investigation						
Hazardous Materials Transport						
Hazard Communication						
Personal Protective Equipment						
Fire Safety						
Electrical Safety						
Hearing Conservation						
Confined Space Entry						
Lock-out/Tag-Out						
Blood borne Pathogens						

Job-Specific Training (list)						

***Attendees Code**

1 All Employees
2 Supervisors/Managers
3 Operators
4 Maintenance
5 Laboratory
6 Clinical

Attachment B to Document 5B2-13

OIL SPILL REPORT

Veterans Affairs Medical Center
(Location)

Operation:_____ Location:_____

Date:_____ Time of Spill:_____

Type of Oil Spilled:_____ Amount of Spill:_____

Did any oil reach a catch basin or sewer? _____ Yes _____ No

Did any oil leave our property? _____ Yes _____ No

Who was contacted:_____ Time:_____

Description of Spill:_____

Did the weather affect the spill?_____

What actions were taken?_____

Actions taken to prevent a recurrence:_____

How was clean-up material disposed of?_____

In-house personnel or contractor who performed clean up:

Name:_____ Signature:_____

Address:_____ Title:_____

Phone:_____ EPA #:_____

Signature of person filing report:_____

Title of person filing report:_____ Date:_____

Reviewed by:_____ Title:_____

Attachment B to Report of Annual Effectiveness Review

S A M P L E

Green Environmental Management System (GEMS) Objective & Target Form

(Note: Use one form per objective)

Date October 5, 2004

Individual Responsible for Implementation:
Housekeeping Officer and Infection Control Practitioner

Environmental Objective:
To reduce the generation of biohazardous waste.

Related Target(s):
3% reduction by weight of biohazardous waste.

Related Significant Environmental Aspect(s):
Air and land pollution due to disposal of biohazardous waste.

Service Specific Function and/or Department:
Primary Care, Behavior Health, Surgery, Specialty and Diagnostics, Housekeeping

Target Date (Month/Year): *End of Calendar Year*

Frequency of Monitoring:	*Weekly*	*Monthly*	*Quarterly*	*Annually*
(Check one)		*X*		

Action Plan:
Implement biohazard segregation program, implement staff education program, identify areas for biohazard containers, continuous monitoring during environmental rounds.

How will this objective be met? (Attach additional pages as necessary)

1. *Housekeeping will survey all areas of the health care system to determine appropriate placement of biohazard receptacles.*
2. *Infection Control will develop training curriculum and deliver staff education.*
3. *Monitoring will be performed by housekeeping staff during trash removal and surveyed during environmental rounds.*

What operational controls shall be incorporated to achieve this objective?
Strategic placement of waste containers.

How will this objective be tracked? (Attach additional pages as necessary)
All biohazard waste will be weighed prior to transport off-site.

What resources will be required to achieve this objective? (Attach additional pages as necessary)
Purchase of additional municipal and biohazardous waste containers.

Attachment B to Biohazardous Waste Reduction Plan

Waste Segregation and Waste Container Placement Log and Report Form

Date	Problem	Location	Corrective Action	Date Fixed	Date Rechecked

Attachment B to Document 5B2-5

Lead-Based Paint Pre-Renovation Certification

Certification of Receipt of Lead Pamphlet:

I have received a copy of the pamphlet, "Protect Your Family from Lead in Your Home", informing me of the potential risk of the lead hazard exposure from renovation activity to be performed in my dwelling unit. I received this pamphlet before the work began.

Printed Name of Recipient _____ Date _____

Signature of Recipient _____

Self-Certification Option (for tenant-occupied dwellings only). If the lead pamphlet was delivered but a tenant signature was not obtainable, you may check the appropriate statement below:

_____ *Refusal to Sign.* I certify that I have made a good faith effort to deliver the pamphlet, "Protect your Family from Lead in Your Home", to the rental dwelling unit listed below at the date and time indicated, and that the occupant refused to sign the confirmation of the receipt. I further certify that I have left a copy of the pamphlet at the unit with the occupied.

_____ *Unavailable for Signature*. I certify that I have made a good faith effort to deliver the pamphlet, "Protect Your Family from Lead in Your Home", to the rental dwelling unit listed below, and that the occupant was unavailable to sign the confirmation of receipt. I further certify that I have left a copy of the pamphlet at the unit by sliding it under the door.

Printed name of person certifying pamphlet delivery _____ Attempted delivery date and time _____

Signature of person certifying lead pamphlet delivery _____

_____

_____

_____

Unit address

Note Regarding Mailing Option: As an alternative to delivery in person, you may mail the lead pamphlet to the tenant. Pamphlet must be mailed at least seven (7) days before renovation (document with a certificate of mailing from the post office).

Attachment C to Document 5B2-13

S A M P L E

OIL STORAGE INFORMATION SHEET

Veterans Affairs Medical Center
(Location)
(Complete one for each tank)

SERVICE: Engineering

CONTACTS: Chief, Engineering Service
Engineer
Manager, Safety

TYPE OF FACILITY: Aboveground Fuel Oil Tanks

TANK DESIGNATION: AST Number X

LOCATION: Building X

TOTAL CAPACITY: XX,000 Gallons

TYPE OF OIL: No. X Fuel Oil

POTENTIAL FOR EQUIPMENT FAILURE: Overflow During Filling, Transfer Pump and Piping

CONTAINMENT: XX,000 Gallon Steel Dike Tank

INSPECTION AND TESTING: Measures for water contamination. Daily manual check for level of tank, and results are recorded into boiler log. Any irregularities are reported immediately to emergency contacts listed in this plan.

SPILL HISTORY: None

Attachment to Document 5B1-12

GEMS Gap Analysis Tool

Note: The following Criteria Statements were updated April 1, 2004; therefore, this Tool will vary from the printed version of the Guidebook.

1. ***Category 1 - Environmental Policy.*** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.1 and 5.1, Tabs A and B).

   a. **Policy.** Is there an environmental policy in place that supports pollution prevention, regulatory compliance and continuous environmental improvement?

   b. **Policy.** Is the policy documented, implemented, maintained and communicated to the employees?

2. ***Category 2 - Planning.***

   a. **Environmental Aspects and Impacts.** (ISO 14001, Section 4.3.1; VHA GEMS Guidebook, Sections 2.2, 3.2 and 4.2 and Document 5B1-1).

      1) **Aspects and Impacts.** Has the facility established a procedure to identify the environmental aspects of the activity, products and services over which it has control and influence?

      2) **Aspects and Impacts.** Have significant impacts been determined and considered in setting environmental objectives and targets?

   b. **Legal Requirements.** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.3 and 5.1 and Document 5B1-2).

      Legal. Is there a procedure to identify, access and evaluate federal, state and local legal requirements?

   c. **Objectives and Targets.** (ISO 14001, Section 4.3.3; VHA GEMS Guidebook, Sections 2.4, 2.5 and 3.2 Step 6 and Document 5B1-3).

      1) **Setting Objectives and Targets.** Has a procedure been developed to identify and document environmental objectives and targets for each relevant function and level?

      2) **Setting Objectives and Targets.** Does the procedure consider legal requirements, significant aspects and other operational requirements?

   d. **Plan For Achieving Objectives and Targets.** (Environmental Programs) (ISO 14001, Section 4.3.4; VHA GEMS Guidebook, Sections 2.4 and 2.5 and Documents 5B1-3 and 5B1-4).

      1) **Plan for Objectives and Targets.** Is there a procedure to achieve objectives and targets and identify the means and acceptable timeframes for accomplishment?

      2) **Plan for Objectives and Targets.** Does the procedure include a designation of responsibility at each relevant function and level?

3. ***Category 3 - Implementation and Operation*.**

   a. **Accountability (Structure and Responsibility).** (ISO 14001, Section 4.4.1; VHA GEMS Guidebook, Sections 2.6, 3.1 and 3.2 Steps 1-2 and Document 5B1-4).

      1) **Accountability.** Has top management provided adequate resources? Has top management appointed a GEMS Coordinator and a GEMS Committee to oversee, track and report GEMS status and performance?

      2) **Accountability.** Have roles, responsibilities and authorities been defined, documented and communicated to facility staff to ensure effective environmental management?

   b. **Training.** (ISO 14001, Section 4.4.2; VHA GEMS Guidebook, Sections 2.7 and 3.2 Steps 2 and 7 and Document 5B1-5).

      1) **Training.** Has the organization identified training needs for those workers who may create a significant impact on the environment?

      2) **Training.** Does the training include significant environmental impacts, emergency response procedures and nonconformance with standard operating procedures?

   c. **Communications.** (ISO 14001, Section 4.4.3; VHA GEMS Guidebook, Section 2.8 and Document 5B1-6).

      1) **Communications.** Is there a procedure for internal communication between the various levels/functions of the facility, the GEMS Coordinator and the GEMS Committee?

      2) **Communications.** Is there a procedure in place to coordinate and document inquiries from external public, private and regulatory organizations?

   d. **GEMS Documentation and Record Keeping.** (ISO 14001, Section 4.4.4, 4.5.3; VHA GEMS Guidebook, Sections 2.9, 2.10 and 2.15 and Documents 5B1-5and 5B1-7).

      1) **GEMS Documentation.** Is there a procedure requiring the documenting of the core elements of the GEMS and explaining their interaction with other facility-related documents?

      2) **Record Keeping.** Is there a procedure to identify, maintain and dispose of environmental, training and audit records?

      3) **Record Keeping.** Are environmental records identifiable, legible, readily retrievable and traceable to activity, product and service?

   e. **Operational Control.** (ISO 14001, Section 4.4.6; VHA GEMS Guidebook, Sections 2.11 and 3.2 Step 5 and Documents 5B1-7 and 5B1-8).

      1) **Operational Control.** Are the operations aligned with significant environmental aspects and objectives?

      2) **Operational Control.** Are procedures in place to communicate the GEMS requirements to suppliers and contractors?

f. **Emergency Response.** (ISO 14001, Section 4.4.7; VHA GEMS Guidebook, Section 2.12 and Document 5B1-9).

Emergency Response. Is there an emergency preparedness and response procedure to recognize and mitigate potential environmental impact?

4. ***Category 4 - Checking and Corrective Action***.

a. **Monitoring and Measurement.** (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.13 and 3.2 Steps 8 and 9 and Document 5B1-10).

1) **Monitoring and Measurement.** Is there a documented monitoring and measuring procedure for operations and activities related to significant aspects?

2) **Monitoring and Measurement.** Does the procedure include requirements for calibration and recording of information to track performance, operational controls and conformance objectives and targets?

3) **Monitoring and Measurement.** Has a periodic (every 3 years) and/or baseline environmental compliance audit been conducted?

b. **Corrective and Preventive Action.** (ISO 14001, Section 4.5.2; VHA GEMS Guidebook, Sections 2.14 and 3.2 Step 9 and Document 5B1-11).

1) **Action Plans.** Is there a procedure covering the definition of roles and responsibilities for investigating and determining a cause of nonconformance?

2) **Action Plans.** Does the procedure include action needed to mitigate impact and necessary preventive action?

3) **Action Plans.** Do corrective and preventive action plans address the causes of the deficiency?

4) **Action Plans.** Is the effectiveness of corrective and preventive actions verified before considered completed?

5) **Action Plans.** Are resources assigned to corrective and preventive actions in order to complete them in a reasonable timeframe?

6) **Action Plans.** Are corrective and preventive actions tracked to completion in the GEMS committee?

d. **Gap Analysis.** (ISO 14001, Section 4.5.4; VHA GEMS Guidebook, Sections 2.16 and 3.2 Step 8 and Document 5B1-12).

1) **Gap Analysis.** Does the program have procedures for conducting annual gap analyses of GEMS?

2) **Gap Analysis.** Is the scope based on the environmental importance of the activity and the results of the previous audit?

3) **Gap Analysis.** Are the results reviewed by the GEMS Committee and the recommendations forwarded to top management for review?

5. ***Category 5 - Management Review***. (ISO 14001, Section 4.2; VHA GEMS Guidebook, Sections 2.17 and 3.2 Step 9 and Document 5B1-13).

   a. **Annual Review.** Is the management review conducted and documented on an annual basis and reported in the GEMS Committee?

   b. **Annual Review.** Does the GEMS Committee use the gap analysis results to address the need for changes to policy, objectives and other GEMS elements?

   c. **Annual Review.** Is there evidence that the facility director (top management) participates in the annual review (for instance, by signing annual review report)?

Attachment to Document 5B1-13

S A M P L E

GEMS Committee Report of Annual Effectiveness Review

Excerpt From the Minutes of the GEMS Committee, November 4, 2004
Approved and Signed by the Medical Center Director

1. The Committee found the GEMS effective in its first year, as indicated by:
   - Completion of 60 % of the corrective actions for the GEMS Gap Analysis conducted June 2003
   - Completion of 25% of the corrective actions for the baseline Environmental Compliance Audit, conducted August 2003
   - Achievement of the objectives and targets (as modified at the Jan 14 GEMS Committee Meeting)
2. The Committee recommends the following new objectives and targets for FY 2005:
   - 5 % reduction in lawn management chemical usage in FY 2005 compared with FY 2004 (see attached plan for monitoring and accomplishment)
   - 10 % reduction in hazardous waste generation in the Research Lab (see attached plan for monitoring and accomplishment)
3. The following GEMS dashboard summarizes the status of effectiveness evaluations:

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
Appoint a GEMS Coordinator and a GEMS Committee	Coordinator and Committee will be appointed no later that the end of the first quarter.	Mr./Ms. was appointed the GEMS Coordinator with participants from all organizational units. Mr./Ms., Associate Director, was appointed committee chairman.
Conduct a Gap Analysis to Determine Disparity in our Present Program	Gap analysis will be completed by the end of the second quarter.	The gap analysis was completed February 2004, with new policies developed as needed and routed for comments.
Develop and Implement a GEMS Program	The program will be published and in effect by the end of FY 04.	The newly established written GEMS program was established September 1, 2004.
Environmental Rounds are Conducted Quarterly in all Areas (Patient and Non-Patient) of the Medical Center to Demonstrate Compliance with GEMS.	Surveys conducted 90% of the time and deficiencies are corrected within 30 days.	This performance standard was significantly met during FY 2004. All surveys were performed as scheduled in MCM 00-46, Environmental Rounds and in accordance with the Environment of Care Standards (JCAHO). However, not all deficiencies were abated within 30 days. Although 89% (1030/1154) of the items noted were abated within 30 days, the percentage fell below the stated goal of 100%. It should be noted that there was no duplication

GEMS Gap Analysis		
Performance Objectives	**Performance Target**	**Status**
		of deficiencies when making rounds the second time in FY 1999.

Environmental Compliance Audits/Inspections		
Compliance Standard	**Compliance Problem**	**Status**
Safe Drinking Water (SDW)	The well exceeds safe drinking water standards.	Standards met as evidenced by _____.
Resource Conservation and Recovery Act (RCRA)	Inspection log not up-to-date.	Standards met as evidenced by _____.
Air Emissions	Boiler exceeds air emission standards in permit.	Standards met as evidenced by _____.

GEMS Targets and Objectives		
Performance Objectives	**Performance Target**	**Status**
Red Bag Waste	Reduce red-bag waste by 3% by weight by end of fiscal year.	Standards met as evidenced by _____.
Pesticide Use	Change practice of scheduled pesticide application to apply when determined necessary by sampling through fiscal year.	Standards met as evidenced by _____.

Submitted by: _____ Date:_____

Approved by: _____ Date:_____

Attachment to Document 5B2-12

Index of Chemical Classifications

The following index identifies 38 common chemicals (in alphabetical order) found in healthcare facilities. The reader may utilize this index to identify the chemical classification and Reportable Quantity (RQ) for each chemical listed. Chemicals not found on the list can be found in 40 CFR Part 302 or on the Material Safety Data Sheet (MSDS).

Chemical Reportable Name	Chemical Classification	Reportable Quantity (RQ)
Acetic Acid	Acid	
Acetone	Flammable Liquid	10 lbs
Acetylene	Flammable Gas	
Alcohol(s)	Flammable Liquid	
Ammonium Hydroxide	Caustic	1,000 lbs
Ammonium Thiosulfate	Caustic	1,000 lbs
Butane	Flammable Gas	
Carbon Dioxide	Nonflammable/Asphyxiant	
Chemotherapeutic Drugs	Carcinogen/Chemo Drugs	1 lb
Chlorine (Gas)	Nonflammable/Asphyxiant	10 lbs
Cyanide	Poisons	10 lbs
Ether	Explosive	100 lbs
*Ethylene Oxide	Flammable Gas/Carcinogen	10 lbs
Freon	Nonflammable/Asphyxiant	
*Formaldehyde	Flammable Liquid/Carcinogen	1,000 lbs
Hydrochloric Acid	Acid	5,000 lbs
Mercury	Toxic-Metal	1 lb
Methylene Chloride	Flammable Liquid	1 lb
Methyl-Ethyl-Ketone	Flammable Liquid	5,000 lbs
Mineral Spirits	Flammable Liquid	
Methyl Methacrylate	Flammable Liquid	

Muriatic Acid	Acid	
Naphtha	Flammable Liquid	1,000 lbs
Nitric Acid	Oxidizer/Asphyxiant	100 lbs
Nitrous Oxide	Nonflammable Gas	
Perchloric Acid	Oxidizer/Acid	
Phenol	Poison	
Phosphoric Acid	Acid	1 lb
Picric Acid	Explosive/Oxidizer/Acid	1,000 lbs
Potassium Hydroxide	Caustic	
Propane	Flammable Gas	
Sodium Hydroxide	Caustic	1,000 lbs
Sulfuric Acid	Oxidizer/Acid	1,000 lbs
Toluene	Flammable Liquid	100 lbs
Trichlorotriflouromethane	Nonflammable Asphyxiant	1,000 lbs
Tetra Hydrofuran	Flammable Liquid	
Trichloracetic Acid	Acid	
Xylene	Flammable Liquid	1,000 lbs

**Note: Ethylene Oxide and Formaldehyde are fully regulated chemicals and are, therefore, addressed with separate Spill Response Guides.*

Attachment A to Document 5B2-9

Hazardous Waste Stored for Collection

Date to Storage	Person Responsible	Waste Material	Waste Phase	Waste Amount	Container Size/Type	Container Number

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Blood Bank/Phlebotomy** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal, Wastewater Discharge	Environmental Contamination	1	1	1	1	**4**
Chemical Storage	Potential for Spills	Contamination of Soil/Water	1	1	1	1	**4**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Blood Drawing	Medical Waste Generation	Environmental Contamination Due to Improper Disposal	0	4	4	4	**12**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	1	2	4	2	**9**

Clean Air Act Basics

The role of the Federal Government -

The Clean Air Act is a federal law covering the entire country. The states do most of the work in implementing the Act. The EPA sets national limits on how much of an air pollutant can be in the air anywhere in the US. But it makes more sense for the states to take the lead in carry out the Act because pollution control problems require specific understanding of local industries, geography, demographics, etc.

EXPANDED OVERVIEW (Terms)

National Ambient Air Quality Standards

Sets threshold concentrations of criteria air pollutants nationwide.

Criteria Air Pollutants

Carbon Monoxide (CO), Nitrogen Oxides NOx, Sulfur Dioxide (SO2), Volatile Organic Hydrocarbons (VOC), Particulate Matter (PM). Threshold concentrations based on human health criteria.

Hazardous Air Pollutants

Toxic air pollutants that cause serious health effects, such as carcinogens, mutagens, disease causing agents, e.g., benzene, pesticides, dry cleaning fluid, etc. There are 189 listed, and are subject to MACT requirements.

Stratospheric Ozone

Ozone depleting substances

Chlorofluorocarbons (CFCs), Hydrcholorfluorocarbons (HCFCs).

Acid Rain

SO2 and NOx, combine with rain to produce sulfuric acid and nitric acid respectively. Damage to vegetation, lakes, and rivers.

CAA Regs Impacting Hospitals

BOILERS

ASBESTOS

OZONE DEPLETING SUBSTANCES

HAZARDOUS AIR POLLUTANTS

INCINERATORS

BOILERS - What is Subject to Regulation?

Regulated according to size and date of construction:

Large Boilers - Subpart Db - > 100 MMBtu/hr or 29 MW - Const. After June 19, 1984

Small Boilers - Subpart Dc - > 10 MMBtu/hr or 2.9 MW - Const. After June 8, 1989

BOILERS - What is required?

Performance testing

When boilers are constructed (or installed) an initial stack test is required with results reportable to EPA and the State.

Emission Monitoring

Must monitor for SO2, Opacity, and possibly NOx.

Recordkeeping and reporting

Must Notify EPA when units are constructed. Must keep records of emission monitoring.

SIP provisions (State permit conditions)

May or not be federally enforceable. Must comply with terms of state permits.

BOILERS - Compliance Issues

Reporting failures

Monitoring failures

Opacity monitors not installed or not working

Failure to notify EPA upon construction/installation

ASBESTOS

National Emission Standards For Hazardous Air Pollutants (NESHAPS) for asbestos.

The EPA standards for asbestos operations (applicable in all states)

State regs, City Regs

Varies from state to state. Usually more stringent than federal standards. Usually requires third party air monitoring and physical containment of work area.

Threshold amounts, RACM, Category I and II non-friable

Federal: 260 linear ft, 160 square feet, or 1 cubic yard of asbestos containing material.

NY & NJ - Usually greater than 25 square or linear feet

Work practices, Monitoring, waste manifests, reporting, recordkeeping

Always requires adequate wetting, waste manifests, notification, and recordkeeping. NY & NJ also require monitoring, and containment of work area.

OZONE DEPLETING SUBSTANCES

Stratospheric Ozone Protection

Regulations that provide for the protection of the stratosphereic ozone layer by regulating, banning, recycling, or otherwise controlling the release of Chlorofluorocarbons (CFCs) into the atmosphere**.**

Applies to equipment with at least 50 lbs. of CFC - If a leak is detected, it has to be repaired within 30 days. 15% leak rate for comfort cooling, and 35% leak rate for all other. **Check methods for detecting leaks.**

Repair must bring unit below the leak rate.

When equipment is disposed of the equipment must be evacuated. Must have certified technician. Must go through EPA approved training. CFC should be recovered and reused. Recordkeeping is required when systems are evacuated. Evacuation equipment must be certified by EPA. When purchasing the equipment the certification must be sent to EPA.

EPA Inspection: Look for the number of units with greater than 50lbs. of CFCs. Look for records of service or repair, purchases of CFCs, and mechanic certifications.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Canteen** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	3	3	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	3	3	**8**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	4	**7**
Cooking	Generation of Grease and Food Waste	Solid Waste Generation, Grease Disposal	1	1	4	3	**9**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	1	2	3	2	**8**
Handling of Cardboard, Plastics, Steel and Aluminum Cans, etc.	Generation of Solid Waste	Generation of Solid Waste or Potential for Recycling	1	1	4	3	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Cardiac Catheterization Laboratory** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Patient Preparation	Improper Disposal of Betadine Disinfectant	Medical Waste, Contamination	2	2	4	3	**11**
Procedure Maintenance	Improper Disposal of Biomedical Waste	Contamination	1	4	4	3	**12**
Film Processing	Toner Cartridge Disposal	Environmental Contamination	0	1	2	2	**5**
Operation of Lab Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	1	3	**4**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: Clinical Laboratory **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Blood Drawing	Medical Waste Generation and Disposal	Generation and Contamination	1	4	4	4	**13**
Receive Specimens	Improper Disposal of Biomedical Waste	Environmental Contamination	1	3	4	4	**12**
Handling of Micro-Organisms	Microbial Contamination, Release of Microbes Into the Environment	Disease, Patient Safety, Employee Health	0	3	2	4	**9**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	4	1	3	**9**
Histology Slide Preparation	Generation of Hazardous Waste, Transportation of Hazardous Waste, Disposal to Sewage System	Environmental Pollution, Water Usage	0	4	3	1	**8**
Rinsing Slides	Wastewater Discharges, Chemical Disposal	Contamination of Sewage Treatment Plant, Damage to Infrastructure	1	3	2	3	**9**
Report Generation	Use of Paper	Use of Resources	0	0	4	0	**4**

7.2 Criteria Statements

1. ***Category 1 - Environmental Policy*** (ISO 14001-2004, Section 4.2; VA Directive 0057, paragraph 2.k; VHA GEMS Guidebook, Sections 2.1 and 5B (Sample MCM).

   a. **Policy.** Is there a published environmental policy in place that supports pollution prevention, regulatory compliance and continual environmental improvement?

   b. **Policy.** Is the policy communicated to the employees and available to the public?

2. ***Category 2 - Planning***

   a. **Environmental Aspects and Impacts.** (ISO 14001-2004, Section 4.3.1; VA Directive 0057, paragraph 2e; VHA GEMS Guidebook, Sections 2.2, 3.2 (Step 4) and 4.2 and Documents 5B1-1, 5B1-2 and 5B1-3).

      1) **Aspects and Impacts.** Has the facility established a written procedure to identify the environmental aspects and impacts of its activities, products and services?

      2) **Aspects and Impacts.** Have significant environmental aspects been determined and considered in setting environmental objectives and targets?

   b. **Legal Requirements.** (ISO 14001-2004, Section 4.3.2; VHA GEMS Guidebook, Sections 2.3 (Step 4) and Document 5B1-2).

      Legal. Is there a written procedure to identify, access and evaluate federal, state and local legal requirements?

   c. **Objectives and Targets.** (ISO 14001-2004, Section 4.3.3; VHA GEMS Guidebook, Sections 2.4, 2.5 and 3.2 (Step 6) and Documents 5B1-3, 5B1-4, 5B2 and 5B3).

      1) **Setting Objectives and Targets.** Is there a written procedure to achieve objectives and targets. Identify and document environmental objects and targets for each relevant function and level? Consider legal requirements and significant aspects and other operational requirements. Identify the means and acceptable time frames for accomplishment. Designate responsibility at each relevant function and level.

3. ***Category 3 - Implementation and Operation***

   a. **Accountability (Structure and Responsibility).** (ISO 14001-2004, Section 4.4.1; VA Directive 0057, paragraph 2.b, and 2.c; EO 13148, Section 404(b); VHA GEMS Guidebook, Sections 2.6, 3.2 (Step 1) and Document 5B1-4).

      1) **Accountability.** Has top management provided adequate resources? Has top management appointed a GEMS Committee to oversee, track and report GEMS status and performance?

      2) **Accountability.** Have roles, responsibilities and authorities been defined, documented and communicated to facility staff to ensure effective environmental management?

b. **Training.** (ISO 14001-2004, Section 4.4.2; VA Directive 0057, paragraph 2.j; VHA GEMS Guidebook, Sections 2.7 and 3.2 (Steps 2 and 7) and Document 5B1-5, Enclosure 6-6).

1) **Training.** Has GEMS awareness been conducted for all employees?

2) **Training.** Does New Employee Orientation include GEMS awareness training?

3) **Training.** Has the organization identified training needs for those workers who may create a significant impact on the environment?

4) **Training.** Are employees aware of environmental aspects/impacts associated with their work activities?

5) **Training.** Does the worksite specific GEMS training include significant environmental impacts, emergency response procedures and environmental consequences of nonconformance with standard operating procedures?

c. **Communications.** (ISO 14001-2004, Section 4.4.3; VHA GEMS Guidebook, Section 2.8 and Document 5B1-6).

1) **Communications.** Is there a written procedure for internal communication between the various levels/functions of the facility, the GEMS Coordinator and the GEMS Committee?

2) **Communications.** Is there a written procedure in place to coordinate and document inquiries from external public, private and regulatory organizations?

d. **GEMS Documentation and Record Keeping.** (ISO 14001-2004, Section 4.4.4 and 4.4.5; VA Directive 0057, paragraph 2.f; VHA GEMS Guidebook, Sections 2.9, 2.10, 2.15 and 3.2 (Step 5) and Documents 5B1-5 and 5B1-7).

1) **GEMS Documentation.** Is there a written procedure to ensure all GEMS policies and procedures are fully integrated and consistent with all other VAMC policies and procedures?

2) **Record Keeping.** The written GEMS document control procedure specifies:

1. approval of documents for adequacy prior to issue
2. review and update as necessary and re-approval of documents
3. ensuring that changes and all the current revision status of documents are identified
4. ensuring that relevant versions of applicable documents are available at points of use
5. ensuring that documents remain legible and readily identifiable
6. ensuring that documents of external origin, determined by the VAMC to be necessary for the planning and operation of the GEMS, are identified and their distribution controlled and
7. preventing the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

3) **Record Keeping.** Is there a written procedure to identify, maintain and dispose of environmental, training audit records?

4) **Record Keeping.** Are environmental records identifiable, legible, readily retrievable and traceable to activity, product and service?

e. **Operational Control.** (ISO 14001-2004, Section 4.4.6; VA Directive 0057, paragraph 2.f; VHA GEMS Guidebook, Sections 2.11 and 3.2 (Step 5) and Documents 5B1-7 and 5B1-8; Construction Safety Guidebook, Chapter 1).

1) **Operational Control.** Are the VAMC environmental operations aligned with significant environmental aspects and objectives?

2) **Operational Control.** Are procedures in place to communicate the GEMS requirements to suppliers and contractors?

f. **Emergency Response.** (ISO 14001-2004, Section 4.4.7; VHA GEMS Guidebook, Section 2.12 and Document 5B1-9; VHA Emergency Management Guidebook).

Emergency Response. Is there an emergency preparedness and response procedure to recognize and mitigate potential environmental impacts?

4. ***Category 4 - Checking and Corrective Action***.

a. **Monitoring and Measurement.** (ISO 14001-2004, Section 4.5.1and 4.5.2.1; VHA GEMS Guidebook, Sections 2.13 and 3.2 (Steps 8 and 9) and Document 5B1-10).

1) **Monitoring and Measurement.** Is there a written monitoring and measuring procedure for operations and activities related to significant environmental aspects?

2) **Monitoring and Measurement.** Does the monitoring and measuring procedure include requirements for calibration and recording of information to track performance, operational controls and conformance objectives and targets?

3) **Monitoring and Measurement.** Has a periodic (every 3 years) and/or baseline environmental compliance audit been conducted?

b. **Corrective and Preventive Action.** (ISO 14001-2004, Section 4.5.3; VHA GEMS Guidebook, Sections 2.14 and Documents 5B1-4 and 5B1-11).

1) **Action Plans.** Is there a written procedure covering the definition of roles and responsibilities for investigating and determining a cause of nonconformance?

2) **Action Plans.** Does the preventive and corrective action procedure include action needed to mitigate impact and necessary preventive action?

3) **Action Plans.** Do corrective and preventive action plans address the causes of the deficiency?

4) **Action Plans.** Is the effectiveness of corrective and preventive actions verified before considered completed?

c. **Gap Analysis.** (ISO 14001-2004, Section 4.5.5; VA Directive 0057, paragraph 2.c; VHA GEMS Guidebook, Sections 2.16 and 3.2 (Step 3 and Documents 5B1-11 and 5B1-12).

1) **Gap Analysis.** Does the program have procedures for conducting annual gap analyses of GEMS?

2) **Gap Analysis.** Is the scope based on the environmental importance of the activity and the results of the previous GEMS gap analysis?

3) **Gap Analysis.** Are the results of the GEMS gap analysis reviewed by the GEMS Committee and the recommendations forwarded to top management for review?

4) **Action Plans.** Are resources assigned to corrective and preventive actions in order to complete them in a reasonable timeframe?

5) **Action Plans.** Are corrective and preventive actions tracked to completion in the GEMS committee?

5. ***Category 5 - Management Review***.

a.) **Annual Review.** (ISO 14001-2004, Section 4.6; VHA GEMS Guidebook, Sections 2.17 and 3.2 (Step 9) and Document 5B1-13).

1) **Annual Review.** Is the management review conducted and documented on an annual basis and reported in the GEMS Committee?

2) **Annual Review.** Does the GEMS Committee use the gap analysis results to address the need for changes to policy, objectives and other GEMS elements?

3) **Annual Review.** Is there evidence that the facility director (top management) participates in the annual review (for instance, by signing annual review report)?

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Dental Clinic/Laboratory** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal, Employee/Patient Exposure	Environmental Contamination	1	1	3	4	**9**
Chemical Storage	Hazardous Waste Disposal and Spills	Environmental Contamination	0	2	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Radiography	Generation of Spent Photo Processing Fluids	Discharge of Hazardous Waste, Employee Exposure to Hazardous Chemicals	0	2	3	3	**8**
Tooth Restoration	Use of Mercury Amalgam and Other Precious Metals	Generation of Mercury Waste, Use of Silver and Gold	0	3	4	3	**10**
X-raying Teeth	Generation of Lead Foil	Generation and Disposal of Lead Products	1	1	3	3	**8**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Dialysis** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal, Wastewater Discharge	Environmental Contamination	1	2	3	2	**8**
Chemical Storage	Hazardous Waste Spills	Environmental Contamination	0	2	3	2	**7**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Disposal of Dialysis Filters	Medical Waste Generation	Environmental Contamination	0	4	3	4	**11**
Analysis of Patient Blood	Regulated Medical Waste Generation	Environmental Contamination	0	4	4	4	**12**
Ozone Used in Water Treatment System	Energy Consumption, Air Emissions	Use of Natural Resources, Air Pollution	0	1	3	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination, Occupational Disease	0	1	4	4	**9**

Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Disease	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Disease	1	2	4	2	**9**

Directory of Acronyms

AEE	Agency Environmental Executive
ALARA	As low as reasonably achievable
A&MM	Acquisition and Materiel Management
AMSTM	American Society of Testing and Materials
ANSI	American National Standards Institute
AP	Affirmative Procurement
AST	Aboveground Storage Tank
BMP	Best Manufacturing Practice
CAA	Clean Air Act
CBOC	Community Based Outpatient Clinic
CEMP	Code of Environmental Management Principles
CEOSH	Center for Engineering & Occupational Safety and Health
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CNG	Compressed Natural Gas
CPG	Comprehensive Procurement Guideline
CWA	Clean Water Act
dBA	Decibel
DEP	Department of Environmental Protection
DOD	Department of Defense
DOT	Department of Transportation
ECI	Environmental Condition Indicator
EHS	Extremely Hazardous Substance
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-To-Know Act

EPI	Environmental Performance Indicator
ESA	Environmental Site Assessment
E-SAFE	Environmental Safety Automated Facility Evaluation
ESD	Executive Services Department
EtO	Ethylene Oxide
FAR	Federal Acquisition Regulations
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
GEMS	Green Environmental Management Systems
GSA	General Services Administration
HAZCOM	Hazard Communication
HAZMAT	Hazardous Material
HMTA	Hazardous Materials Transportation Act
IL	Information Letter
IPM	Integrated Pest Management
IRAP	Independent Remedial Action Program
ISO	International Organization for Standardization
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LEED	Leadership in Energy and Environmental Design
MCM	Medical Center Memorandum
MPI	Management Performance Indicator
MSDS	Material Safety Data Sheet
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NPDES	National Pollution Discharge Elimination System
ODS	Ozone Depleting Substances
OMB	Office of Management and Budget
OPI	Operational Performance Indicator
P2	Pollution Prevention
P&D	Processing & Decontamination

PCB	Polychlorinated Biphenyl
PDSA	Plan, Do, Study, Act
PL	Public Law
PPA	Pollution Prevention Act
PPE	Personal Protective Equipment
ppm	Parts Per Million
PRV	Pressure Relief Valve
PVC	Polyvinyl Chloride
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RPG	Recycled Products Guide
RQ	Reportable Quantity
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control and Countermeasures
STEL	Short Term Exposure Limit
T&E	Threatened and Endangered
TRI	Toxic Release Inventory
TSCA	Toxic Substance Control Act
TSD	Treatment, Storage or Disposal
TWA	Time-Weighted Average
USC	United States Code
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VA	Department of Veterans Affairs
VACO	VA Central Office
VAMC	VA Medical Center
VHA	Veterans Health Administration

VISN	Veterans Integrated Service Network
VOC	Volatile Organic Compound

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Domiciliary** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effect, Environmental Contamination	1	1	2	4	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	2	4	**8**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	2	4	**10**
Activities to Include Ceramics, Wood Shop, Horticulture, etc.	User of Paints, Solvents, Glazes, Pesticides, Herbicides, etc.	Health Effects, Environmental Contamination	1	3	2	3	**9**

Enclosure 1-5

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Highlights

- All 21 VISNs provide complete submissions.
- Cost of waste disposal decreased 32.1% since FY '96.
- Recycling efforts generate $414,711 in revenue.

Inside

- FY '02 costs for all waste categories surveyed.
- FY '02 pounds or Cu. Ft. generated in each category.
- FY '02 recycling data and VHA's Environmental Goals.

The Office of Facilities Management (18)

January 2004

FY '02 Waste Minimization & Compliance Report

Environmental Programs Service (181C)

FY '02 Waste Minimization Survey on Waste Minimization and Recycling Activities within Veterans Health Administration

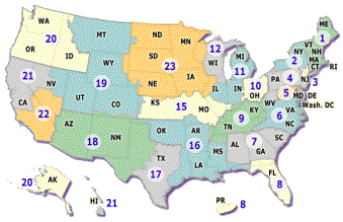
Veterans Health Administration (VHA) Directive 99-037 provides the format for reporting data on waste categories, volume, environmental compliance, and recycling activities to the Environmental Protection Agency (EPA), the Office of the Federal Environmental Executive (OFEE), the Agency Environmental Executive (AEE), as well as other Administrations within the Department of Veterans Affairs (VA).

The FY '02 Waste Minimization and Compliance Report represents the ninth in a series of annual efforts by VHA to accurately track waste minimization and recycling programs within VHA health care facilities. This report includes the total cost, total pounds (except for Radioactive Waste), highest and lowest cost, and highest and lowest amount generated for the Veterans Integrated Service Networks (VISNs) in the following reporting areas: Solid Waste, Regulated Medical Waste, Hazardous Waste, Radioactive Waste, Recycling Programs and Procurement of Recycled Products. It should be noted that at the time of this survey, there were 21 VISNs. All reporting areas were compared with the results of the FY '96 survey that is used as the baseline survey.

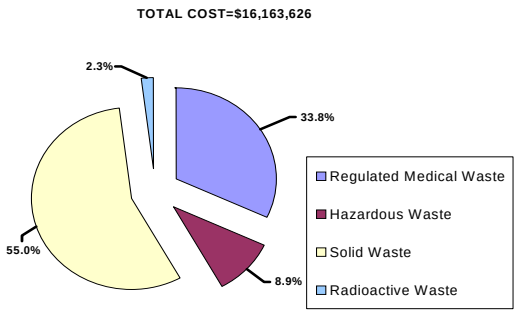
The total FY '02 cost for all waste disposal was $16,163,626. Compared to FY '96, this represents a decrease of 32.1%. The FY '02 total pounds of waste generated were 244,936,045. Compared to FY '96, this represents a decrease of 1.1%.

The FY '02 highest total cost per VISN of waste generated was $1,656,652. The lowest total cost of waste generated was $305,726 in VISN 2. The highest total pounds per VISN of waste generated were 38,247,006. The lowest total pounds of waste generated were 4,047,546 in VISN 2.

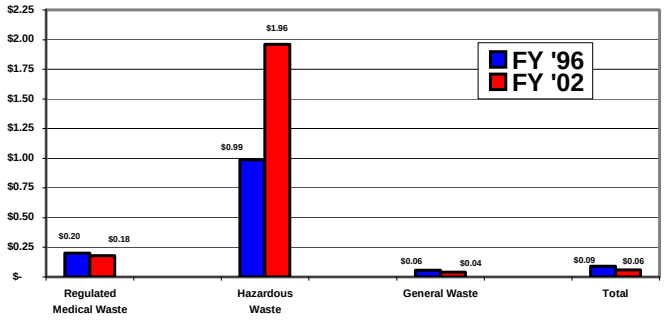
The FY '02 average cost of waste disposal excluding radioactive waste was 6.4 cents per pound. Compared to FY '96, this represents a decrease of 26%. The highest average cost per VISN was 18.1 cents per pound. The lowest average cost was 3.1 cents per pound in VISN 16.



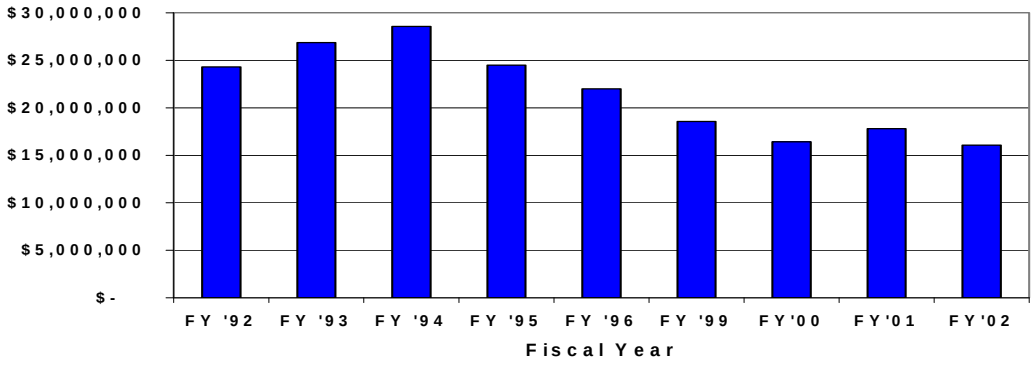
FY '02 PERCENT COST OF WASTE DISPOSAL BY CATEGORY



COST OF WASTE DISPOSAL IN $ PER POUND



TOTAL EXPENDITURES FOR WASTE REMOVAL/DISPOSAL IN VHA



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Solid Waste

The term "solid waste" refers to any garbage, refuse, sludge and other discarded materials including solid, liquid, semisolid or contained gaseous material. Although these wastes are not normally designated as hazardous, they must still be managed to prevent pollution of the environment.

Many of the key components of the typical health care facility solid waste stream include packing, waste from central supply and dietary services, non-hazardous biological wastes, non-hazardous combustible and non-combustible wastes. Wastes generated from construction, renovation and demolition activities are also included.

The FY '02 total cost of solid waste disposal was $8,903,864. Compared to FY '96, this represents a decrease of 36%. The highest total cost per VISN of solid waste disposal was $997,430. The lowest total cost of solid waste disposal was $111,822 in VISN 2.

The FY '02 total pounds of solid waste generated were 213,835,696. Compared to FY '96, this represents an increase of 2.9%. The highest total pounds per VISN of solid waste generated were 34,952,373. The lowest total pounds of solid waste generated were 3,417,700 lbs in VISN 2.

Regulated Medical Waste

Regulated Medical Waste (RMW) is also referred to as infectious waste, potentially infectious medical waste, etc., and includes any waste material or article that harbors, or may be reasonably expected to harbor pathogens that might be expected to produce disease in healthy individuals. This category may include cultures and stocks, pathological wastes, human and blood products, used sharps, animal wastes and isolation wastes.

Due to the increasing regulations in air quality, many VHA health care facilities do not treat their RMW but contract directly for transportation and disposal. Where treated on site, treatment methods identified in the Waste Minimization Survey included steam sterilization, incineration and other alternative methods of treatment.

The costs for disposal of RMW included treatment costs (where utilized) plus contract disposal costs. This was because where RMW was treated onsite, the residue, ash or unrecognizable materials were disposed of off site by contract.

The FY '02 total cost of RMW disposal alone was $5,449,901. Compared to FY '96, this represents a decrease of 29%. However, the cost per pound for disposal increased 2.2%. The highest cost per VISN for RMW disposal was $762,922. The lowest cost for RMW disposal was $115,402 in VISN 9.

The FY '02 total pounds of RMW generated were 30,369,592. Compared to FY '96, this represents a decrease of 20.2%. The highest total pounds per VISN of RMW generated were 6,183,007. The lowest total pounds of RMW generated were 281,849 in VISN 21.

The FY '02 total pounds of RMW treated on site were 10,129,076. The highest total number of pounds per VISN of RMW treated on site was 2,629,571. The lowest total number of pounds of RMW treated on site was 6,528 in VISN 1.

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Hazardous Waste

The EPA has designated hazardous waste as waste that meets one or more of the following characteristics: (1) ignitable, (2) corrosive, (3) reactive and (4) toxic. The Resource Conservation and Recovery Act (RCRA) regulates the storage, treatment and disposal of hazardous waste.

The Hazardous Waste section of the Waste Minimization Survey asked for specific responses from each VHA health care facility as to the number of pounds generated, costs for disposal from the waste disposal manifests, spill control plans, date of last chemical inventory, presence of a waste minimization program, and waste disposal costs for research activities. In addition, questions were developed to identify the number of pounds of halon present in extinguishing systems and the status of any replacement projects.

The FY '02 total cost of hazardous waste disposal was $1,431,631, which represented a 7.7% decrease over FY '96. The highest total cost per VISN of hazardous waste disposal was $198,943. The lowest was $8,086 in VISN 2. It is important to note that the cost per pound of disposal increased 100% to $1.96 per pound during this period.

The FY '02 total pounds of hazardous waste generated were 730,757. Compared to FY '96, this represents a decrease of 45.5%. The highest total pounds per VISN of hazardous waste generated were 112,067. The lowest was 9,607 in VISN 19.

Virtually every facility identified a waste minimization program in place for hazardous waste, written agreements with the local publicly owned treatment works for effluent discharge, and a completed chemical inventory within FY '02. VHA health care facilities were using solvent recovery systems with xylene and alcohols being the most frequently recovered items. For FY '02 VHA spent $ 85,051 to remove 26,476 lbs of mercury and materials containing mercury from the health care environment.

The cost of hazardous waste disposal in VHA from research activities was $529,967 or 37% of the total VHA cost.

The amount of halon remaining in extinguishing systems was 1,346 lbs.

Radioactive Waste

The survey collected information on radioactive materials primarily subject to regulation by the Department of Transportation and the Nuclear Regulatory Commission that comes from sources such as dry solid, biological waste, scintillation vials, absorbed, regulated, mixed and other.

In FY '02, 9.606 cubic feet of radioactive waste was generated with a disposal cost of $378,630 and $78,302 in permits and fees. Compared to FY '96, this represents a decrease of 35.3% in cost. The highest total cost per VISN of radioactive waste disposal was $91,000, and the lowest was $2,565 in VISN 1. The most frequently identified land disposal site was Barnwell, SC.

Recycling Programs

For the purpose of collecting accurate data on recycling programs, VHA health care facilities were required to indicate proceeds (+) or costs (-) and

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pounds of recycled materials for a variety of items, which historically have been major components of a recycling program. These included, but were not limited to wood, paper, glass, metal, plastics, rubber, batteries, silver, fluorescent lamps, etc. It is important to note that facilities may have difficulty in collecting accurate proceeds/cost and pounds of recycled materials. This information is often kept by a number of services and individuals and is not often centralized.

Waste Management Policy is currently defined in M-1, Part 7, Chapter 14, and further information is available in VHA Program Guide 1850.1, Recycling Program. A recycling coordinator can help to monitor the recycling programs and nominate the facility for a number of environmental award programs. Effective recycling programs may not always generate proceeds, but may realize direct dividends in cost avoidance.

Proceeds from the recycling program may be retained and utilized locally to promote environmental programs at the discretion of the VHA health care facility director.

There were a substantial number of successful new initiatives in recycling in VHA for the FY '02 reporting period that resulted in increased proceeds or cost avoidance in other areas. The most frequently identified problems were the lack of a local market and disposal of construction debris. However, the overall result was a net proceed.

The FY '02 total proceeds were $414,711. Compared to FY '96, this represents a decrease of 11%. The greatest total proceeds of recycled materials were $2,478,295 in VISN 15. The greatest cost per VISN of recycled materials was $157,359.

The FY '02 total pounds of materials recycled were 36,307,349. Compared to FY '96, this represents an increase of 19.3%. The greatest total number of pounds of materials recycled was 4,765,272 in VISN 3. The lowest number of pounds per VISN of materials recycled was 421,043.

The FY '02 new initiatives in recycled programs resulted in total cost avoidance of $875,879. The greatest cost avoidance was $136,969 in VISN 23. The lowest cost per VISN avoidance was $0.

Recycling initiatives generated from this report will be made available separately.

Procurement of Recycled Products

The procurement of recycled items is normally addressed separately in the RCRA 6002 Report. This report is forwarded annually to the Federal Environmental Executive at the OFEE.

The data requested includes the dollar amount spent in each Federal agency in procuring recycled, re-refined and reusable items for a variety of specified categories.

The FY '02 total dollar amount of recycled, re-refined and reusable materials was $21,070,153.

The highest total dollar amount of these materials purchased was $2,512,607 in VISN 8. The lowest total dollar amount per VISN of these materials purchased was $231,948.

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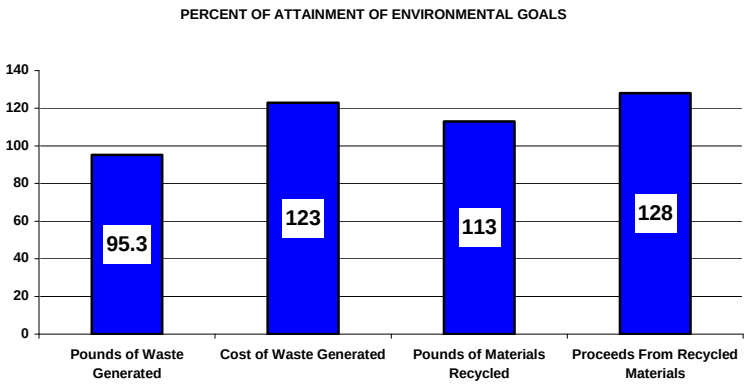

Environmental Goals

Executive Order 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition, required each Federal Agency to establish goals in waste prevention, recycling and acquisition of recovered materials for the years 2000, 2005 and 2010.

On April 5, 1999, the Under Secretary for Health established the environmental goals for January 1, 2000. The baseline data for developing these goals was the data derived from the FY '96 Waste Minimization Survey, although no accurate data on the procurement of recovered materials was available at that time.

For the waste prevention category, the January 1, 2000, goals were 234,010,010 lbs in total waste generated with $20,901,010 in total disposal costs. The measured results were 244,936,890 lbs in total waste generated (4.7% short of the goal) and $16,071,799 (23.1% above the goal).

For the recycling category, the January 1, 2000, goals were 32,010,010 lbs of total materials recycled with $323,010 in proceeds. The measured results were 36,307,349 total pounds of materials recycled, 13.4% above the goal, and $414,711 in proceeds, 28.3% above the goal.

For Further Assistance

The FY '02 Waste Minimization and Compliance Report was the collaborative effort of many dedicated professionals. This report is part of an ongoing review of the waste minimization, recycling and pollution prevention (P2) programs in VHA.

The survey questionnaire will be updated annually as requirements for environmental compliance and agency responsibilities continue to evolve.

Your opinions are important to us. For further information or clarification on this report, please contact Mr. Gregory L. Winters, Program Manager, Environmental Programs Service (181C), at (202) 565-8525, or e-mail to his attention using the Service's address at VHACOEPS181C@hq.med.va.gov. The report is also available at this Web address: http://www.va.gov/facmgt/environmental.

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VHA Environmental Training Program Plan

Training	Agenda	Audience	Forum	Resources
Regulatory Compliance Training				
National Environmental VA Meeting Kick-off	Intro by top VA mgmt. to show environmental commitment, overview of major statutes, and environmental management systems.	Environmental Coordinators, HQs & VISN Safety/Health, Medical Center Directors/ Associate Directors	4 day (2 day compliance, 2 day GEMS) conference face-to-face in Spring 2004. Taped for future use by VA.	With EPA HQ & regional help (suggestion to make it a civilian-wide conference & add RCRA training).
Environmental Compliance 101	Overview of major statutes (i.e., RCRA/ UST, CAA, CWA [SPCC, storm water, wetlands] EPCRA, TSCA [Lead, PCBs], SDWA, FIFRA). Compliance with other requirements such as Executive Orders and VA policy, etc.	Environmental Coordinators, HQs, VISN Safety/Health, Program/Service Managers, Director/Associate Directors	1-1½ day face-to-face in each EPA Region during FY2004 that will be taped for future use by VA.	EPA Regions FFPMs – Region 1 will hold in October 2003.
RCRA Hazardous Waste Mgmt Training and Annual Refresher	Required EPA hazardous waste management training.	Environmental Coordinators, VISN Safety/Health	Distance Learning by VA.	Numerous contractors give course. NETI RCRA Inspector Training CD-ROM.
Identification of Hazardous Waste for Healthcare	Detailed discussion on waste characterization.	Environmental Coordinators, HQs, VISN Safety/Health	1 day - could be broadcast or videotaped.	EPA Region 2 has developed - to be given November 12th.
Required Certification Training	Necessary training to be certified to perform task.	Employees such as HVAC, wastewater treatment, pesticides applicators, boiler plant operators	As required.	Many contractors give course.
Laboratory-Specific Environmental Training	Describes the environmental requirements and best management practices that relate to laboratories such as RCRA, CWA, and CAA. At a minimum, it will satisfy the training requirements of RCRA 265.16. Also, covers auditing questions.	Environmental Coordinator, VISN Safety/Health, Laboratory employees, including the Laboratory Program Manager	CD-ROM or interactive video developed by VA.	GEMS guide for small Laboratories. Lab 21 Web site.
DOT training		Environmental Coordinators, Warehouse shippers		

Training	Agenda	Audience	Forum	Resources
UST Training Module	Review of the underground storage tank requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	UST guidebooks & website. EPA UST presentations. UST auditing protocol.
SPCC Training Module.	Review of the SPCC requirements at a facility. Includes how to develop a SPCC plan and auditing questions.	Environmental Coordinators, VISN Safety/Health, Facility Engineer	CD-ROM or interactive video developed by VA.	SPCC website. EPA SPCC presentations. SPCC booklets.
Clean Water Act Training Module.	Review of the CWA requirements at a facility such as NPDES, pre-treatment, wetlands, and storm water. Includes auditing questions. May want to include security issues as relates to wastewater plants.	Environmental Coordinators, VISN Safety/Health, Wastewater Plant Operators, COTR if construction project	CD-ROM or interactive video developed by VA.	EPA NPDES website. EPA presentations. Construction Compliance Assistance Center.
Toxic Substances Training Module	Describes requirements and best management practices related to Asbestos, Lead-Paint, PCBs and Mercury. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, COTR if demolition/renovation project	CD-ROM or interactive video developed by VA.	EPA Asbestos webpage. Numerous Mercury elimination documents. Auditing Protocol for TSCA.
Facilities Maintenance Module	Environmental Requirements & best management practices that apply to the facilities maintenance operations such as CAA, CWA, SDWA (UIC), FIFRA, RCRA, Universal Waste, TSCA, beneficial landscaping, etc. It must meet the RCRA 260.16 training requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/Health, Facilities maintenance personnel (e.g., motor pool, paint shop, grounds keeping, HVAC, plumbing, electricians, carpentry, etc.)	CD-ROM or interactive video developed by VA.	EPA's national CA centers.
Clean Air Act Training Module	Review of Clean Air Act requirements that apply to healthcare facilities. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Boiler personnel	CD-ROM or interactive video developed by VA.	EPA Web site. CFC checklists.
Medical Waste Training Module	Review of requirements related to medical waste. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Housekeeping	CD-ROM or interactive video developed by VA.	State Agencies.
EPCRA Training Module	Review of EPCRA requirements. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health	CD-ROM or interactive video developed by VA.	EPA Web site. EPA TRI courses.

Training	Agenda	Audience	Forum	Resources
SDWA Training Module	Review of SDWA requirements. May want to include security issues as related to drinking water plants. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Drinking Water Treatment Plant Operators	CD-ROM or interactive video developed by VA.	EPA Web site.
Dental Environmental Compliance Module	Review of requirements and best management practices related to dental facilities, such as RCRA. Including auditing questions.	Environmental Coordinators, VISN Safety/ Health, Dental personnel	CD-ROM or interactive video developed by VA.	Vermont's Dental Guide.
Pharmacy Environmental Compliance Module	Review of requirements and best management practices related to pharmacies, such as RCRA. Includes auditing questions.	Environmental Coordinators, VISN Safety/ Health, Pharmacy personnel	CD-ROM or interactive video developed by VA.	Pharmacology Web site.
Environmental Compliance for Lawyers	Review major environmental laws applicable to VAMCs, state and federal regulator's procedures for inspections, violations, fines; and VAMC legal defense strategies.	District Counsel	?	?

Green Environmental Management Systems Training				
GEMS Training For Top Management	Overview of GEMS Elements.	Directors and Associate Directors at VAMC, HQs and VISN level GEMS Coordinators and Auditors	2 Hour broadcast by VA.	
Designing Your GEMS – Federal Facility Workshop	More detailed discussion of GEMS elements and hands-on workshop with VA examples.	GEMS Coordinators & Auditors	2-day conference. Same as what is offered in Kick-off.	
GEMS Element-By-Element Hands-On Training	Detailed discussion of elements – one element at a time with facility-specific help.	GEMS Coordinators, Program/Service Managers (or designated person)	V-TEL by VISN. Done once a month until EMS complete.	See metal finishing GEMS workshops
Facility-Specific GEMS Training	Training on facility-specific policies and procedures.	Employees	Varies depending on facility developed by facility.	
ISO 14001 Lead Auditor Course	Training on how to conduct a GEMS audit.	VISN GEMS Auditor	Classroom for 5 days.	Offered by many contractors.

Pollution Prevention/Environmental Stewardship				
Environmental Preferable Purchasing/ RCRA 6002/ Executive Orders	Training on buying environmentally preferable products and complying with RCRA 6002 and Executive Orders.	Environmental Coordinators, VISN Safety/Health, COTRs, COs, Credit Card Holders, Chief, Acquisition & Materiel Management	CD-ROM, interactive videos, PowerPoint presentations.	H2E, EPA EPP Program, OFEE. Lyons VA.
Waste Minimization/ Product Substitution	Training on waste minimization at healthcare facilities.	Environmental Coordinators, VISN Safety/ Health, Program/Service Managers, Credit Card Holders, COTRs, COs	CD-ROM, videos	H2E, EPA Wastewise.
Green Cleaning	Awareness of more environmentally and safer cleaning products.	Environmental Coordinators, VISN Safety/Health, Housekeeping/Laundry	CD-ROM, videos.	EPA EPP Program, Greening Govt CD EPA Regions 1-3.
Green Building	Awareness of building and renovating in a greener manner.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROM, videos.	EPA.
Indoor Air Quality	Training on indoor air quality.	Environmental Coordinators, VISN Safety/Health, COTRs	CD-ROM by VA.	Completed.
P2 Training for Auto Repair Shops	Training on pollution prevention techniques available to auto repair shops/fleet maintenance.	Motor Pool, Environmental Coordinators, VISN Safety/ Health	Video and workbooks.	EPA Region 9 has completed.
Best Management Practices for Outdoor Shooting Ranges	Best management practices for outdoor shooting ranges.	Outdoor shooting ranges if built.	Guidance Document.	EPA Region 2 Guide.

Green Environmental Management Systems (GEMS) Training Needs Assessment

VA Personnel	Training Needed
Top Management – VAMC and Network Directors/Associate Directors, VACO Research, Medical Center Chief of Staff, District Counsel	GEMS for Top Managers, Environmental Compliance 101 for Top Managers.
GEMS Coordinators & other GEMS Committee Members	GEMS for Top Managers, Designing your GEMS workshop, GEMS monthly workgroup, Environmental Compliance 101, RCRA & Universal Waste required training, Identification of Hazardous Waste Training, Environmental Coordinator Training (series of modules on statutes to be able to audit the facility).
VISN GEMS Auditor	Everything above and GEMS ISO 14001 auditor training.
Program/Service Managers (Engineering, Laboratories, Housekeeping, Acquisition, Clinical)	GEMS for top managers, GEMS monthly workgroup, Environmental Compliance 101, Modules of Environmental Coordinator Training that applies to specific program/service.
Clinical, Research, and Dental Laboratory & Morgue Employees	Laboratory-Specific Environmental Training Module. Facility-specific GEMS training (after GEMS developed).
Facility Maintenance (HVAC, Motor Pool, Paint Shop, Plumbers, Electricians, Carpentry, Grounds Keeping, Silver-Recovery)	Facility Maintenance Environmental Training Module. CAA/Section 608 & 609 required training if needed. Pesticide Applicator Training if needed. P2 for Auto Repair (R9) training if applicable. Facility-specific EMS training (after GEMS developed).
Warehouse - shippers & receivers	DOT Training, Facility-specific GEMS training (after GEMS developed).
Facility Engineer	UST and SPCC modules, Facility-specific GEMS training (after GEMS developed).
Wastewater Plant Operators	CWA module, Applicable Wastewater Certification Training, Facility-specific GEMS training.
Drinking Water Treatment Plant Operators	SDWA module, Applicable Drinking Water Certification Training, Facility-Specific GEMS Training.
Facilities Management - Contracting Officer Technical Representative	Environmental Compliance 101, Environmental Preferable Purchasing/RCRA 6002 Training, Waste Minimization Module, Asbestos, Storm water, Indoor Air Quality, Wetlands, Green Building, Real Property Transition Due Diligence & Lead Paint Modules as need arises, Facility-specific GEMS training.
Acquisition and Materiel Management – Contracting Officers	Environmental Compliance 101, Environmentally Preferable Purchasing/RCRA 6002, Waste Minimization.

VA Personnel	**Training Needed**
Housekeeping/Laundry Workers	Pesticides Applicator Training as required, Medical Waste Module, Green Cleaning, Integrated Pest Management, Facility-Specific GEMS training.
Dental Clinics that are not labs	Dental Clinic-specific Environmental Training. Facility-specific GEMS training.
Pharmacists, Pharmacy Technicians, & other clinicians who handle disposal of drugs	Pharmacy-specific environmental training. Facility-specific GEMS training.
Boiler Plant Operators	CAA module. Facility-specific GEMS training.
Shooting Range Operator	EPCRA/TRI module, RCRA module, Best Management Practices for Outdoor Shooting Ranges if applicable, Facility-specific GEMS training.
District Counsel	Environmental compliance for lawyers.

GEMS Concepts

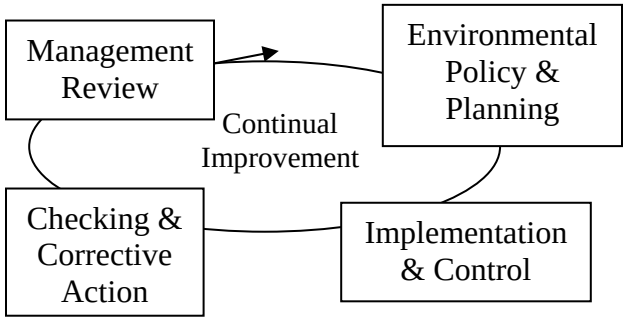
What is GEMS?

The VHA GEMS (Green Environmental Management Systems) is a formal system for integrating the environmental footprint into the overall management of the organization. Required by presidential Executive Order 13148, the goal of GEMS is to achieve continual improvement in environmental protection.

GEMS and JCAHO.

GEMS follows the plan-do-check-act model, making it easy to integrate with the JCAHO Environment of Care programs at healthcare facilities. In fact, many of the requirements for GEMS are already in place and being tracked by facility Safety or Environment of Care Committees.

PLAN - DO - CHECK - ACT



PLAN

The planning phase includes creating an environmental policy, identifying environmental aspects and impacts of the healthcare facility activities, and establishing environmental objectives and targets and the plans for achieving them.

DO

Accountability for GEMS activities is established by identifying the structure and responsibilities through medical center memoranda, conducting training on GEMS concepts and for specific environmental activities, and by establishing GEMS documentation and operational controls.

CHECK

Ongoing monitoring and measuring of operational controls is augmented by periodic evaluations of the GEMS (gap analysis) and environmental compliance audits, all of which generate preventive and corrective actions which are tracked in the GEMS Committee.

ACT

Similar to other Environment of Care program elements, an annual evaluation of the effectiveness of the GEMS and recommendations for continual improvement are submitted for approval to the facility director.

Nine Steps to a Successful Green Environmental Management System (GEMS)

1. Appoint GEMS Coordinator & GEMS Committee.

A GEMS Coordinator will be appointed at each VA Medical Center to ensure that the requirements of GEMS are established, implemented and periodically reviewed in accordance with principles of the ISO 14001 model.

The GEMS Committee is a multi-disciplinary committee established to coordinate and oversee the GEMS.

2. Train GEMS Committee.

The GEMS Committee is trained first, so they can develop, monitor, and continually improve the GEMS.

3. Conduct Initial GEMS Gap Analysis.

The purpose of the initial gap analysis is to help the facility understand what it is already doing in terms of the requirements for GEMS, and to build on existing programs and activities in order to close the gap between requirements and reality.

4. Identify Significant Environmental Aspects.

This involves a process starting with identifying legal and other requirements applicable to the activities of each operating unit. Operating Units then identify and score the impacts they have on the environment. The GEMS Committee determines significant aspects for further control.

5. Establish Operational Controls.

The GEMS Committee ensures operational controls are adequate for all significant aspects. This includes developing, publishing, and distributing GEMS and other environmental policies and procedures.

6. Set Objectives and Targets.

The GEMS Committee sets environmental objectives and targets and the plans to achieve them. Success with these is evidence of continual improvement.

7. Train Staff on GEMS Policies and SOPS.

The training program should provide sufficient training to employees to ensure that the GEMS is operating at the highest level.

8. Conduct Environmental Compliance Baseline and Periodic Follow-Up Audits.

The purpose of this audit is to determine the compliance status of the facility and address any non-compliance issues.

9. Annual Program Effectiveness Review and Report.

To maintain continual improvement, management will periodically review the GEMS to ensure it is operating as planned.

How Does Your Job Impact the Environment?

Do you…

- Use, dispose, and/or store paint?
- Use, dispose, and/or store solvents?
- Use and dispose of fluorescent light bulbs?
- Use paper, computers, batteries?
- Repair/operate motor vehicles?
- Use aerosol sprays?
- Store waste?
- Operate a boiler?
- Dispose of hazardous, radiological waste, or solid waste?
- Manage construction projects?
- Work with asbestos?
- Work with ozone depleting substances?
- Use large amounts of electricity or water?
- Purchase chemicals, medical or other supplies?

Your job activities could impact the environment by…

- Causing an unplanned spill or release of hazardous chemicals that could pollute the air, soil, or water
- Causing incorrect storage or disposal of waste that could pollute the soil and water
- Not recycling when possible and creating more waste in landfills that can pollute the soil and water

Work to…

- Maintain regulatory compliance
- Implement controls
- Prevent unplanned spills and releases
- Ensure sampling and monitoring devices are calibrated and operating correctly
- Conserve energy and water
- Use recycled products
- Prevent pollution by substituting “green” products

Environmental Contacts:

(Please write name and phone number)

VAMC GEMS Coordinator:

_____…_____-_____

VISN Safety/Industrial Hygiene Manager:

_____…_____-_____

Resources:

This brochure, GEMS Guidebook, Environmental Compliance Guidebook, and RCRA Guidebook are available at the CEOSH web site:
vaww.ceosh.med.va.gov

Department of Veterans Affairs

Green Environmental Management Systems

GEMS

SAMPLE

Green Environmental Management Systems (GEMS) Aspects Rating Template

OPERATING UNIT: **Blood Bank/Phlebotomy** **Date:**_____

Activity or Service	Compliance	Risk	Frequency of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	1 – Activity is not regulated, but VAMC has taken steps to reduce energy consumption.	1 – VAMC operation of equipment in Blood Bank is a moderate risk to human population and environment.	3	1 – VAMC has little control over use of energy due to operational necessity.	**6**
Chemical Usage	1 – The activity is regulated, and compliance measures are in place.	1 – Due to limited amount of chemical usage, there is a moderate risk to sensitive human population and ecosystem.	1	1 – VAMC has little control over use of energy due to operational necessity.	**4**
Chemical Storage	1 – The activity is regulated, and compliance measures are in place.	1 – Due to limited amount of chemical storage, the risk is moderate.	1	1 – VAMC has little control over use of energy due to operational necessity.	**4**
Report Generation	0 – The activity is not regulated, but a recycling program is in place.	0 – There is a minor risk to the human population and ecosystem.	2	3 – VAMC has significant influence over paper generation (vs. electronic data storage).	**5**
Blood Drawing	0 – The activity is highly regulated; however, VAMC is in full compliance.	4 – There is a high risk to the human population and ecosystem in the event of improper disposal.	4	4 – VAMC has total control over medical waste disposal.	**12**

Cleaning & Disinfecting Surfaces and Equipment	1 – The activity is regulated, and compliance measures are in place.	2 – Semi-hazardous chemicals are used but in small quantity; therefore, there is a moderate risk to the human population and environment.	4	2 – VAMC has influence over the amount of chemical usage; however, the amount of cleaning is out of VAMC control.	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: _____ **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE

Enclosure 6-7

DEPARTMENT OF VETERANS AFFAIRS

SAMPLE APP Facility-Level Audit Questions

1. *Policy:*

a) Does your facility have policy specifically requiring an Affirmative Procurement Program (APP), and compliance with RCRA 6002 and EO 13101?
____Yes ____No

If yes, please attach a copy of the policy or provide the web address (URL)_____

If no, does your facility follow VA's APP Policy?

____Yes ____No

2. *Planning:*

a) Has your facility established objectives/targets for APP performance (or purchases of Comprehensive CPG items/materials with recycled content) that are consistent with the nature and quantity of purchases normally made by your facility?
____Yes ____No

b) Do you have a process for routine review and updating of APP objectives/targets?

____Yes. Describe:_____

____No

3. *Implementation and Operation:*

a) Does your facility have an APP awareness-training program?

____Yes. Describe:_____

____No

Is your APP awareness-training program tailored specifically to the nature and quantity of purchases typically made by your facility?

____Yes. Describe:_____

____No

Does your facility's APP policy assign responsibility for implementation of the APP awareness-training program to a specific person/office?

____Yes. Describe:_____

____No

b) Is the APP awareness training program provided in initial and refresher training to all personnel involved with preparation of specifications/ statements of work, purchases with government credit cards, contracting/ procurement?

____Yes. Describe:_____

____No

c) Does your facility's policy provide a process for measurement of progress toward APP objectives?

____Yes. Describe:_____

____No

d) Does your facility's policy assign responsibility for routine measurement, evaluation, and reporting of APP performance data?

____Yes. Describe:_____

____No

4. *Checking and Corrective Action:*

a) Has your facility incorporated APP requirements into self-assessments, compliance inspection protocols, and management system audit protocols?

____Yes. Describe:_____

____No

b) Do your inspection protocols include evaluations of APP awareness training, performance measurement, and responsibility/accountability?

____Yes. Describe:_____

____No

Does your APP policy call for routine self-assessments of the effectiveness of awareness training and the completeness and integrity of APP performance data?

____Yes. Describe:_____

____No

c) Do your self-assessment, compliance inspections, and management system audit procedures include requirements for follow-up action and documented closure of deficiencies in APP?

____Yes. Describe:_____

____No

5. *Management Review:*

a) Do you have a process for management review of APP performance data?

____Yes. Describe:_____

____No

b) Does the management review process provide facility senior leadership with accurate and timely data regarding your facility's APP performance?

____Yes. Describe:_____

____No

c) Does your management review process include provisions for feedback and policy changes to ensure continuous improvement in APP performance?

____Yes. Describe:_____

____No

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Above/Underground Storage Tanks** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Emergency Generation	Storage of Oil, Gasoline and Diesel Fuel	Soil and Groundwater Contamination	0	4	4	4	**12**
Gasoline Dispensing	Storage of Gasoline	Soil and Groundwater Contamination	0	4	4	4	**12**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Boiler/Chiller Plant** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	4	3	4	**12**
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Fuel Usage (Vehicles, Energy Production)	Air Emissions (SO2, NOx, CO), Environmental Contamination, Energy Consumption	Use of Natural Resources, Air Pollution	0	4	4	3	**11**
Asbestos Abatement	Hazardous Waste Disposal	Employee Health, Air Pollution	0	4	2	4	**10**
Operation of Machinery/Power Tools	Energy Consumption, Noise, Heat	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	3	**6**
Boiler Plant Containing Asbestos	Air Emission (Explosion)	Air Pollution	0	4	0	2	**6**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - BMET Shop** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	2	4	4	**10**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	2	3	**9**
Radiology Transformer (PCB)	Air Emissions	Air Pollution	0	4	1	4	**9**
Use of Oils and Hydraulic Fluid	Hazardous Waste Disposal	Environmental Contamination	0	3	1	4	**8**
Fuel Usage (Vehicles)	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Battery Disposal	Universal Waste Disposal	Environmental Contamination	0	3	1	3	**7**
Use of Fume Hood	Air Emissions, Energy Consumption	Air Pollution, Use of Natural Resources	0	1	3	2	**6**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	3	**6**
Material Waste (Plastics)	Waste Disposal	Use of Landfill Space	0	1	1	3	**5**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Carpentry/Lock Shop** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	2	4	4	**10**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	2	2	3	**8**
Fuel Usage (Vehicles)	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Metal Shavings	Disposal, Use of Landfill Space	Water Pollution (Leaching of Heavy Metals)	1	2	3	2	**8**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	3	**6**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Electrical Shop** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	2	3	3	**9**
Fuel Usage (Vehicles)	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Lamp Disposal (Mercury-Containing)	Universal Waste Disposal	Environmental Contamination	1	3	1	4	**9**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	3	**6**
Battery Disposal	Universal Waste Disposal	Environmental Contamination	0	3	1	4	**8**
Metal Fabrication	Air Emissions	Air Pollution	1	2	2	4	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - HVAC Shop** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	3	3	**10**
Fuel Usage (Vehicles)	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Portable/Non-Portable Refrigerants	Waste Disposal	Air Pollution, Environmental Contamination	0	3	3	4	**10**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	3	**6**
Roofing Projects	Air Emissions (PM)	Air Pollution	1	2	2	2	**7**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Mason Shop** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	2	4	**10**
Fuel Usage	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	4	1	**7**
Cement Mixing	Air Emissions (PM)	Air Pollution	1	1	3	2	**7**
Report Generation	Use of Paper	Use of Natural Resources	0	0	1	3	**4**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Motor Pool** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	3	**10**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	3	3	**10**
Fuel Usage	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	3	**8**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Paint Shop** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	4	3	3	**11**
Fuel Usage	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Engineering - Pipe Shop** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Storage	Potential for Spills	Environmental Contamination	0	3	4	4	**11**
Asbestos Abatement	Hazardous Waste Disposal	Employee Health, Air Pollution	1	4	3	4	**12**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	3	3	**10**
Drain Cleaner	Hazardous Waste Disposal	Environmental Contamination	1	3	4	3	**11**
Fuel Usage	Air Emissions, Energy Consumption	Use of Natural Resources, Air Pollution	1	2	2	2	**7**
Metal Fabrication	Hazardous Waste Disposal, Air Emissions, Energy Consumption	Environmental Contamination, Use of Natural Resources	1	2	2	3	**8**
Operation of Machinery/ Power Tools	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**

Executive Summary

The Green Environmental Management Systems (GEMS) Program represents a systematic approach to environmental management, but it is not another environmental program. Rather, it is a management tool that provides a framework to weave existing environmental programs into the Environment of Care management processes, which enables the organization to achieve continual improvement in performance. The Green Environmental Management Systems (GEMS) Program within the Environment of Care Program will provide for environmental regulatory compliance and conformance with Veterans Health Administration (VHA) policy and Executive Order 13148. VHA facilities already have active environmental programs with many of the GEMS elements in place, but these programs are individual and separate entities. The primary purpose of the GEMS is to coordinate these activities into one integrated framework that enhances and improves the overall efficiency and effectiveness of these environmental programs.

Background

In August 2002 VHA and the United States Environmental Protection Agency (EPA) signed an agreement to collaborate on a number of projects to improve the level of environmental compliance at VHA facilities nationwide. This agreement was signed as both agencies recognized the need to improve environmental programs, and VHA appreciated the offer of EPA to work with VHA in a collaborative effort. This partnership has been very successful, and a number of initiatives are underway or have been completed by VHA alone or in collaboration with EPA.

To assist in the development of a facility Green Environmental Management Systems (GEMS) Program and to support compliance with federal mandates, VA Central Office (VACO) organized a task force comprised of VACO and facility representatives to develop the Green Environmental Management Systems (GEMS) Guidebook. The task force collaborated with the Center for Engineering & Occupational Safety and Health (CEOSH) who prepared and produced this guidebook (Book 6A). This is one of a two-volume set on environmental programs and compliance. Environmental Compliance, Book 6B, focuses on all environmental regulations that impact VA and non-VA hospitals. Source material is based upon federal legislation and is provided to assist your facility in complying with these requirements.

The Nine Step process in Section 3 is designed to provide facilities with a useful tool and a complete step-by-step process to assist in their development of a facility environmental management system. It is based on the process developed for the Emergency Management Guidebook (February 2002), because of its proven effectiveness and usefulness of the samples provided.

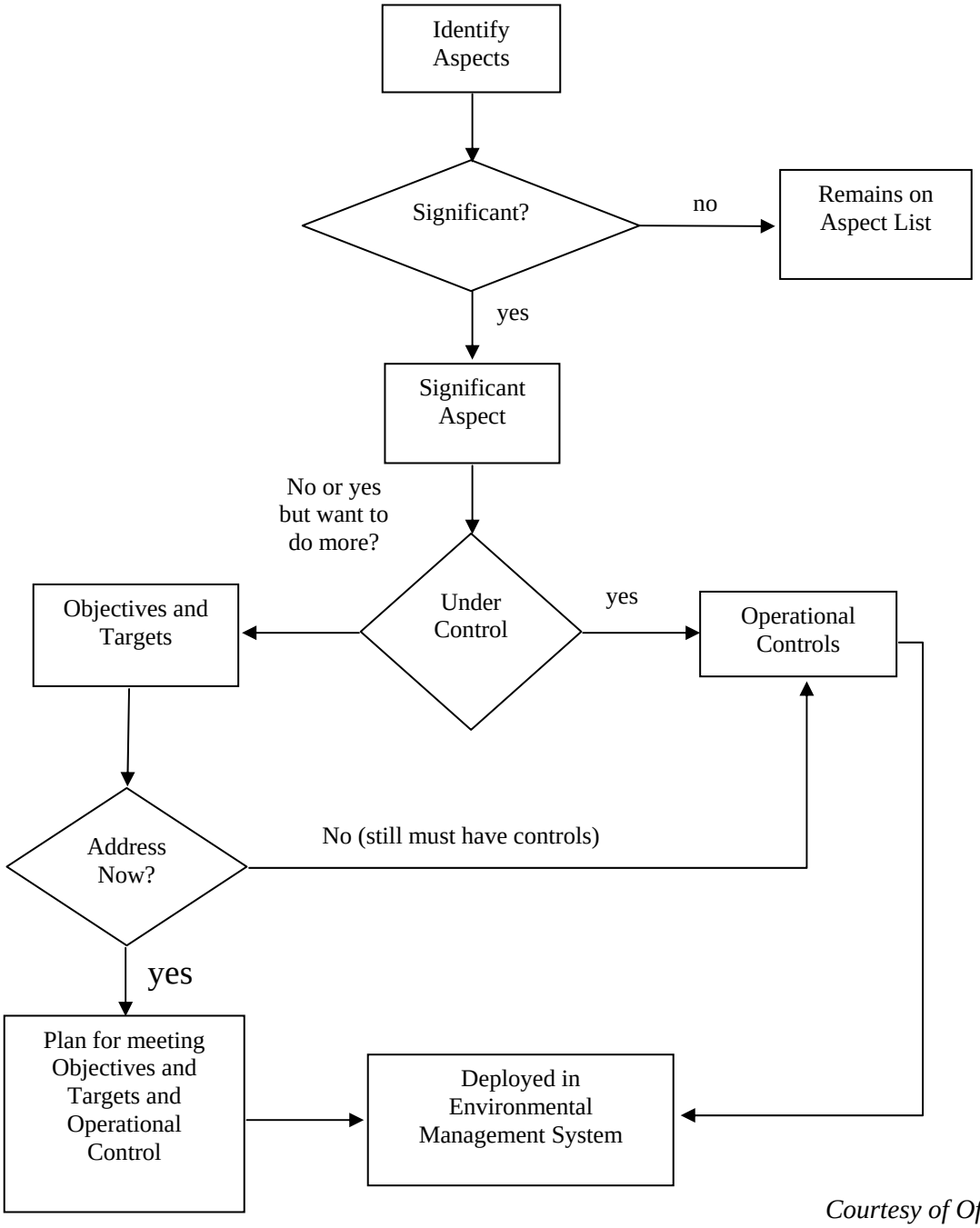
Software provided is enhanced with desktop publishing quality formatting so that medical centers can easily produce documents with professional appearance at a similar level of quality as the guidebooks. All material in this guidebook is provided on CD-ROM using Word 6.0 and Excel 5.0 for Windows. This will enable each VA medical center to easily customize these documents for their own use.

Additional copies of this Guidebook, as well as other guidebooks, may be obtained upon request from the Center for Engineering & Occupational Safety and Health (CEOSH) at 314-543-6700 and can be downloaded from their web site at:

vaww.ceosh.med.va.gov

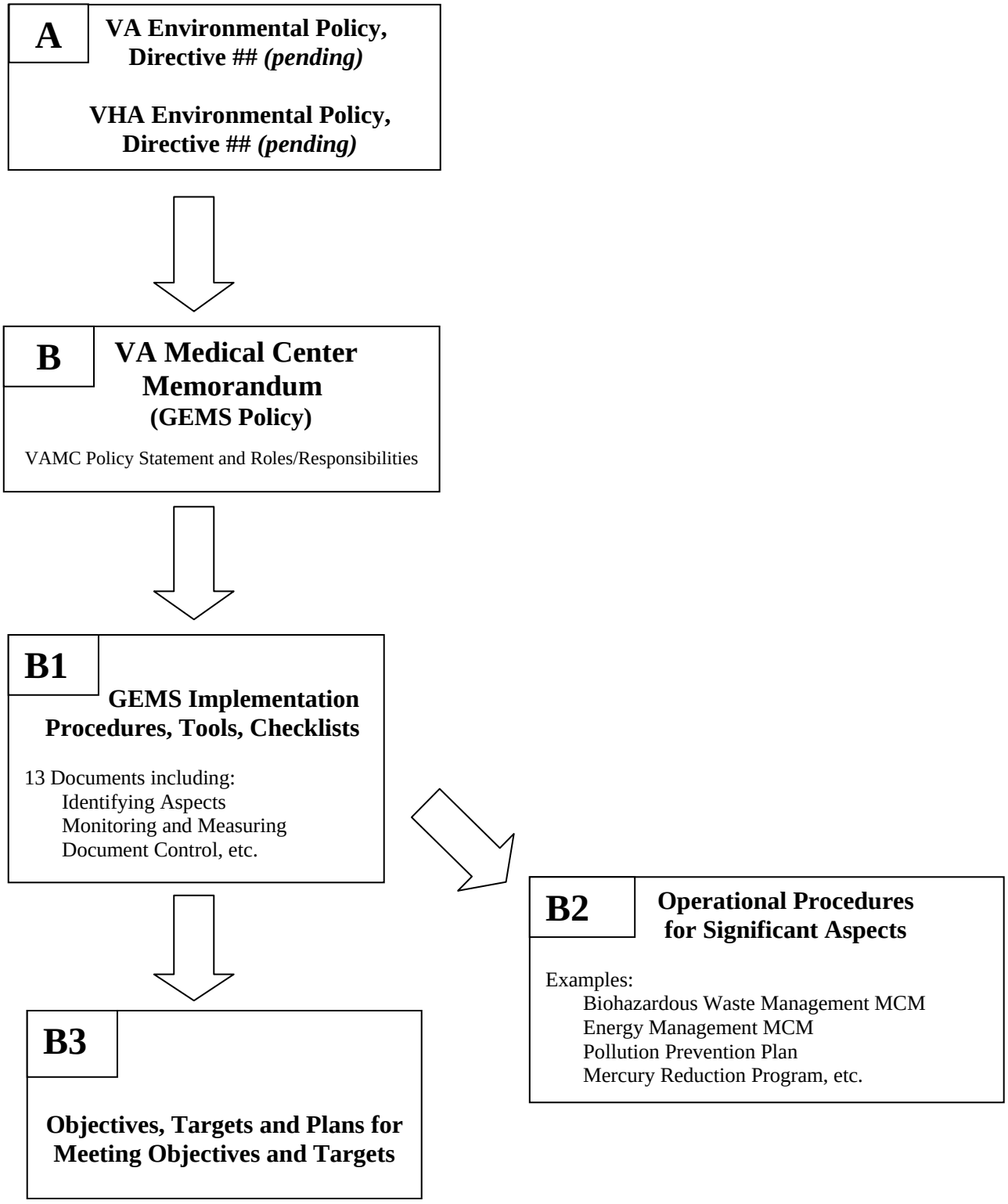
Questions regarding the use and application of this guidebook can be addressed to Mr. Arnold Bierenbaum, Director, Safety and Technical Services, VA Central Office, at 202-273-5844.

Figure 3-1: Process to Evaluate Environmental Aspects



Courtesy of Office of Federal Environmental Executive.

Figure 5-1: GEMS Documentation Scheme



Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Fire Department - Emergency Medical Service** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	4	**7**
Response to Hazardous Materials Spills	Waste Handling and Generation	Waste Disposal Considerations, Environmental Contamination	0	3	1	2	**6**
Maintenance of Fire Extinguishers	Exposure to Chemicals	Exposure, Disposal	1	1	2	2	**6**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**

Changing Linen	Handling of Contaminated Laundry	Potential Employee/Patient Exposure	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	1	2	4	2	**9**

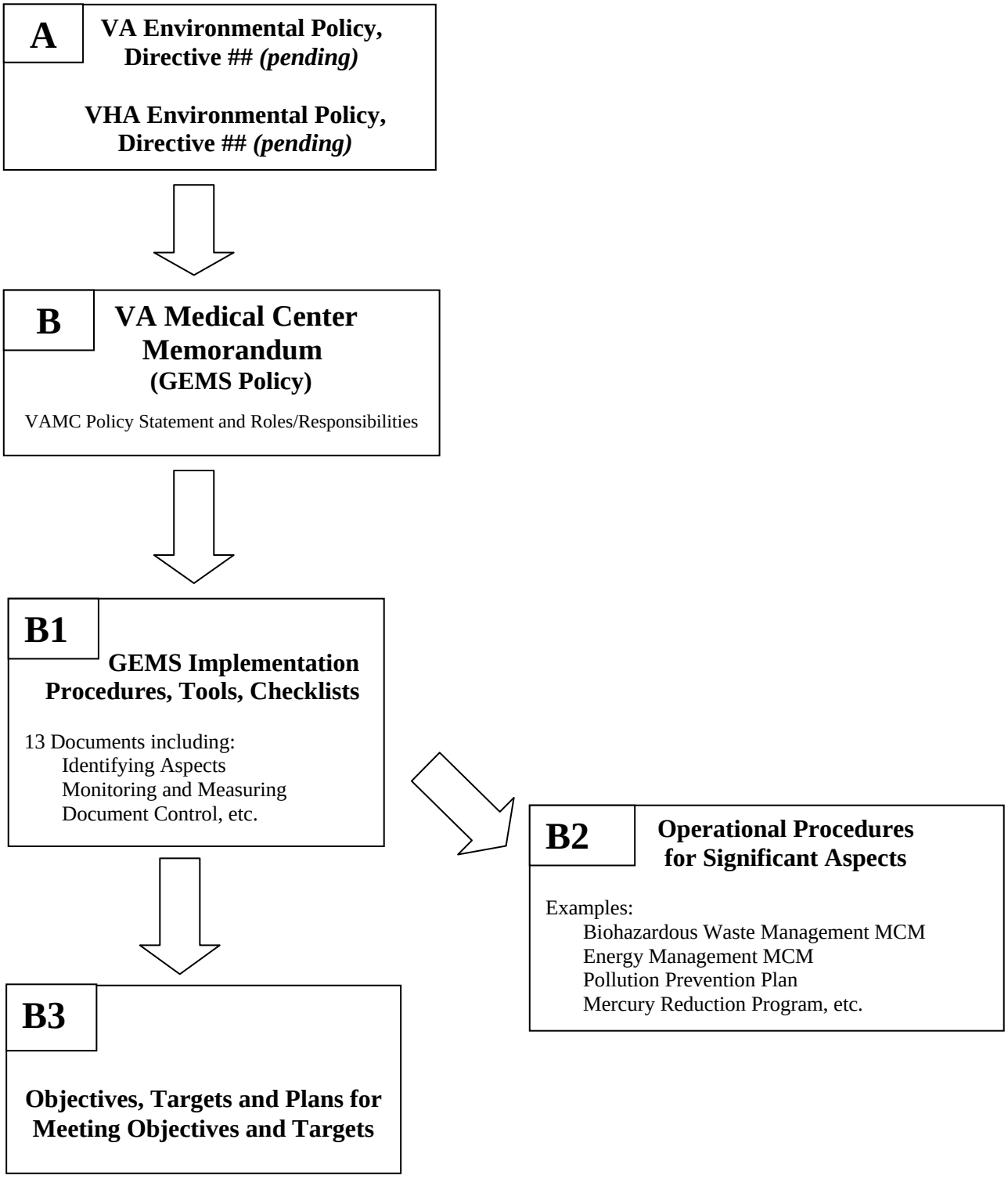
Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Food and Nutrition** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	3	3	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	3	3	**8**
Report Generation	Use of Paper	Use of Natural Resources	0	0	3	4	**7**
Cooking	Generation of Grease and Food Waste	Solid Waste Generation, Grease Disposal	1	1	4	3	**9**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	1	2	3	2	**8**
Handling of Cardboard, Plastics, Steel and Aluminum Cans, etc.	Generation of Solid Waste	Generation of Solid Waste or Potential for Recycling	1	1	4	3	**9**

GEMS Policies and Procedures at a Glance

These Policies and Procedures appear in Section 5.



GEMS Policies and Procedures at a Glance

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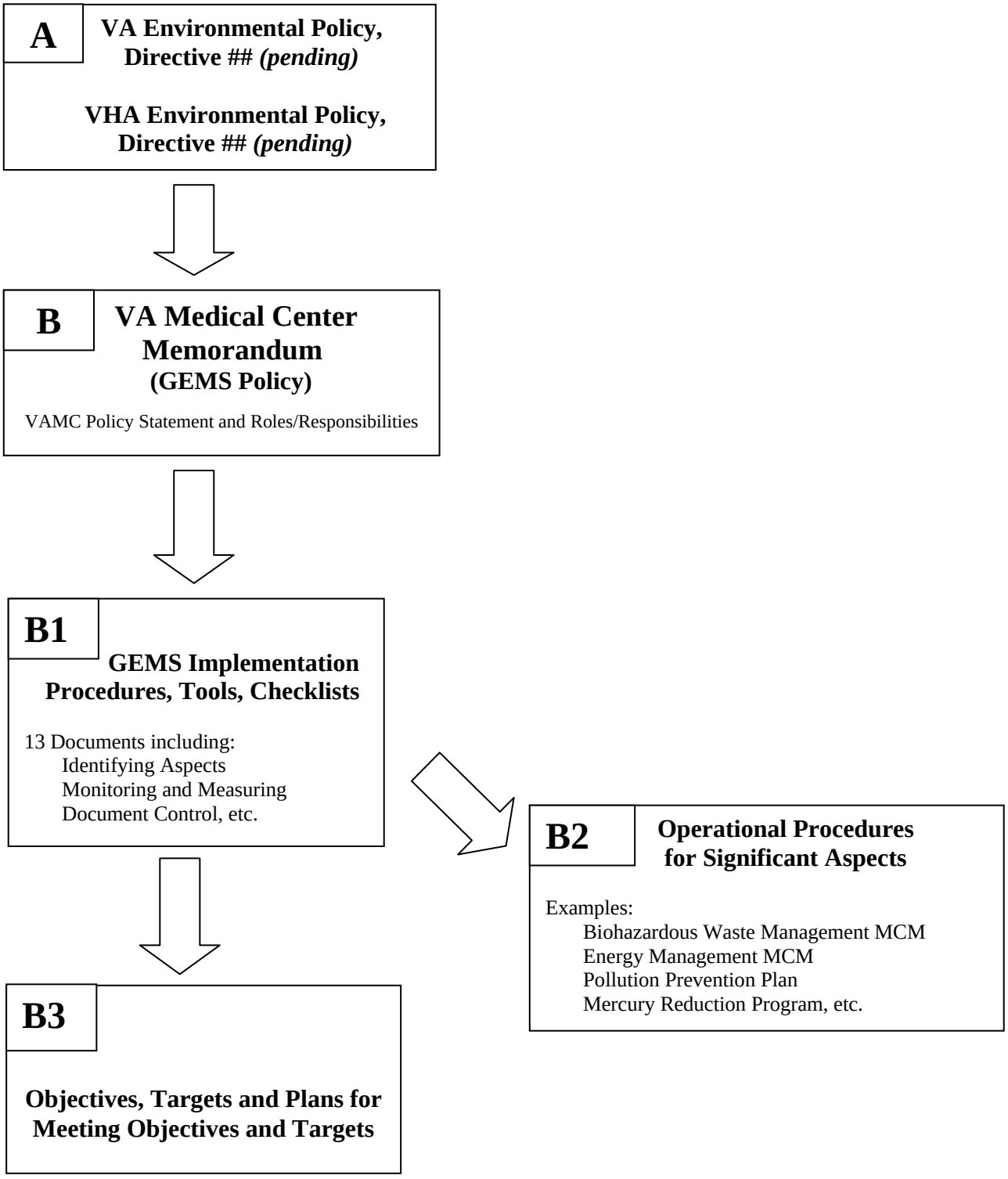

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **GI Procedures** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Operation of Lab Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Facility Maintenance	Use of Wexide to Clean Surfaces	Environmental Contamination	1	2	3	2	**8**
Equipment Maintenance	Enzyme Cleaner Used to Disinfect Scope Lenses	Environmental Contamination, Employee Health	1	2	3	3	**9**
Scope Procedure	Regulated Biomedical Medical Waste	Employee Health, Environmental Contamination	1	4	3	3	**11**
Scope Procedure	Sharps Waste Generation	Employee Health	0	4	2	2	**8**
Procedure Results	Formulin Used for Biopsy Specimens	Employee Health, Environmental Contamination	0	2	3	2	**7**

Glossary

- A -

Accreditation - Procedure by which an authoritative body formally recognizes that a body or person is competent to carry out specific tasks.

Activities - Key operational (industrial) operations conducted to meet mission. Examples include vehicle maintenance, heating-ventilation-air conditioning, and facilities operation and maintenance. Activities and operations generally include multiple "practices."

Aspect - A characteristic of a practice that can cause, in normal operation or upset mode, an impact to an environmental or other resource. Each practice may have several aspects. Typical aspects of practices operated include:

- Spill/release
- Air release
- Hazardous material use
- Hazardous waste generation
- Solid waste generation
- Medical waste generation
- Noise
- Electricity use
- Fuel use
- Physical presence
- Particulate matter generation (dust, smoke)
- Fire
- Excavation
- Soil disturbance

Asset (or Vulnerable Asset) - A resource on which the installation depends or over which it has some responsibility, and which may be impacted (adversely or beneficially) by the conduct of practices, such as environmental, historical, and cultural areas on and off the installation; personnel health and safety; mission effectiveness; real property; financial resources; and public relations status.

Audit - A planned, independent and documented assessment to determine whether agreed upon requirements are being met.

Audit Cycle - The period of time in which all the activities in a given site 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*.)

- C -

Causal Analysis - An informal analysis of the combination of factors that in sequence lead to a given outcome, and to determine the actions that must be taken to prevent recurrence. A causal analysis is usually performed by the person or persons directly involved with the incident.

Certification - The environmental management system of a company, location or plant is certified for conformance with ISO 14001 after it has demonstrated such conformance through the audit process. When used to indicate environmental management system certification, it means the same thing as registration.

Certification Body - A third party that assesses and certifies/registers the environmental management system of organizations with respect to published environmental management system standards and any supplementary documentation required under the system.

Checklists - Checklists are series of questions, in either paper or automated format, for use in evaluating compliance and/or environmental management system effectiveness. Checklists occur in several forms for use by varying levels of personnel

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; also, the state of meeting the requirements. In ISO terms, compliance to regulations. Compare with Conformance.

Compliance Evaluation - Identification, characterization, and documentation of compliance deficiencies related to either practices or environmental programs conducted by environmental management office personnel or other environmental professionals designated by the installation. Includes oversight of any inspections that have been performed by practice owners.

Conformance/Conformity - Action in accordance with customs, rules, prevailing opinion. In terms of GEMS, conformance to ISO 14001. Compare with compliance. An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulations; also the state of meeting the requirements.

Continual Environmental Improvement - Mechanisms in place to improve, cultural change, management commitment (Including fixing nonconformances **and** improving performance). Enshrined in the published Standards for environmental management system is the principle of continual improvement, which is intended to ensure that an organization does not simply adopt an environmental management systems for cosmetic purposes and thereby remain static, without commitment to reduce its impact on the environment. Continual improvement is the process of enhancing the environmental management system to achieve improvement in overall environmental performance in line with the organization's environmental policy.

Controls - Means used to ensure that the impacts on resources are effectively prevented or minimized. Three types of controls are defined as follows:

- ***Management Controls*** define and affect the administrative environmental behaviors associated with practices, and are applied by environmental staff as well as by practice

owners Management controls are described by the elements of the environmental management system implementation component (e.g., programs, responsibilities, training, communication, etc.) and are evaluated through the environmental management system corrective action component.

- ***Operational Controls*** define behaviors and actions applied in the course of operating or maintaining the practice (and associated physical controls) to eliminate or reduce their negative impacts on environmental or other resources. Common examples include labeling drums, maintaining equipment operating logs, opening/closing discharge valves on a containment berm, etc.
- ***Physical Controls*** are not behaviors or actions, but physical devices or equipment (e.g., containment structures, process control equipment, etc.) designed to physically minimize or prevent impacts to the environment or other resources. Physical controls are similar to practices in that they may be subject to operational or management controls to ensure their environmentally sound operation and maintenance. Some physical controls may be managed as part of their associated practices (e.g., oil water separators with washrack, berm/valve with aboveground storage tank).

Corrective Action - Steps taken to eliminate the **cause(s)** of actual and potential nonconformances, including verifying that the corrective action is effective.

- E -

Effectiveness - Meeting military mission while fully meeting executive, federal, state, local, environmental regulations and VA environmental policy.

Efficiency - Achieving effectiveness at the lowest possible cost (considering time, personnel resources, and money). A risk-based prioritization of practices and their impacts is the basis for efficiency enhancements under the environmental management system.

Emergency Response Plan - A detailed plan that describes the logistics and reporting requirements in the event of either fire, erosion or spills.

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

Environmental Aspect - Element of the operating unit's activities and services that can interact with the environment. An environmental aspect signifies the potential for an environmental impact. Environmental impacts and aspects include both positive and negative events such as recycling paper and leaking drums.

Environmental Cost Accounting - The modification of cost attribution systems and financial analysis practices specifically to directly track environmental costs that are traditionally hidden in overhead accounts to the responsible products, processes, facilities or activities.

Environmental Impact - Any change to the environment, or to the health or safety of people, whether adverse or beneficial, wholly or partially resulting from the operating unit's activities or services.

Environmental Management Representative - The clearly identified environmental management system team leader who has responsibility for the environmental management system from start to finish and has the designated authority of senior manager to get the job done.

Environmental Management System - 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. The environmental management system emphasizes pollution prevention, environmental compliance, and continual improvement.

Environmental Management System Audit - A systematic documented verification process of objectively obtaining and evaluating evidence to determine whether an organization's environmental management system conforms to the environmental management system audit criteria set by the organization, and for communication of the results of this process to management.

Environmental Objective - Site-specific goal that the medical center sets for itself to achieve. Objectives are selected from the significant aspects and are consistent with the environmental policy. Example: Waste reduction.

Environmental Plan for Achieving Targets and Objectives - Detailed performance requirement and how the VAMC intends to achieve it, including measurement and monitoring. It may include new operational controls such as procedures or the purchase of new equipment.

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 - Statement by the organization of 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 - The measurable elements of the environmental plan, including a measure of the objective (such as 10% reduction of waste) and a timeframe for achievement (such as by the end of the fiscal year).

Environmentally Benign Pressure Sensitive Adhesives - Adhesives for stamps, labels, and other paper products that can be easily treated and removed during the paper recycling process.

- F -

Facility - Any building, installation, structure, land, and other property owned or operated by, or constructed or manufactured and leased to, the Federal Government, where the Federal

Government is formally accountable for compliance under environmental regulation (e.g., permits, reports/ records and/or planning requirements) with requirements pertaining to discharge, emission, release, spill, or management of any waste, contaminant, hazardous chemical, or pollutant. This term includes a group of facilities at a single location managed as an integrated operation, as well as government owned contractor operated facilities.

- G -

Gap Analysis - An analysis of the existing environmental management system to identify the variances from the GEMS standard.

GEMS - The VA Green Environmental Management System Program for ensuring environmental compliance with ISO 14001 and Executive Order 13148, 13123 and 13101, Greening the Government Executive Orders.

Greening the Government Executive Orders - Executive Order 13148 and the series of orders on greening the government including Executive Order 13101 of September 14, 1998, Executive Order 13123 of June 3, 1999, Executive Order 13134 of August 12, 1999, and other future orders as appropriate.

- H -

Hazard - A source of potential harm or damage, or a situation with potential for harm or damage.

- I -

Impact - An effect of operating a practice on an environmental resource. Each practice may have several impacts. Typical impacts associated with practices operated on Navy installations include:

- Personnel exposure
- Indoor air quality degradation
- Outdoor air quality degradation
- Surface water degradation
- Groundwater degradation
- Soil quality degradation
- Species (endangered) population/habitat disturbance
- Water consumption
- Electricity consumption
- Other resource (e.g., landfill space) consumption
- Cost to mitigate risk

- Adverse regulatory exposure
- Negative public perception
- Real property damage
- Historic/cultural resource damage
- Natural resource disturbance
- Soil erosion
- Human health effects

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

Inspection - On-site examination of practices and related environmental control measures by or on behalf of practice owners to determine whether environmental compliance requirements are being satisfied. Includes documentation and reporting of deficiencies as arranged with the installation's environmental management office and any sampling, analysis, or other monitoring activities that the practice owners perform in order to maintain compliance.

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.

- L -

Life Cycle Assessment (LCA) - Systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a product or service system throughout its life cycle.

Life Cycle - Consecutive and inter-linked stages of a product system, from raw material acquisition or generation of natural resources until disposal.

Lead Auditor - Person qualified to manage and perform environmental management system audits.

- N -

Nonconformity - 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.

- O -

Objectives - Qualitative goals that a facility sets to reduce significant impacts leading to improved environmental performance (i.e. reduced wastewater discharges)

Observation - A practice, while not in strict violation of environmental management system requirements, may constitute a poor practice that can lead to a nonconformance.

Operating Unit Activity - A recurring activity or series of activities that is performed by the operating unit in the accomplishment of its mission.

Ozone-Depleting Substance - Any substance designated as a Class I or Class II substance by EPA in 40 Code of Federal Regulations (CFR) Part 82.

- P -

Pollution Prevention - Pollution prevention means "source reduction," as defined in the Pollution Prevention Act (PPA), and other practices that reduce or eliminate the creation of pollutants through: a) increased efficiency in the use of raw materials, energy, water, or other resources; or b) protection of natural resources by conservation.

Practice - Any activity conducted by an installation or its tenants in performing their missions that has an actual or potential impact on the installation's assets. The term includes the processes, equipment, and facilities used in conducting the activities. Practices may be further distinguished as business practices and management practices:

- ***Business Practice*** - Work-related activities including operation and maintenance of industrial processes, pollution control equipment, and mission-critical equipment and facilities; weapons systems training operations; etc.
- ***Management Practice*** - Activities conducted to manage, coordinate, or support business practices, such as provision of environmental training for personnel, documentation of environmental management system elements, development and implementation of plans and standard procedures, etc.

Practice Owner - The person, unit, or organization that operates, conducts, controls, or is otherwise responsible for a "practice".

- R -

Registrar - Third party, which audits and registers the environmental management system of an organization with respect to the ISO 14001 environmental management system standard.

Resources (Environmental) - Sensitive environmental receptors (e.g., air, water, natural resources, etc.) or cultural or historic assets on an installation or regional complex, in the surrounding community, within the ecosystem or beyond, that can be impacted by the operation of practices.

Resources (Other Resources) - Other assets that may be impacted by conduct of practices, such as personnel health and safety, real property, financial resources, public relations status, and, mission capability.

Root Cause Analysis - A formal process for identifying the basic or contributing causal factors that underlie variations in performance associated with Adverse Events or Close Calls. A root cause analysis is usually performed by an impartial, interdisciplinary team knowledgeable of the process(s) or systems.

- S -

Senior Management - Senior management is defined as the Office of the Director for VA Facilities.

Significant Environmental Aspect - An environmental aspect that has or can have a significant environmental impact.

Significant Environmental Impact - A significant potential change to the environment, wholly or partially resulting from the organization's activities or services.

Stakeholders - Those groups and organizations having an interest or stake in an 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).

- T -

Target - Measurable, quantitative goals with set schedules to meet an objective (i.e. reduce wastewater discharges by 10 percent within one year).

- V -

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

- W -

Waste Minimization - Simple strategic reduction of waste at source, through improved manufacturing methodologies, more careful work procedures, revised, usually improved product specifications; is capable of releasing massive cash returns, either for use in the business, returning to stakeholders or rewarding workers, thus upgrading their ability to become consumers of the goods being produced.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Grounds Maintenance** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Pest Control	Use of Chemicals	Environmental Contamination	1	3	1	2	**7**
Weed Control	Use of Chemicals	Environmental Contamination	1	3	1	2	**7**
Fertilizing	Use of Chemicals	Environmental Contamination	1	2	1	2	**6**
Mowing, Trimming, Pruning	Use of Power Equipment, Disposal of Yard Waste	Air Pollution, Potential Inappropriate Disposal of Waste Materials	1	1	4	2	**8**
Ice/Snow Removal	Use of Chemicals, Use of Power Equipment	Environmental Contamination, Air Pollution	1	1	1	2	**5**

Health Care Resources

Alternatives to Mercury Containing Products

Common Violations and Problems Found at Hospitals

Environmental Self-Assessment for Health Care Facilities - NY State Department of Environmental Protection

Examples of Potentially Incompatible Waste

Hospitals for a Healthy Environment Website

Healthcare Environmental Resource Center

Hospital Chemotherapy and Mercury Wastes

Major Federal Environmental Regulations Applicable to Hospitals

Reducing Mercury Use in Health Care: Promoting a Healthier Environment

Recycling of Elemental Mercury and Dental Amalgam by Dentists

How to Manual for Mercury Pollution Prevention

Instruments and Products Used in Hospitals That May Contain Mercury

Sustainable Hospitals Website

Green Guide to Healthcare

Add the Following (Note: they are not organized in any particular order)

Lamp Recycling Outreach Project (http://www.almr.org/almr_project_web.html)

The State of North Carolina's information sheet "Management of Aerosol Cans for Businesses and Industries" (http://www.p2pays.org/ref/01/00007.htm)

Minnesota Pollution Control Agency fact sheet on aerosols (www.pca.state.mn.us/waste/pubs/4_00.pdf)

The Steel Recycling Institute's Information on the Recycling of Aerosol Cans (http://www.recycle-steel.org/)

Managing Waste Chemotherapeutic Agents: What to Know and What to Find Out H2E Teleconference March 11, 2005 (http://h2e-online.org/teleconferences/molydesc.cfm?Date=2005-03-11&teleconfid=49)

Identifying and Managing Hazardous Waste H2E Teleconference September 12, 2003 (http://www.h2e-online.org/teleconferences/molydesc.cfm?Date=2003-09-12&teleconfid=9)

Best Management Practices fpr Pharmaceutical Wastes H2E Teleconference May 12, 2006 (http://www.h2e-online.org/teleconferences/molydesc.cfm?Date=2006-05-12&teleconfid=249)

California Medical Waste Management Act (http://www.dhs.ca.gov/ps/ddwem/environmental/Med_Waste/LawRegs/default.htm)

Recommendations for Chemotherapy Spill Response are detailed in the OSHA Technical Manual C.5, (http://www.osha.gov/dts/osta/otm/otm_vi/otm_vi_2.html#5)

Recommendations for Respirator Protection are detailed in the OSHA Technical Manual B.6.c, (http://www.osha.gov/dts/osta/otm/otm_vi/otm_vi_2.html#5)

New Hampshire Department of Environmental Services Guidance for Chemotherapy Spills on Carpet (http://www.des.nh.gov/nhppp/Healthcare_P2/default.asp?link=faq6)

Tri-TAC Memo to California POTW Pretreatment Coordinators and Managers, September 23, 2003, RE: Disposal of Pharmaceutical Wastes in Sewer (http://www.ciwmb.ca.gov/WPIE/HealthCare/TriTACMemAtt.pdf)

Locate Information on Hazardous Waste Transport, Storage, and Disposal Facilities Nationwide (http://www.epa.gov/enviro/html/rcris/rcris_query_java.html)

EPA Pharmaceutical Industry Sector Notebook (http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/pharmaceutical.html)

Cradle-to-Cradle Stewardship of Drugs for Minimizing Their Environmental Disposition While Promoting Human Health (http://www.epa.gov/nerlesd1/chemistry/ppcp/images/green1.pdf and http://epa.gov/nerlesd1/chemistry/ppcp/images/green2.pdf)

The State of Ohio's Guidance on Handling Expired Chemicals and Guidance on How to Properly Manage Photo & X-Ray Chemicals (http://www.epa.state.oh.us/dhwm/pdf/NotifierSpring06.pdf)

EPA's Hazardous Waste Management Guide for Photo Processing
(http://www.epa.gov/epaoswer/hazwaste/id/infocus/photofin.pdf)

EPA's Hazardous Waste Management Guide for Construction, Demolition, & Renovation
(http://www.epa.gov/epaoswer/hazwaste/id/infocus/rif-c&d.pdf)

EPA's Hazardous Waste Management Guide forVehicle Maintenance
(http://www.epa.gov/epaoswer/hazwaste/id/infocus/vehicle.pdf)

Environmentally Beneficial Landscaping (http://www.epa.gov/epaoswer/non-hw/green/pubs.htm)

Department of Energy Chemical Safety Handbook
(http://www.eh.doe.gov/techstds/standard/hdbk1139/doe-hdbk-1139-1-2006.pdf)

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Hematology/Oncology** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage to Include Cytotoxic Agents	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	0	3	4	4	**11**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination, Employee Health	0	1	4	4	**9**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Changing Linen	Handling of Contaminated Laundry	Potential Employee/Patient Exposure	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	1	2	4	2	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Histology Laboratory** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Lab Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal, Wastewater Discharge	Environmental Contamination	1	4	4	4	**13**
Chemical Storage	Potential for Spills	Environmental Contamination	0	4	4	4	**12**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Use of Fume Hoods	Energy Consumption, Air Emission	Use of Natural Resources, Environmental Contamination	0	3	4	3	**10**
Receive Specimens	Biomedical Waste, Chemical Waste	Environmental Contamination	0	3	4	4	**11**
Slide Preparation	Generation of Hazardous Waste, Transportation of Hazardous Waste, Disposal to Sewage System	Environmental Contamination, Water Usage	0	4	3	3	**10**

Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	0	2	4	2	**8**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Reclamation of Solvents	Filtration and Purification of Spent Solvents	Potential for Fire/Explosion, Employee Exposure	1	3	3	3	**10**
Storage and Handling of Hazardous Waste	Generation of Hazardous Waste Associated With Histology Procedures	Environmental Contamination	1	4	4	4	**13**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Housekeeping** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Electrical Equipment	Energy Consumption	Use of Natural Resources	1	1	3	2	**7**
Report Processing	Paper Usage, Potential Usage of Non-Recycled Paper	Use of Natural Resources	1	1	1	2	**5**
Cleaning, Stripping, Refinishing	Disposal and Use of Chemicals	Employee Health, Environmental Contamination	1	2	3	2	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	3	4	2	**10**
Waste Handling	Handling, Storage, Transport and Disposal of Hazardous Waste	Environmental Contamination, Potential for Spills	1	2	4	2	**9**
Pest Control	Use of Chemicals	Environmental Contamination, Employee Exposure	2	2	3	2	**9**
Clean Up of Hazardous Waste	Hazardous Waste Disposal	Employee Exposure, Environmental Contamination	1	2	1	2	**6**

How to Use This Guidebook

This Guidebook was developed as part of the Veterans Health Administration (VHA) Safety Guidebook Series, a multi-volume set of basic safety and health guidebooks to assist VHA facilities in establishing and developing their occupational safety and health and environmental compliance programs. This Guidebook contains criteria statements applicable to VA Medical Centers and used in the Environmental Safety Automated Facility Evaluation (E-SAFE), a computerized tool for assessing conformance with the requirements of the Executive Order 13148, Greening the Government through Leadership in Environmental Management.

Each Section of the guidebook provides a general discussion of the Section topic and information on requirements contained in the criteria statements (available in Section 7). At the end of each Section, enclosures are listed identifying the documents contained in the hardcopy of the Guidebook or on the accompanying CD-ROM. Resources, including reference publications and web sites, are also provided as additional background material.

The Green Environmental Management Systems (GEMS) Guidebook is divided into seven sections, as described below:

Section 1 - Introduction to GEMS

This section discusses key elements of an environmental management system and presents the principles on which it is based (Code of Environmental Management Principles [CEMP] and International Organization of Standards [ISO] 14001). Executive Order 13148 is included as an enclosure. The pending VA Directive, Department of Veterans Affairs Environmental Policy, and the pending VHA Directive, Veterans Health Administration Environmental Policy, will be provided for inclusion in this Guidebook upon publication.

Section 2 - Concepts of the GEMS Program

This section introduces the principles of environmental management systems as the foundation to developing a medical center program.

Section 3 - Nine Steps to Establish a Successful GEMS

A systematic approach to establishing a GEMS program is presented in a simple nine-step process. Most of the steps will be familiar to medical center management because of their involvement in committee work, audits and continuous improvement activities.

Section 4 - Operating Unit Environmental Aspect Templates

As a part of the GEMS program, facilities must identify significant environmental aspects and rank the level of impact each has on the environment. This section contains sample forms showing how to list each aspect and identify the environmental impact. A sample

facility form is included showing how the aspects were ranked at one VA Medical Center. Also included is a blank form for facility use.

Section 5 - Sample GEMS Documents

This section lists and describes categories of documents and provides samples to illustrate the concepts, as well as to serve as guidelines for evaluating existing documents or creating new ones (see diagram on page 5-3). The Section is divided as follows:

Tab A	VA Environmental Policy Directive - *(pending)* VHA Environmental Policy Directive - *(pending)*
Tab B	VA Medical Center Memorandum (GEMS Policy)
Tab B1	GEMS Implementation Procedures, Tools and Checklists (Sample Memoranda)
Tab B2	Operational Procedures for Significant Aspects (Plans/Guidance)
Tab B3	Objectives, Targets and Plans for Meeting Objectives and Targets

Section 6 - Technical Resources

The Green Environmental Management Systems Professional Advisory Group (PAG) assembled an extensive list of resources, including web sites, etc. (Note: Web site information was current at the time of publication.)

Section 7 - E-SAFE

This Section contains the Environmental Safety Automated Facility Evaluation (E-SAFE) criteria statements as a program evaluation guide.

Glossary

Several acronyms are used throughout the guidebook and, to avoid redundancy in defining these acronyms each time they are used, an acronym list is situated in the front of the guidebook. A Glossary of defined terms is located in the back of the guidebook.

Master Index

A Master Index is in the back of each guidebook as a cross-reference for all topics in the guidebook series collectively.

Topic Index

A Topic Index for ease of cross-reference in locating policies, samples and material is also provided.

The entire Guidebook, including enclosures, is located on the accompanying CD-ROM and at the CEOSH web site:

vaww.ceosh.med.va.gov

DISCARDED MATERIAL

#1 Faxback 11958

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/26b5303990594f348525670f006c202e!OpenDocument

#2 Faxback 11012

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b630cd51dc85edc58525670f006bce84!OpenDocument

#3 To: Cothern

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b70fab5e63ef29948525670f006bf791!OpenDocument

#4 Sep 6 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/2b6eba889b64e2f28525670f006bdc21!OpenDocument

#5 Mar 22 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/0909e3a0ef568a7c8525670f006bdae2!OpenDocument

#6 Nov 30 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/a4eaf8f089e62c8a8525670f006bd9ca!OpenDocument

#7 Sep 29 1986

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/5886fa010316533a852568e300467f7f!OpenDocument

#8

#9 May 12 1986

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#10 Dec 17 1984

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/c61f14db4a52411a8525670f006c1c28!OpenDocument

SOLID WASTE EXCLUSIONS

#1 Wastes- Solvent-Contaminated Industrial Wipes website

www.epa.gov/cgi-bin/epaprintonly.cgi

#2 google: applicability of household hazardous waste exemption in university dormitories

http://www.epa.gov/ne/assistance/univ/pdfs/householdHWinterpr.pdf

#3 U.S. Nuclear Regulatory Commission EA-99-171 website

http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/materials/ea99171.html

#4 May 16 1991

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/a3a7a7a8f297438b8525670f006be5d8!OpenDocument

#5 Faxback 12996

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#6 Aug 11 1989

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/f718b0337da018df8525670f006bdfa3!OpenDocument

#7 google: rcra superfund hotline monthly summary January 89

http://yosemite.epa.gov/OSW%5Crcra.nsf/Documents/B42E09BAE4B25783852565DA006F068F

#8 Aug 26 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/9e16ad6a39689e658525670f006bdbfa!OpenDocument

#9

#10 Dec 10 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/e5c9841752ede3dc8525670f006bd9f9!OpenDocument

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#13 Jun 26 1987

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#14 Jun 10 1987

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#15

#16 To: Stringham From: Williams

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/c86ebef3d318fc418525670f006bd609!OpenDocument

#17 google: rcra superfund hotline monthly summary july 86

http://yosemite.epa.gov/OSW%5Crcra.nsf/Documents/55184A9460D8F96C852565DA006F024E

#18 To: Devine From: Williams

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/463998327cad0f4d8525670f006bf817!OpenDocument

#19

#20

#21

HAZARDOUS WASTE EXCLUSIONS

#1 Wastes- Solvent-Contaminated Industrial Wipes website

www.epa.gov/cgi-bin/epaprintonly.cgi

#2 google: applicability of household hazardous waste exemption in university dormitories

http://www.epa.gov/ne/assistance/univ/pdfs/householdHWinterpr.pdf

#3 U.S. Nuclear Regulatory Commission EA-99-171 website

http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/materials/ea99171.html

#4 Faxback 11606

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/a3a7a7a8f297438b8525670f006be5d8!OpenDocument

#5 Faxback 12996

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/e57f94877b7ac7208525670f006bc496!OpenDocument

#6 Jun 6 1989

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#7

#8 Nov 1 1988

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#9

#10 May 2 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/36ca81a9643439bd8525670f006bdb4c!OpenDocument

#11 Jan 13 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/48e80bab720bed538525670f006bda62!OpenDocument

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#17 Apr 21 1986

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b1ea4010185041df8525670f006c22c7!OpenDocument

#18

#19 Mar 17 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/38f54fab80ce79338525670f006bf83e!OpenDocument

#20

#21 Jan 13 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/5bc5a247af7d059f8525670f006c18a4!OpenDocument

#22 google: rcra superfund hotline monthly summary February 86

http://yosemite.epa.gov/OSW%5Crcra.nsf/Documents/DA492DFC0A876946852565DA006F0A30

#23 Jan 28 1986

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b2213cd1350031738525670f006c22bd!OpenDocument

#24 Apr 19 1984

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/e6b7595d51d865bc8525670f006bf7ed!OpenDocument

LISTED HAZARDOUS WASTE

#1 Apr 25 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/290273f6e25343758525670f006bdb36!OpenDocument

#2 Jun 16 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/a84d28e4c573528e8525670f006c1bcc!OpenDocument

#3 Jan 27 1986

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/8bffd6a14a5e3ec98525670f006bd311!OpenDocument

#4 Dec 13 1985

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/fee5ea1afa5237498525670f006bd29e!OpenDocument

#5 To: Baltay From Claussen

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b1ecb949e5be8f238525670f006c1c3c!OpenDocument

#6 May 30 1984

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b5b350332ead3e8d8525670f006c1c12!OpenDocument

#7 Mar 5 1984

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b41736892f7162b38525670f006bff3f!OpenDocument

#8 Sep 28 1989

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/ea2d57481c3685038525670f006be045!OpenDocument

#9 google: rcra superfund hotline monthly summary august 89

http://yosemite.epa.gov/osw/rcra.nsf/Documents/651B9B4309E33BD2852565DA006F06E9

#10 Jun 28 1989

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/29f32f77405bd37d8525670f006bdee3!OpenDocument

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#12 Jul 30 1987

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#13 Apr 14 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/41dfda20cb6626818525670f006bf892!OpenDocument

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#1

#2 Dec 11 1986

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** This document doesn't have the attachments it has in the binder

#3 Apr 24 1986

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/c79a25b76fbe8ed68525670f006c14ea!OpenDocument

#4

#5

#6 Jan 7 1986

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#7 Nov 27 1985

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#8 Oct 23 1985

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/1c3a09ae2baeed8f8525670f006bd26f!OpenDocument

#9 Oct 23 1984

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/dc00bde7d2999b828525670f006c166e!OpenDocument

“MIXTURE” AND “DERIVED-FROM” RULES

#1 Revision to the Mixture and Derived-From Rule

#2 Apr 14 1989

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/9d15d1012b84eefc8525670f006bde29!OpenDocument

#3 May 23 1989

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/7a3af51a21dab94e8525670f006c1c31!OpenDocument

#4 Jun 22 1987

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#5 Apr 30 1987

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#6 Apr 8 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/d5749159bd17ca0a8525670f006c108c!OpenDocument

#7 SAME AS #6 but signed

#8 To: Didier

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/0a3224bd18a388ed8525670f006bd66a!OpenDocument

#9 To: Cooper From: Williams

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#10

#11 Nov 13 1986

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#12 Sep 25 1986

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#13 Sep 15 1986

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#14 google: rcra superfund hotline monthly summary September 86

http://yosemite.epa.gov/OSW/rcra.nsf/Documents/4A1EB8D230F3E3AB852565DA006F0279

#15 Jun 17 1987

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/76fc3d744f198ed08525670f006bd7df!OpenDocument

#16 Jan 22 1986

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#17

HAZARDOUS WASTE CHARACTERISTICS

#1

#2 To: Lataille

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#3

#4 To: Stone

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#5 Monthly Hotline Report website

http://yosemite.epa.gov/OSW/rcra.nsf/Documents/41E160BD479A0147852565DA006F0909

#6

#7 To: Mastalerz

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/bcfa96341abf27668525670f006bdfd2!OpenDocument

#8

#9

#10 Jul 28 1988

http://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/b34efe5db468b5908525670f006bdbb4!OpenDocument

#11 From: Stelmack

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#12 May 2 1988

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#13 Nov 30 1987

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#14 Nov 20 1987

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#15 Sep 14 1987

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#16

#17 Aug 18 1987

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#19 Apr 16 1987

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#20 Feb 25 86

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#3 Apr 20 1988

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#7 google: rcra superfund hotline monthly summary February 87

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#8 Sep 8 1985

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#10 Jun 2 1986

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#11 google: rcra superfund hotline summary may 86

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UNIVERSAL WASTE RULE

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#6 April 12 1999

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#6 Nov 18 1980

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#7 Nov 4 1994

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#8 google: Thomas Balf large quantity generator

http://www.epa.gov/ne/assistance/univ/pdfs/generationTransportationInterpr.pdf

#9 SAME AS #8

#10 Jun 5 1989

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#3 Jun 5 1989

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#13 Title: Regulation and Permitting of Laboratories

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#15

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Intensive Care Unit (ICU)** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Patient Safety, Disposal of Hazardous Drugs	Improper Disposal	2	1	4	4	**11**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Changing Linen	Handling of Contaminated Laundry	Potential Employee/Patient Exposure	0	2	4	3	**9**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Potential Employee/Patient Exposure	0	2	4	2	**8**

[47 FR 32367, July 26, 1982]

APPENDIX V TO PART 264—EXAMPLES OF POTENTIALLY INCOMPATIBLE WASTE

Many hazardous wastes, when mixed with other waste or materials at a hazardous waste facility, can produce effects which are harmful to human health and the environment, such as (1) heat or pressure, (2) fire or explosion, (3) violent reaction, (4) toxic dusts, mists, fumes, or gases, or (5) flammable fumes or gases.

In the lists below, the mixing of a Group A material with a Group B material may have the potential consequence as noted.

GROUP 1–A
Acetylene sludge
Alkaline caustic liquids
Alkaline cleaner
Alkaline corrosive liquids
Alkaline corrosive battery fluid
Caustic wastewater
Lime sludge and other corrosive alkalies
Lime wastewater
Lime and water
Spent caustic

GROUP 1–B
Acid sludge
Acid and water
Battery acid
Chemical cleaners
Electrolyte, acid
Etching acid liquid or solvent
Pickling liquor and other corrosive acids
Spent acid
Spent mixed acid
Spent sulfuric acid

Heat generation; violent reaction.

GROUP 2–A
Aluminum
Beryllium
Calcium
Lithium
Magnesium
Potassium
Sodium
Zinc powder
Other reactive metals and metal hydrides

GROUP 2–B
Any waste in Group 1–A or 1–B

Fire or explosion; generation of flammable hydrogen gas.

GROUP 3–A
Alcohols, Water

GROUP 3–B
Any concentrated waste in Groups 1–A or 1–B
Calcium
Lithium
Metal hydrides
Potassium
SO_2 Cl_2, $SOCl_2$, PCl_3, CH_3 $SiCl_3$
Other water-reactive waste

Fire, explosion, or heat generation; generation of flammable or toxic gases.

GROUP 4–A
Alcohols
Aldehydes
Halogenated hydrocarbons
Nitrated hydrocarbons
Unsaturated hydrocarbons
Other reactive organic compounds and solvents

GROUP 4–B
Concentrated Group 1–A or 1–B wastes
Group 2–A wastes

Fire, explosion, or violent reaction.

GROUP 5–A
Spent cyanide and sulfide solutions

GROUP 5–B
Group 1–B wastes

Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

GROUP 6–A
Chlorates, Chlorine, Chlorites
Chromic acid
Hypochlorites
Nitrates
Nitric acid, fuming
Perchlorates
Permanganates
Peroxides
Other strong oxidizers

GROUP 6–B
Acetic acid and other organic acids
Concentrated mineral acids
Group 2–A wastes
Group 4–A wastes
Other flammable and combustible wastes

Fire, explosion, or violent reaction.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Inpatient Clinics** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination, Employee Health	0	1	4	4	**9**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Changing Linen	Employee/Patient Exposure to Contaminated Linen	Disease Transmission	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	2	2	4	2	**10**

Instructions for the CD-ROM

The enclosed CD-ROM provides an electronic version of the Green Environmental Management Systems (GEMS) Guidebook, and contains the policies and procedures exactly as they appear in the guidebook, along with additional resources that may be helpful in establishing a facility environmental management plan.

This Guidebook was produced using Microsoft Word for Windows Version 6.0, Excel for Windows Version 5.0, Microsoft PowerPoint and Adobe Acrobat 5.0.

- Word for Windows documents have an extension of *.doc.
- Excel documents have an extension of *.xls.
- Adobe Acrobat documents have an extension of *.pdf.

(The * represents the name of the file.)

This Guidebook, as well as the entire Occupational Safety, Fire Protection and Industrial Hygiene Guidebook series, is available on the CEOSH web site:

vaww.ceosh.med.va.gov

Additional copies of this guidebook may be obtained by contacting the CEOSH Administrative Library at 314-543-6700.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Interior Design** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Unpacking Furniture	Excess Cardboard, Plastic and Styrofoam	Waste Production	1	2	3	2	**8**
Report Generation	Use of Paper	Use of Natural Resource	1	1	3	3	**8**
Chemical Usage	Maintenance and Fueling of Forklifts	Contamination	0	2	1	2	**5**
Chemical Usage	Maintenance and Fueling of Moving Trucks	Contamination	0	2	2	2	**6**
Product Storage	Pallet Usage and Disposal	Waste Production	1	1	2	3	**7**
Furniture Replacement	Disposal of Metal Furniture	Waste Production	1	1	2	3	**7**
Furniture Replacement	Disposal of Wooden Furniture	Waste Production	1	1	1	3	**6**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Information Resource Management (IRM)** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	4	2	**8**
Uninterruptible Power Supply Systems	Generation of Waste Batteries	Environmental Contamination	1	1	1	3	**6**
Disposal of Video Display Terminals	Generation of Universal Waste	Environmental Contamination	0	1	3	3	**7**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	3	**7**
Printing	Disposal of Printer Cartridges	Environmental Contamination	0	0	3	2	**5**
Maintenance of Equipment	Generation of Waste Batteries	Environmental Contamination	1	1	2	2	**6**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Laundry Plant** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	4	2	**8**
Production Services (Laundering)	Chemical Usage	Disposal, Environmental Contamination	1	3	4	2	**10**
Operation of Washers	Natural Resource (Water) Consumption	Use of Natural Resources	1	1	4	2	**8**
Report Generation	Use of Paper	Use of Natural Resources	1	1	2	2	**6**

DRAFT

An Investigation of Alternatives to Mercury Containing Products

DRAFT: October 25, 2002

Prepared for
The Maine Department
of Environmental Protection

by
Catherine Galligan
Gregory Morose
Jim Giordani

Table of Contents

Executive Summary

The Maine Department of Environmental Protection (DEP) will issue a report on January 1, 2003 that will include a comprehensive strategy to reduce the mercury content of products. To assist in gathering information for this report, the Maine DEP commissioned the Lowell Center for Sustainable Production of the University of Massachusetts Lowell to conduct a study of alternatives to mercury containing products.

Mercury's chemical and physical properties have been applied to meet the requirements of thousands of products and applications including: dental amalgams, scientific instruments, electrical components, batteries, lamps, and medical devices. These mercury containing products are widely used in residential, commercial, industrial, military, marine, and medical environments.

Mercury from these products can be released to the environment during various stages of the product life cycle including production, transportation, manufacturing, use, and disposal. Once released, the mercury can transform to organic forms, and can readily disperse in the environment through the air, soil, and water. Mercury is persistent in the environment, and also accumulates in concentration as it biomagnifies within the food chain. Mercury is highly toxic to humans; exposure can damage kidneys and the central nervous system. The fetus is particularly sensitive to mercury's toxic effects. Mercury also has adverse effects on wildlife including early death, weight loss, and reproductive issues.

In February 2002, the Interstate Mercury Education and Reduction Clearinghouse (IMERC) was formed under the auspices of the Northeast Waste Management Officials' Association (NEWMOA). IMERC is an umbrella organization designed to assist the eight northeast states in their implementation of mercury reduction laws and programs aimed at getting mercury out of consumer products, the waste stream, and the environment.

The LCSP study included a review of the mercury product notification data submitted by manufacturers to IMERC. The notification data included a description of mercury added components, number of components, amount of mercury per unit, amount of mercury in total domestic sales, and purpose of mercury in the product. At the time of the review, this included seventy-six manufacturers reporting 390 mercury containing products. The LCSP study also included discussions with mercury product experts, discussions with manufacturers of mercury products, review of responses to a May 1, 2002 State of Maine letter to mercury product manufacturers (see Appendix 4), review of published mercury product studies, and review of pertinent data available on the internet.

Since there are thousands of products that contain mercury, a prioritization effort was needed to focus on a core set of products that could then undergo further detailed study. The criteria for this prioritization included: amount of mercury released to the environment, amount of mercury contained within the product, total amount of mercury reported for all product sales, product coverage by current regulation, and the availability of mercury-free alternatives. Products and components were reviewed as part of the prioritization process. Components are typically sold to original equipment manufacturers to be incorporated within a product. For example, the mercury tilt switch is a component that is incorporated in automobiles, vending machines, cranes, wheelchairs, and numerous other products.

The priority products selected for further detailed study included sphygmomanometers, gastrointestinal tubes, manometers, non-fever thermometers, barometers, hygrometers, psychrometers, hydrometers, flow meters, pyrometers, and thermostats (industrial and manufacturing only). The priority components selected for further detailed study included float switches, tilt switches, pressure switches, temperature switches, displacement relays, wetted reed relays, mercury contact relays, and flame sensors.

After the priority products and components were selected, detailed research and analysis was

then conducted. The findings from this research include:

- Description of how the mercury product/component operates
- Typical applications of the mercury product/component
- Mercury-free alternatives available
- Cost range for the mercury product/component and mercury free alternatives
- Advantages and disadvantages of the mercury products/components and their mercury free alternatives
- Manufacturer information for mercury free alternatives
- Summary of findings for each mercury product/component

In general, cost competitive mercury-free alternatives were identified that meet the functionality requirements for most priority mercury products. Therefore, these products could be targets for mercury reduction efforts. The two products where alternative replacements cannot be recommended are the gastrointestinal tubes and the industrial thermostats.

For the following components there are cost competitive mercury free alternatives available for new products and applications: flame sensors, float switches, tilt switches, temperature switches, and pressure switches. However, mercury free relays can cover most, but not all, combinations of design parameters for new relay products or applications.

Certain retrofit situations for mercury switches and relays exist where the mercury-free alternative is not cost competitive. Efforts to reduce the sale of mercury switches and relays for retrofitting existing products or applications should take this into consideration.

There are many opportunities for substituting mercury free alternatives for mercury containing products and components. Many alternatives are not simple drop-in substitutions. Although a mercury free alternative may ultimately achieve the same desired functionality, such as providing an accurate measure of blood pressure or sensing a flame, there are often design considerations or different techniques or practices that must be first learned and communicated.

1.0 Introduction

The Maine Department of Environmental Protection (DEP) will issue a report on January 1, 2003 that is required under *An Act to Phase Out the Availability of Mercury Added Products*, PL 2001, c. 620. The report will include a summary of mercury product data and a comprehensive strategy to reduce the mercury content of the products.

To assist in gathering information for this report, the Maine DEP commissioned the Lowell Center for Sustainable Production (LCSP) to conduct a study of alternatives to mercury containing products. This report summarizes the findings of the LCSP investigation.

The LCSP develops, studies and promotes environmentally sound systems of production, healthy work environments, and economically viable work organizations. The LCSP is based at the University of Massachusetts Lowell, where it works closely with the Massachusetts Toxics Use Reduction Institute (TURI) and the Department of Work Environment.

Because of its persistent, bioaccumulative and toxic nature, the management of mercury presents a hazard to the environment that should be addressed and minimized wherever feasible. Reducing mercury exposure can be accomplished by source reduction, by minimizing uses that disperse the material into the environment, and by diverting and reclaiming any mercury containing products prior to disposal. While regulations on use and waste diversion strategies are necessary, an effective and economically efficient strategy would be, wherever possible, to substitute mercury containing products with products containing less hazardous materials.

The objective of this study is to accomplish the following:

- Investigate mercury product information in the public domain
- Identify priority products for investigating non-mercury alternatives
- Identify non-mercury alternatives to the products identified
- Conduct a qualitative evaluation of viable alternatives, including their cost and performance

The research methodology undertaken to complete this study included:

- Telephone communication and meetings with Northeast Waste Management Officials' Association (NEWMOA) and Maine DEP personnel were conducted to understand the information received on mercury-containing products.
- An internet search was conducted to obtain data and understand the flow of mercury associated with products. This data provided a reference against which the NEWMOA and DEP mercury product submissions could be compared.
- Telephone interviews of mercury reduction experts were held to gain insight on their perspectives and to reinforce or challenge conclusions drawn by the researchers.
- An internet search and phone interviews were conducted to identify the function of mercury in products and to identify alternatives for mercury containing components and products.
- Telephone interviews were conducted with manufacturers to develop information on the alternatives, their applications, and their advantages and disadvantages.
- Interviews were held with product users to understand what made a product preferable from the user's perspective.
- A search and review of literature in the public domain was conducted to provide data on mercury products and components and their performance.

2.0 Mercury Notification Data Review

The Maine statutes (see 38 MRSA § 1661-A) prohibit the sale of mercury-added products unless the manufacturer has provided written notification disclosing the amount and purpose of the mercury. New Hampshire, Rhode Island, and Connecticut have passed similar mercury notification laws.

In February 2002, the Interstate Mercury Education and Reduction Clearinghouse (IMERC) was formed. IMERC is an umbrella organization designed to assist the eight Northeast states in their implementation of mercury reduction laws and programs aimed at getting mercury out of consumer products, the waste stream, and the environment.

Launched under the auspices of the Northeast Waste Management Officials' Association (NEWMOA), IMERC has coordinated regional mercury reduction efforts and assisted state environmental agencies in developing and implementing specific legislation and programs for manufacturer notification, labeling, collection, and eventual phase-out of products that contain mercury.

IMERC has consolidated the mercury notification information obtained by the individual states prior to February 2002, and has served as the clearinghouse for all mercury notification information received since that time for Maine, New Hampshire, Rhode Island, and Connecticut. IMERC has used two notification forms to collect this data:

> *Mercury Added Product Notification Form*: The term "mercury added" is used to indicate that the mercury was intentionally added to the product. This form requests manufacturer contact information, as well as information pertaining to the mercury in the product such as description of mercury added components, number of components, amount of mercury, and purpose of mercury in the product.
>
> *Total Mercury in all Mercury Added Products Form*: This form requests manufacturer contact information, as well as total amount of mercury in all units sold in the United States for a particular product.

Approximately 500 letters in December 2001 and 700 letters in June 2002 were sent to manufacturers to request such information for mercury containing products. IMERC has reviewed the received mercury notification forms for adherence to the requested information. The majority of notification forms received require follow-up communications with the manufacturer to address missing or erroneous data. Once the review of the notification forms has been finished and has been considered complete, the information is entered into an IMERC electronic database.

For this study, the mercury notification information in the IMERC electronic database was reviewed in June and July of 2002. At the time of this review, there was notification information for seventy-six manufacturers reporting 390 mercury containing products. The total amount of mercury for all units sold in the United States was available for ninety-eight of these products. The following table illustrates the distribution of IMERC data for the various product types:

Table 2.1: IMERC Data

Product	Number of Products Reported
Barometer	1
Battery – button cell	3
Battery - general	13
Gas plasma display	7
Lamp	16
Lamp – cold cathode	1
Lamp – fluorescent	32
Lamp – HID	36
Lamp – LCD	115
Lamp – mercury xenon	18

Product	Number of Products Reported
Lamp – ultraviolet	1
Manometer	7
Relays	2
Sensor – flame	52
Sphygmomanometer	3
Switch – float	15
Switch – pressure	2
Switch - temperature	1
Switch - tilt	36
Thermometer	9
Thermostat	20
Total:	390

Source: NEWMOA Database, July 2002

Of the 1,200 notification request letters sent by IMERC, only seventy-six manufacturers have provided data sufficient to be deemed complete and entered into the IMERC database. The majority of notification requests have either not been returned, or have been returned with missing or erroneous data and remain in the review process. Substantially more mercury data is therefore anticipated to be available from IMERC in the near future.

The IMERC mercury product data were one of several important sources of data for this report. IMERC information was valuable for the prioritization process discussed in section 3, and for identifying the initial manufacturers to be contacted for further information. Other sources of mercury product information included discussions with mercury product manufacturers and experts, review of mercury product reports, and review of relevant data available on the internet.

3.0 Mercury Product Prioritization

A broad search was conducted to determine the scope of products that contain mercury. The intent of this search was not to develop a comprehensive list of products, but rather to develop background information on:

- How is mercury being used in products?
- Why is mercury being used in products?
- How much mercury is in various products?
- What are common mercury components for various products?
- Are mercury free alternatives available for these mercury containing products?

These questions were investigated through discussions with mercury product experts, discussions with manufacturers of mercury products, review of IMERC mercury notification results, review of responses to a May 1, 2002 State of Maine letter to mercury product manufacturers (see Appendix 4), review of published mercury product studies, and review of pertinent data available on the internet.

This review has shown that for most mercury-added products, the mercury is found in a number of common components. For example, tilt switches are a common component in hundreds of products and applications such as building security systems, automobile trunk lights, scanners, and robotics. This is also true for batteries, relays, and fluorescent lamps which are each used in hundreds of products and applications.

The universe of products that use mercury is extensive. Mercury's chemical and physical properties have been applied by design engineers to meet the needs of thousands of diverse products and applications. The following table illustrates examples of products that employ some of these properties.

Table 3.1: Properties of Mercury

Product Example	Property of Mercury
Mercury wetted reed relays	Electrical conductivity
Position sensing products such as level sensors	Liquid at ambient conditions
Barometer	Precise movement in response to air pressure differential
Thermometer	Precise expansion/contraction in response to temperature change
Dental amalgam	Easily alloys with many metals such as gold, silver, and tin.
Gastrointestinal tubes	Density
Fluorescent lights	When energized, mercury in vapor form emits ultraviolet energy
Tilt switches utilize both the electrical conductivity and liquid at ambient conditions properties	Combination of properties

Since there are thousands of products that contain mercury, the research effort focused on identifying a core set of priority products or common components that could then undergo further detailed study. For the purpose of this report, the terms product and component will be defined as followed:

Product: A product is predominately sold to the consumer in its final product state. For example, a thermometer is sold to the consumer for temperature measuring purposes.

Component: A component is predominately sold to an original equipment manufacturer to be incorporated within another product. For example, the tilt switch is sold to automobile manufacturers to be incorporated into an automobile.

The following five criteria were selected as the basis for this prioritization:

1. What is the contribution of the product category to the total mercury released to the environment for all product categories?

   Only limited data is available on mercury released on an individual product basis. More information is available on mercury released by product category. Thus, total mercury released by product category was chosen as a screening criterion. The more mercury released by a product category, the more likely that products in that category would be a priority for further research.

   The following report was selected as a basis to support this criterion: "Substance Flow Analysis of Mercury in Products" prepared by Barr Engineering Company for the Minnesota Pollution Control Agency on August 15, 2001. (Barr, 2001) This report was chosen because it provided a comprehensive review of total mercury releases from numerous product categories, it included mercury releases to each environmental media (land, air, and water), and it was recently published. In addition, the states of Maine and Minnesota are both leaders in fostering mercury reduction programs, and they have comparable demographic and commercial characteristics such as retail sales per capita. The releases by product category from this report have been categorized as high for releases greater than 20% of total releases, medium for releases from 5% to 20% of total releases, and low for releases less than 5% of total releases.

2. What is the amount of mercury within the product?

   The higher the amount of mercury contained within a product, the more likely it would be a priority for further research. Various sources were used to obtain this information including: discussions with manufacturers of mercury products, review of IMERC mercury notification results, review of published mercury product studies, and review of pertinent data available on the internet.

3. What is the total amount of mercury reported for all sales of a specific type of product in the U.S.?

   The higher the total amount of mercury reported for all U.S. product sales, the more likely it would be a priority for further research. The primary source for this data was a review of IMERC mercury notification results. However, this information was reported and available for only a few product types at the time of this study.

4. Is the product addressed by existing mercury regulations?

   Mercury-added products already regulated by either the State of Maine or federal Environmental Protection Agency (EPA) were eliminated as a priority for further study as part of this report. The Maine statutes on mercury-added products, 38 MRSA §1661 et seq., as well as pertinent EPA regulations were used as sources for this information.

5. Have readily available mercury free alternatives been identified?

If mercury-free alternatives are available in the marketplace, then the product is more likely to be a priority for further study. The data sources for this effort included discussions with mercury product experts, discussions with manufacturers of mercury products, review of published mercury product studies, and review of pertinent data available on the internet.

Certain mercury products did not fall into a product category. For many of these products very limited information was available about their current use, manufacture, and mercury content. This included counterweights, jewelry, and advanced mercury alloys used in products such as convertors, oscilloscopes, semiconductors, solar cells, satellites, and infrared sensors. These products were therefore not considered a priority for this project.

As a result of applying these five criteria to mercury containing products, the following products and components were selected for further study as part of this report:

Table 3.2: Priority Products and Components

Products

- Sphygmomanometers
- GI tubes
- Manometers
- Thermometers (non-fever)
- Barometers
- Hygrometers
- Psychrometers
- Hydrometers
- Flow meters
- Pyrometers
- Thermostats (industrial and manufacturing)

Components

- Float switches
- Tilt switches
- Pressure switches
- Temperature switches
- Displacement/plunger relays
- Wetted reed relays
- Mercury contact relays
- Flame sensors

The results of applying these five criteria are summarized on the following page in Table 3.3 Priority Product Selection. The shaded cells indicate the priority products selected.

Table 3.3: Priority Product Selection

Product	Product Category Releases[1]	Mercury Content (mg)[2]	Total Mercury Use (g)[3]	Addressed in Existing Legislation[4]	Alternatives Identified	Priority
Sphygmo-manometers	Other measurement & control devices (High)	> 1,000	1,815,000	No	Yes	Yes
Manometers		> 1,000	6,956	No	Yes	Yes
GI Tubes		> 1,000	None reported	No	Yes	Yes
Flame sensors		> 1,000	1,267,000	No	Yes	Yes
Thermometers (non-fever)		> 1,000	765,443	No	Yes	Yes
Barometers, hygrometer, psychrometer, hydrometer, flow meter, pyrometer		> 1,000	None reported	No	Yes	Yes
Permeter, barostat, oscillator, gyroscope, otoscope, sequential multiple analyser, phanotron, ignitron		None reported	None reported	No	No	No
Amalgam	Dental (High)	> 1,000	Tytin Alloy: 8,811,270	Yes	Yes	No
Fever Thermometers	Fever Thermometers (Medium)	100 – 1,000	None reported	Yes	Yes	No
Fluorescent Lamps	Fluorescent Lamps (Medium)	Predom-inately < 100	2,092	No	Yes	No
Float switch	Other Relays & Switches (Medium)	> 1,000	1,914,418	No	Yes	Yes
Tilt switch		100 to 1,000 > 1,000	11,329	No	Yes	Yes
Pressure Switch		> 1,000	None reported	No	Yes	Yes
Temperature Switch		> 1,000	None reported	No	Yes	Yes
Displacement/plunger relay		10 to 50, 50 to 100 100 to 1,000 > 1,000	16,174,300	No	Yes	Yes
Wetted reed relay		10 to 50, 50 to 100 100 to 1,000 > 1,000	2,400	No	Yes	Yes
Other mercury contact relays		0 to 5, 5 to 10 10 to 50 100 to 1,000 > 1,000	None reported	No	Yes	Yes
Manufacturing and industrial thermostats	Thermostats (Medium)	100 – 1,000 > 1,000	2,162	No	Yes	Yes
HID & Other Lamps	HID & Other Lamps (Low)	Predom-inately < 100	16,051	No	Yes	No

Product	Product Category Releases[1]	Mercury Content (mg)[2]	Total Mercury Use (g)[3]	Addressed in Existing Legislation[4]	Alternatives Identified	Priority
Batteries	Batteries (Low)	Predom-inately < 100	50,085	No	Yes	No
Bulk Liquid Mercury	Bulk Liquid Mercury (Low)	Not applicable	None reported	No	No	No
Automobile Switches	Automobile Switches (Low)	0 – 5 100 – 1,000 > 1,000	24,885	Yes	Yes	No
Chlor-alkali products	Chlor-alkali products (Low)	Misc-ellaneous ppm/ppb	None reported	No	Yes	No
Pharmaceuticals	Pharmaceuticals (Low)	Misc. ppm/ppb	None reported	No	No	No
Latex Paint	Latex Paint (Low)	Misc. ppm/ppb	None reported	Yes	Yes	No
Fungicides	Fungicides (Low)	Misc. ppm/ppb	None reported	No	Yes	No
Film	Film	0 - 5	164	No	No	No
Convertor, oscilloscope, semiconductors, solar cells, satellites, infrared sensors	Advanced Materials (HgCdTe, HgTe, HgSe)	Not readily available	None reported	No	No	No
Cleaners, detergents, catalysts, reagents, pigments, cosmetics, other industrial/laboratory use	Chemical Compounds	Misc-ellaneous ppm/ppb	None reported	No	No	No
Jewelry, counterweights	Miscellaneous	Not readily available	None reported	No	No	No

[1] Source: "Substance Flow Analysis of Mercury in Products" Prepared for the Minnesota Pollution Control Agency, August 15, 2001. Film, advanced materials, chemical compounds, and miscellaneous were not explicit product categories within this report. High: greater than 20% of total releases, Medium: 5% to 20% of total releases, Low: less than 5% of total releases.

[2] From IMERC database, IMERC paper files, and other miscellaneous sources.

[3] Total amount of mercury used in all products sold in calendar year 2001 as reported to IMERC. The value in the table indicates the highest amount reported from a single manufacturer for a particular product. Total amounts have not yet been reported by all manufacturers.

[4] The Maine statutes on mercury-added products, 38 MRSA §1661 et seq., as well as pertinent EPA regulations were used as sources for this information.

4.0 Findings

Once the prioritization process was completed and accepted by the Maine Department of Environmental Protection, the analysis of the priority products and components was initiated. After conducting research and analysis of the priority products and components, the findings were prepared. The findings of this study are here presented in the following format:

Description
This section includes an overview of how the product/component operates, background information on the product/component, and typical applications of the product/component.

Alternatives
This section identifies the mercury free product/component available to replace the function and performance characteristics of the mercury containing product/component.

Costs
The costs in this section are often provided in a range. The range includes only list prices available on the internet or by manufacturer inquiry as part of this study. The range does not necessarily include every model or every manufacturer listed for a particular technology. The prices for a specific model may vary considerably based upon options required, quantity ordered, customer discount, and other factors. The price ranges are only presented to provide a gross cost comparison between the various technologies.

Advantages/Disadvantages
This section compares the effectiveness of the mercury free alternative product/components to the mercury containing products or components. The function of the mercury containing product/components will be considered, and the merits and shortcomings of the alternatives will be presented.

Manufacturers
This section lists in table format the manufacturers of mercury containing products/components and manufacturers of the mercury free alternatives. This table also provides product/component name, manufacturer phone number, and manufacturer website information.

Format
There are two formats used in this report to present findings. The priority products are covered in sections 4.2 through 4.11 utilizing the following format:

Description

Alternatives

Costs

Advantages/Disadvantages

Manufacturers

Summary

The priority components are covered in sections 4.12 through 4.17 utilizing a slightly different format. Since the components are used in a wide variety of products and applications, the description, costs, advantages/disadvantages, and manufacturers information will be provided for each mercury free alternative identified. Also, the manufacturers of both mercury and non-mercury manufacturers are provided. The following is the format for priority components:

Description

Costs

Advantages/Disadvantages

Manufacturers

Summary

4.1 Costs of Using Mercury

Traditionally the cost of using mercury has been focused on the purchase price of the device. What is often not recognized are the other costs that go along with the use of mercury. These other costs include potential for costly spills, adverse health effects, liability, regulatory compliance costs and maintaining equipment and trained personnel to handle mercury releases.

Tellus Institute's report "Healthy Hospitals: Environmental Improvements Through Better Environmental Accounting" proposes that environmental costs and benefit information can be incorporated into accounting practices to attain a more meaningful cost. It considers environmental costs, which are defined as "impacts, both monetary and non-monetary, incurred by a firm or organization resulting from activities affecting environmental quality. These costs include conventional costs, potentially hidden costs, and less tangible costs." (Tellus Institute, 2000)

Table 4.1: Mercury Costs

Potentially Hidden Costs	Less Tangible Costs
• Up-front: site preparation, permitting, installation • Back-end: site closure, disposal of inventory, post-closure care • Regulatory: training, monitoring, recordkeeping	• Liability: Superfund, personal injury, property damage • Future regulatory compliance costs • Employee safety and health compensation • Organizational image

Source: Tellus Institute, 2001

The same report provides a case study of Kaiser Permanente's mercury minimization efforts. Kaiser Permanente is the largest not-for-profit Health Maintenance Organization (HMO) in the United States. Kaiser considered the costs in addition to the purchase price of mercury thermometers and sphygmomanometers that could be avoided by using alternative mercury free products. For sphygmomanometers, Kaiser found that "the aneroid alternative is significantly more expensive to purchase on a unit basis. When associated lifecycle costs are included … total costs per unit drop to about 1/3 the total costs of the mercury unit." The findings of the LCSP study indicate that in 2002, the purchase cost of mercury and aneroid sphygmomanometers are now comparable. This further reduces the lifecycle costs for the mercury free sphygmomanometers.

Kaiser's mercury minimization efforts reduced costs avoidance by reducing the incidence of spills, exposure incidents and liability, and staff toxics training, as detailed in the Table 4.2. Kaiser's estimates suggest that for every $1 spent on spill response, there is potentially another $1.75 for training, fines, and treatment of exposure. (Tellus Institute, 2000)

Although clean up costs are not well documented in the literature, an internet search revealed numerous reports that provide insight into the financial impact of a mercury spill. A summary of these reports is presented in Appendix 2.

While the LCSP study does not present the full life cycle costs for each of the mercury and non-mercury products, the costs delineated in this section should be considered when evaluating these products.

Table 4.2 : Kaiser Permanente Case Study

Avoided Cost Category and Amount	Sources of cost avoidance estimate
Spill preparation and response $20,000/year	The cost of a mercury spill kit is known, as is the cost of a spill response by Kaiser Permanente's contractor. These costs, combined with the average historical number of spill incidents from broken devices in a year, permit an avoided cost estimate to be made.
Compliance and liability $15,000/year	Use of mercury-containing devices necessitates staff spill/exposure training. Further, given staff training, careful use and appropriate spill procedures, the presence of mercury-containing devices gives rise to the possibility of fines from facility inspections or spill incidents. The probabilistic costs of mercury related penalties were estimated using representative statutory and regulatory penalties multiplied by the probability of a fine being assessed for any particular violation.
Treatment of exposure	A probabilistic cost. Even assuming very high standards of appropriate and careful use, some small number of mercury exposures from broken devices are likely when mercury-containing devices are employed throughout the Kaiser system. Cost is determined from the expected yearly cost of long-term treatment of a single pediatric exposure case ($100,000-plus), and the probability of an exposure incident within a given year.
Additional soft savings (environmental staff were aware of these costs, but they were not quantified)	"Soft cost" savings were not estimated, but could, include: environmental contamination from mercury release, subsequent health impact, and negative media attention.

Source: Tellus Institute, 2000

4.2 Sphygmomanometers

Description

Blood pressure is generated by the activity of the heart and blood vessel system and is widely accepted as a measure of cardiovascular performance. Therefore blood pressure levels and variations are considered to be a valid indicator of cardiovascular function and overall health.

Most blood pressure devices use an air filled cuff to temporarily block blood flow through the artery, then apply a particular technique to obtain blood pressure data while the cuff deflates. The two most common techniques for pressure measurement are the auscultatory method (listening for characteristic blood flow sounds) or oscillometric technique (using a pressure transducer).

The two main considerations for this discussion of blood pressure devices are 1) how the blood pressure is sensed (e.g. by ear or by using a pressure transducer) and 2) the gauge or indicator for the pressure value (mercury column, dial gauge, or microprocessor/digital display). A mercury column is the traditional method of indicating blood pressure.

Alternatives

In the field, two alternatives to mercury are widely marketed for clinical blood pressure measurement. They are aneroid (mechanical dial) sphygmomanometers and low-end professional electronic blood pressure monitors. There are other non-mercury blood pressure monitors available as well, including home monitors, ambulatory blood pressure monitors, and high-end vital signs monitors. These are not covered in this report because they are generally not considered direct replacements for mercury sphygmomanometers.

Auscultatory Sphygmomanometers (mercury and aneroid)

Mercury and aneroid sphygmomanometers rely on the auscultatory technique, in which a clinician determines systolic and diastolic blood pressures (SBP and DBP) by listening for Korotkoff sounds, or sounds that characterize different stages of blood flow during cuff deflation. At certain points in the sound pattern, the clinician reads the pressure using a column of mercury or the dial of an aneroid (mechanical) gauge. This technology is the most widely used because of its low cost and simplicity.

The familiar mercury sphygmomanometer uses a column of mercury (manometer) to provide the pressure readout. Mercury's liquid state and its precise expansion and contraction in response to pressure are very suitable for pressure indication. The manometer reads from 0 to 300 mmHg.

A common aneroid gauge consists of a dial that reads in units of 0 to 300 mmHg and a thin brass corrugated bellows inside. There is a shaft which connects two pins at right angles to each other; one of these rests on the bellows, the other is inside a concave sided triangle which meshes with a pinion connected to the dial pointer. A thin coiled spring (known as a hair spring) is also connected to the pinion and returns the pointer to zero when the pressure is released. The gauge is connected to a blood pressure cuff around the patient's arm. As the pressure in the cuff rises, the pin resting on the expanding bellows is lifted. This movement is transmitted by the other pin which moves the triangle and therefore the pinion and pointer. (Yeats, 1993)

Welch Allyn has recently introduced the Dura Shock aneroid sphygmomanometer that utilizes a new internal design. The new concept results in a sphygmomanometer that is lighter in weight, considerably lower in cost, and more shock resistant than a conventional aneroid sphygmomanometer. Further research is warranted to understand the internal design.

Oscillometric Blood Pressure Monitors

The oscillometric blood pressure monitor uses a pressure sensor and a microprocessor in place of the ear and simple gage. During cuff deflation, a pressure sensor transmits an electric signal representing the distention of the artery. Within the microprocessor, this signal is translated to systolic and diastolic blood pressure (SBP and

DBP) using empirically derived algorithms. Manufacturers spend considerable effort validating their algorithms for accuracy.

In addition to SBP and DBP, this type of device can display more comprehensive information about blood pressure patterns, which can be useful for diagnostics. Because of its higher cost and technical sophistication, this type of device is not as prevalent as the auscultatory devices. The cost of these devices has dropped significantly over the past few years and companies are now marketing these to hospitals based on the breadth of information they can provide.

Electronic equipment using the oscillometric technique is common in two types of equipment:

1. A mid-price blood pressure monitor, designed to compete with auscultatory devices. In the past few years several companies have begun promoting this type of device and as their cost has decreased, use is becoming more widespread.
2. Vital signs monitors – This class of device is often found in hospital settings where simultaneous monitoring of multiple vital signs (e.g. temperature, blood pressure, heart rate, blood oxygen level) is desirable or critical for patient outcomes. The instrument's electronic box includes multiple modules, each for measuring a different sign. They are available from several device manufacturers. These devices, though relatively common in hospitals, are not considered further because they are not considered a one-for-one replacement for a mercury sphygmomanometer.

Cost

Most manufacturers of auscultatory devices offer both mercury and aneroid sphygmomanometers. A sampling of prices for mercury and aneroid devices revealed essentially no difference between the two, as shown in the following table.

Table 4.3 Cost of Comparable Mercury and Aneroid Sphygmomanometers

Manufacturer & Style	Type	List or Suggested price[1]	Model
Welch Allyn Wall unit	Mercury	$132	5097-26
	Aneroid	$134	5091-38
Welch Allyn Mobile unit	Mercury	$258	5097-29
	Aneroid	$253	5091-41
Welch Allyn Pocket unit (portable)	Mercury	Not available[2]	
	DuraShock[3] aneroid	$59	DS45-11
	Aneroid	$162	5098-02
ADC Wall Unit	Mercury	$111	952B
	Aneroid	$105	750W
ADC Mobile Unit	Mercury	$204	972
	Aneroid	$204	750M
Trimline Mobile Unit	Mercury	$299	0103N
	Aneroid	$264	4103N
Trimline Wall Model	Mercury	$120	0303N
	Aneroid	$137	4303N
Trimline Desk Model	Mercury	$148	0403N
	Aneroid	$151	4203N
Trimline Hand-held	Mercury	Not available[2]	
	Aneroid	$98	2273N

[1] These prices were obtained by contacting each manufacturer and/or their websites and requesting pricing on comparable mercury and aneroid units.

[2] No comparable unit because Hg column must be rigidly mounted in perfectly vertical position; incompatible with hand-held or portable units.

[3] The DuraShock is a new product for Welch Allyn that is more resilient than a traditional aneroid. This design also results in a significantly lower cost.

Oscillometric blood pressure monitors are considerably higher in price, as shown in the following table.

Table 4.4 Cost of Oscillometric Blood Pressure Monitors

Manufacturer & Style	List or Suggested price	Model
Pulse Metric	$995	DynaPulse Pathway
VSM MedTech Ltd.	$645	BP Tru
Welch Allyn Medical Products	$805	Spot Vital Signs™

Advantages/Disadvantages

From the perspective of clinicians and hospital systems, the considerations for blood pressure devices include cost, accuracy, ease of use, maintenance and calibration, and environmental impact. One needs to consider the merits and shortcomings of the following two aspects of blood pressure devices:

1. The method of pressure sensing; i.e. auscultatory (listening to sounds) versus oscillometric (using pressure transducers).
2. The pressure readout mechanism; i.e. mercury manometer, aneroid gauge, or microprocessor with digital display.

Auscultatory devices (mercury and aneroid) rely on the human ear to detect and distinguish sounds and there is a possibility for measurement error due to individual skill and levels of auditory acuity and sensitivity. Auscultatory devices allow measurement of just SBP and DBP. In contrast, the oscillometric monitors are less dependent on operator technique and many offer a greater breadth of baseline data including mean arterial pulse (MAP) and pulse rate. Some monitors also allow addition of modules for other vital signs (temperature, pulse oximetry), pulse waveforms, and data analysis. One manufacturer's technical representative reported that he continues to learn about the utility of the oscillometric device as doctors phone in and describe how they are using the data for diagnostics. In short, the breadth of information may allow doctors to better understand and manage a patient's condition.

Mercury gauges are familiar, have a long history of use, are on the low end of the cost spectrum and they have the unique advantage of being perceived as the gold standard for blood pressure. The primary disadvantages of the mercury gauge are associated with the toxicity of mercury. Mishandling may result in a mercury spill and there is potential for a costly mercury cleanup. Even with proper handling and maintenance, mercury gauges eventually require either handling of elemental mercury during maintenance or disposal of mercury as a hazardous waste. For the clinician, mercury gauges require positioning one's head at the proper, but often awkward, angle to read the glass tube's mercury meniscus.

Aneroid gauges are familiar, have a long history of use, are on the low end of the cost spectrum, are easy to read, and the clinician can easily perform a rudimentary function check by observing the zero resting point and the smoothness of dial rotation. Mishandling may result in damage to the gauge. Aneroid gauges have been maligned in the press recently, and there is an unsubstantiated perception that accuracy of aneroid gauges is inferior to mercury columns. The calibration is different from, but comparable in complexity, to proper calibration of the mercury devices.

The electronic monitors on the oscillometric devices are easy to use and provide an easy-to-read digital display of the DBP and SBP. The devices go through a self-calibration routine on start up. In addition to SBP and DBP, many of the devices display comprehensive data that provides greater insight into patient health; as the devices are used more widely it is likely that the full utility of features will be better recognized and reported. Some disadvantages of the electronic blood pressure monitors are initial cost and the need for A/C power or a battery pack.

Manufacturers
The following are manufacturers of alternative sphygmomanometers:

Mercury and Aneroid Sphygmomanometers

Manufacturer Name	Product	Phone Number & Website
American Diagnostic Corporation	ADC Sphygmo-manometer	613-273-9600 www.adctoday.com
Trimline Medical Products	Trimline Sphygmo-manometer	800-526-3538 www.trimlinemed.com
Welch Allyn Medical Products	WelchAllyn Tycos sphygmo-manometer	315-685-4100 www.welchallyn.com

Oscillometric Blood Pressure Monitors

Manufacturer	Product	Phone Number & Website
Pulse Metric	DynaPulse Pathway	866-3962-78573 www.pulsemetric.com
VSM MedTech Ltd.	BpTRU™	913-307-9527 www.vsmmedtech.com
Welch Allyn Medical Products Vital Signs Products	Spot Vital Signs™	800-535-6663 www.welchallyn.com

Summary
Research on sphygmomanometers suggests that there are numerous good alternatives to mercury sphygmomanometers. Aneroid sphygmo-manometers are cost competitive, have a long history in the field, and have been found acceptable by many hospitals. Blood pressure monitors are more costly, but are becoming more popular as costs are dropping and medical practitioners are seeing advantages to their ease of use and the breadth of information provided.

The Mayo Medical Center in Rochester, Minnesota is an example of a facility that has successfully converted to non-mercury sphygmomanometers. Since 1993, Mayo Clinic replaced approximately 1,500 mercury sphygmomanometers with wall-mounted aneroid devices. At the same time a maintenance protocol was developed to ensure proper function and accuracy of these devices. In March 2001, Mayo published the results of an internal study in which they concluded that the aneroid sphygmomanometers provide accurate pressure measurements when properly maintained. (Canzanello et al, 2001)

4.3 Esophageal Dilators (Bougies) and Gastrointestinal Tubes

Esophageal Dilators (Bougies)

Description
An esophageal dilator, also called a bougie, is a long, weighted flexible tube that is passed down a patient's esophagus to dilate a narrowed area. In the past, mercury was commonly used in the bougie. Its density and liquid state made mercury ideal as a flexible weight that assisted passing the tube down the throat into the esophagus, conforming to the shape of the esophagus and exerting the pressure needed to enlarge the narrowed section. The mercury-filled devices have a thick latex outer coating that contains about two pounds of mercury. Esophageal dilators may be found in thoracic surgery, otolaryngology, and the medical procedure units.

Alternatives
The alternatives to mercury bougies use a tungsten gel to provide the flexible weight. Because tungsten is a solid at room temperature, the tungsten within the device is a powder suspended in a gel. This allows the dilator to flex and conform to the shape of the esophagus, have a "feel" similar to the density of mercury, and to apply the proper pressure to enlarge the narrow area of the esophagus.

Cost
Mercury bougies are no longer widely available. Of the three manufacturers that were identified, only one company still offers mercury bougies at

a cost of $3,395 for a full set. The cost of a set of replacement tungsten gel bougies listed in the range of $3,000 to $4,400. At the $4,400 end of the range, one manufacturer was offering 10% discounts and a free mercury bougie take-back option.

Advantages/Disadvantages

Bougies have an expiration date, due to the potential for degradation of the outer rubber casing. At the end of its useful life, a mercury bougie must be disposed of as a hazardous material. Mercury containing esophageal dilators have been known to rupture during handling or use causing potential environmental, patient, and employee hazards. The FDA Medical Device Report (MDR) system includes reports of bougies rupturing and leaving mercury inside the patient as well in the room. Examples of MDRs for ruptured bougies are included in Appendix 1.

The tungsten bougie is considered to be a safer, more environmentally benign alternative. The tungsten gel filled bougies perform like mercury filled bougies, so there are no changes in technique required. At the end of its useful life, a tungsten filled bougie can be disposed of in the trash. Tungsten bougies have either a silicone covering or a PVC covering. An advantage of the silicone surface is that it is non-slip when dry and slippery when wet, making handling easier. Some healthcare facilities are moving away from PVC because of a concern that when PVC is incinerated as waste, there is potential for the formation of dioxins during incineration.

Manufacturers

The following are manufacturers of non-mercury and mercury esophageal dilators:

Manufacturer	Product	Phone Number & Website
Medovations, Inc	Weightright™ Bougie	800-558-6408 www.medovations.com
Pilling	Bougie Tubes (Maloney style and Hurst style bougies are weighted with tungsten gel)	800-523-6507 www.pillingsurgical.com
Rusch	Bougie Tubes (Maloney style and Hurst style bougies are tungsten filled)	800-524-7722 www.myrusch.com

Summary

Phone interviews with manufacturers and medical practitioners suggest that tungsten filled bougies are widely available and well received as alternatives to mercury containing bougies. For example, a seasoned practitioner in a hospital in the northwest suburbs of Boston who was interviewed recalled her hospital's much earlier use of mercury bougies. Her recollection was that the hospital had been using tungsten filled bougies for years and the mercury free devices performed just fine.

Gastrointestinal Tubes

Description

Another family of tubes, including Miller Abbott, Blakemore, and Cantor tubes, are used for addressing intestinal obstructions. Historically these tubes used mercury as a flexible weight to guide the tube into place through gravity.

This family of products represents a data gap in this report. Research suggested that these devices are no longer widely used and no manufacturers of mercury-containing devices were identified. Unweighted tubes are available, and although the manufacturers do not supply mercury they believe some customers add their own mercury.

Alternatives

Two manufacturers were identified that described their products as viable alternatives for this type of application. Andersen offered unweighted and

tungsten weighted tubes that they described as alternatives for Miller-Abbott and Cantor tubes. Rusch's Product Manager suggested that practitioners can add sterile water to the Cantor tube, as a weight to help move the tube.

Cost
A cost comparison is not relevant since mercury products were not located. However, the cost of the non-mercury Miller Abbott and Cantor tubes were approximately $300 to $400.

Advantages/Disadvantages
One manufacturer reported that sterile water can be used as a weight for the cantor tube, in the place of mercury. The disadvantage is that the tube passes much more slowly, a disadvantage that translates to a longer medical procedure time.

Manufacturers
The following are manufacturers of gastro-intestinal tubes for which the buyer must provide the weighted liquid:

Manufacturer	Product	Phone Number & Website
Andersen	Miller Abbott & Cantor Tubes	800-523-1276
Rusch	Cantor Tubes	800-524-7722 www.myrusch.com

Summary
Research on gastrointestinal tubes suggests that this family of products is no longer widely used in hospitals. It is unclear whether mercury is still used in settings where gastrointestinal tubes have not become obsolete and if so, whether an alternative practice or product might be acceptable.

Dartmouth Hitchcock Medical Center reported that in 1995 they eliminated the use of mercury in Miller Abbott Tubes by replacing the mercury with water and a contrast media. When the change was implemented, there was a concern that because water is not as heavy as mercury, the procedure might take longer than with mercury. However the Safety and Environmental Programs office did not receive complaints from clinicians about the replacement. It was reported that the nursing and housekeeping staff were pleased with the elimination of mercury because they were responsible for mercury spills.

4.4 Manometers

Description
Manometers are used to measure air, gas, and water pressure. The mercury in manometers responds to air pressure in a precise way that can be calibrated on a scale. Manometers are used in laboratories, the dairy industry milking process, and for calibrating outboard motors and motorcycle carburetors. Manometers are also used by HVAC contractors for testing, balancing, and servicing equipment.

Alternatives
The three alternatives to a mercury manometer include the needle/bourdon gauge, the aneroid manometer, and the digital manometer. The needle/bourdon gauge operates under a vacuum with a needle indicator as a method to measure pressure. The aneroid manometer operates in a similar fashion to the needle/bourdon gauge. The digital manometer uses a digital computer programmed memory and gauges to measure the pressure.

Cost
Many digital manometers are manufactured for various purposes and most pressure-sensing units can be used interchangeably for different applications. Digital manometers can range in price from $100 to $700 depending on the application it is being used for. Needle/bourdon gauges range from $50 to $200 depending on the application and manufacturer.

Advantages/Disadvantages
Digital manometers, mercury manometers, and needle/bourdon gauges require calibration. This calibration ensures the accuracy of the instrument reading. A digital manometer can be more precise than the mercury manometer if properly calibrated.

Manufacturers
The following are manufacturers of non-mercury manometers.

Manufacturer Name	Product	Phone Number & Website
Mannix	Digital manometer	516-887-7979 www.mannix-inst.com
Testo	Digital manometer	973-252-1720/1-800-227-0729 www.testo.com
Extech Instruments	Digital manometer	781-890-7440 www.extech.com
Carbtune	Aneroid manometer	011 44 28 9023 9007 www.carbtune.com
Alnor	Digital manometer	1-800-424-7427 www.alnor.com
Dwyer Instruments	Digital manometer, Needle/ bourdon gauge	219-879-8000 www.dwyerinstruments.com

Summary
It appears that the alternatives to a mercury manometer are cost competitive, reliable, and widely manufactured and used throughout the United States. An example of a successful mercury manometer replacement project is the effort undertaken for dairy farms in Wisconsin with a $40,000 grant from the EPA. Dairy equipment service providers participated in this program by collecting the mercury manometers used on dairy farms and replacing them with non-mercury manometers. Under this program, more than 100 manometers have been removed from Wisconsin dairy farms. (Wisconsin Department of Natural Resources, 2002)

4.5 Thermometers (non-fever)

Basal Thermometers

Background
An individual's basal body metabolism is reflected in basal metabolic temperature, or the lowest normal body temperature of a person immediately on waking in the morning. Day-to-day variations in basal temperature are indicative of the body's cyclical changes. For example, basal temperature is a useful index for evaluating ovulation.

This baseline temperature is measured with a basal thermometer, which is more sensitive than a conventional fever thermometer. The smallest division on a basal thermometers is 0.1 degree, compared with 0.2 degree on a conventional fever thermometer.

Mercury basal thermometers are similar in function to mercury fever thermometers. A column of mercury within a glass tube expands with increasing temperature and registers a reading at the peak temperature.

Alternatives
Alternatives to basal thermometers are galinstan-in-glass (liquid in a glass tube) and compact digital thermometers.

Galinstan basal thermometers are sold under the brand name Geratherm. Like mercury thermometers, the Geratherm thermometer consists of silvery liquid in a glass tube. The liquid is a mixture of gallium, indium, and tin that expands with temperature to provide a reading. These are similar to Geratherm fever thermometers.

Battery-powered digital basal thermometers are the most common option for basal thermometers. These are similar in appearance and function to digital fever thermometers.

Cost
Basal thermometers are fairly inexpensive and technologies are readily available for under $15. The cost of devices is historically lowest for

mercury basal thermometers, mid-range for Geratherm, and highest for digital devices.

A data gap exists for the cost of mercury basal thermometers as our research was unable to easily identify a current manufacturer. Becton Dickenson, a large medical manufacturer, reported that they no longer offer mercury basal thermometers. Pharmacies in the researchers' local area have also eliminated mercury basal thermometers, although anecdotal information suggests that mercury basal thermometers are still available in other geographic locations.

According to one manufacturer, their list price for the Geratherm basal thermometer is $7.69-$7.99. Another manufacturer reported that the average list price for its digital basal thermometer is $12.

Advantages/Disadvantages

The primary selling points for mercury are cost and familiarity. The disadvantages of mercury basal thermometers are: lengthy dwell time to peak temperature (3-5 minutes), shake down is required between readings, difficulty reading the column of mercury, fragile glass structure, and mercury basal thermometers may not be widely available.

The Geratherm liquid-in-glass thermometer is comparable in function to mercury. That is, it consists of a glass tube containing a silvery liquid that rises in a column with increasing temperature. The Geratherm is lower in cost than digital thermometers. Galinstan thermometers have several disadvantages: the toxicity of the gallium-indium-tin mixture is not well researched or understood, the silvery liquid may be mistaken for mercury, the fragile glass structure can break easily, and the Geratherm is slightly larger than a mercury basal thermometer.

Digital basal thermometers appear to be the most commonly available alternative to mercury devices. There are a number of reasons that the digitals are easily accepted: the time for taking a temperature is approximately 1 minute (vs. ~4 minutes for mercury), the thermometer provides beeps to signal when peak temperature is reached, and there is a memory chip that recalls the last reading. The main drawback of a digital thermometer is that it uses a battery, which requires proper recycling/disposal at the end of its useful life. The digital basal thermometers are also more expensive than either mercury devices or Geratherm thermometers.

Manufacturers

The following are manufacturers of basal thermometers:

Manufacturer	Product	Phone Number & Website
Becton Dickinson	Digital basal thermometer	201-847-6800 http://www.bd.com
Mabis Healthcare	Digital basal thermometer	800-728-6811 http://www.mabis.net
Omron Healthcare, Inc.	Digital basal thermometer	800-231-3434 http://www.omronhealthcare.com
R.G. Medical Diagnostics (U.S. Distributor)	Geratherm basal thermometer (Galinstan liquid-in-glass thermometer)	888-596-9498 http://www.1thermometer.com

Summary

Based on discussions with manufacturers and visits to local pharmacies, it appears that suitable alternatives are readily available for mercury basal thermometers.

Other Thermometers (non-fever)

Description

Non-fever thermometers are used for various industrial, laboratory, and commercial applications including food preparation, freezers, laboratory refrigerators, and testing. The protocol for certain lab requirements and food preparation codes require that the thermometers be of a high quality.

Alternatives

The spirit-filled glass thermometer is the most common replacement to the mercury thermometer. The liquids used in such glass thermometers are common organic liquids such as alcohol, kerosene, and citrus extract based solvents that are dyed blue, red or green. Digital,

bi-metal or infrared thermometers are also alternatives to mercury thermometers and are used in many of the same applications.

Cost

The costs of a thermometer can vary based upon the requirements of a particular application. The following table illustrates these cost differences.

Table 4.5: Thermometer Costs

Application	Thermometer Type	Cost
Food Preparation	Mercury	$10 - $40
	Bi-metal	$13 - $138
	Digital	$14 - $20
	Spirit filled	$2 - $28
Industrial	Infrared	$92 - 270
Laboratory	Mercury	$15 - $60
	Digital	$20 - $100
	Spirit filled	$20 – $60
	Infrared	$92 - $270
Freezer/ Refrigeration	Bi-metal	$6 - $15
	Spirit filled	$2 - $28

Advantages/Disadvantages

The benefits of using a digital or infrared thermometer are that they are very accurate and easy to read. Infrared thermometers are much more costly than digital thermometers but in some applications the use of an infrared thermometer is necessary. All thermometers, whether they are mercury, digital, bi-metal or organic liquid, do need to be re-calibrated at least annually. Re-calibration is required due to the gradual relaxation of residual mechanical strains in the glass that can affect the volume of the bulb.

A disadvantage of all liquid thermometers is the possibility of column separation. When a separated column occurs, the thermometer cannot be used until the column is rejoined and recalibrated.

Evidence provided by manufacturers indicates that alternatives to mercury thermometers are as effective and reliable as the mercury thermometer with regular calibration. The most common barrier to change is the widespread use of mercury thermometers as the "standard" for all temperature sensing devices.

Manufacturers

The following are manufacturers of alternatives to mercury thermometers.

Manufacturer Name	Product	Phone Number & Website
ICL Calibration Laboratories	Alcohol/spirit filled, Digital thermometer	www.icllabs.com
Ertco (ever ready thermometers)	Alcohol/spirit filled, Digital thermometer	1-800-453-7826 www.ertco.com
Comark	Alcohol/spirit filled, Digital Thermometer	1-800-555-6658 / 503-643-5204 www.comarkltd.com
Miller Weber	Alcohol/spirit filled, Digital, Bi-metal thermometer	718-821-7110 www.millerweber.com
Taylor	Alcohol/spirit filled, Digital, Bi-metal thermometer	630-954-1250 www.taylorusa.com
Weiss Instruments	Alcohol/spirit filled, Digital, Bi-metal thermometer	631-207-1200 www.weissinstruments.com
Cooper Instrument Corporation	Alcohol/spirit filled, Digital thermometer	860-349-3473 www.cooperinstrument.com
Becton Dickenson	Alcohol/spirit filled, Digital thermometer	201-847-6800 www.bd.com
Mannix	Infrared, Digital thermometer	516-887-7979 www.mannix-inst.com

Summary

It is apparent that there are many alternatives to mercury thermometers that are cost effective and acceptable. However, a Food and Drug Administration procedure for food processing was identified that requires at least one mercury-in-glass thermometer for each retort. This

requirement is outlined in the Code of Federal Regulations under: 21 CFR Ch. 1 Part 113 – Thermally Processed Low-acid Foods Packaged in Hermetically Sealed Containers.

An example of a successful mercury thermometer replacement program is the "Mercury Thermometer Swap" program undertaken by the University of Vermont. More than 1,400 mercury thermometers were replaced with non-mercury alternatives under this program. The majority of these replacements occurred in laboratories within the chemistry department. (Winkler, 1999)

4.6 Barometers

Description

Barometers are used to measure the atmospheric pressure. The barometer is a long cylindrical tube filled with mercury. The mercury is displaced by the atmospheric pressure. When the mercury level rises in a barometer it indicates increasing air pressure; when the mercury level is decreasing it indicates decreasing air pressure.

Alternatives

The aneroid barometer is more compact and consists of an evacuated metal diaphragm linked mechanically to an indicating needle. As atmospheric pressure increases or decreases the diaphragm compresses or expands, causing the indicating needle to show the change in pressure. The digital barometer contains a sensor with electrical properties (resistance or capacitance) that change as the atmospheric pressure changes. These sensors are considered to be just as accurate as a traditional or an aneroid barometer. Additional electronic circuitry converts the sensor output into a digital display. There is also a device called a water barometer that is similar to a traditional mercury barometer. Changes in air pressure cause the water to rise and fall in the spout. Low water level indicates high pressure and fair weather. The water level rises as the air pressure falls.

Cost

The digital barometer can cost between $50 - $300 depending on the manufacturer and the other applications the digital barometer can perform. Because mercury barometers and aneroid barometers are often considered collector's items, their prices are much higher, ranging from $100 to over $1000.

Advantages/Disadvantages

Aneroid barometers have been used for approximately 200 years and are considered just as accurate as the traditional mercury barometer. The digital barometer is programmable and is considered to be as accurate as the mercury barometer.

Manufacturers

The following are manufacturers of alternatives to mercury barometers.

Manufacturer Name	Product	Phone Number/ Website
Howard Miller	Aneroid barometer	www.howardmiller.com
Weems & Plath	Aneroid barometer	410-263-6700 www.weems-plath.com
Bacharach	Digital barometer	724-334-5000/1-800-736-4666 www.bacharach.com
Kestrel	Digital barometer	610-447-1555 www.nkhome.com

Summary

The aneroid and digital barometers are cost effective, in use, and acceptable alternatives to the mercury barometer.

4.7 Psychrometers/Hygrometers

Description

A hygrometer is an instrument used to measure the moisture content of air or any gas. The most common type of hygrometer is the "dry and wet-bulb psychrometer." The psychrometer is best described as two mercury thermometers, one with a wetted base, and one with a dry base. The water from the wet base evaporates and absorbs

heat causing the thermometer reading to drop. Using a calculation table, the reading from the dry thermometer and the reading drop from the wet thermometer are used to determine the relative humidity.

The sling psychrometer is also used to determine relative humidity and is reliably measured by both digital and alcohol type psychrometers. The sling psychrometer is basically a thermometer encased in a swiveling mechanism that is swung around rapidly to record an accurate reading for relative humidity. Psychrometers function the same as a hygrometers, however the names are different due to the applications for which they are used. For example, the hygrometer is used to monitor the moisture in the storage area for cigar tobacco used by manufacturers and cigar aficionados. Atmospheric scientists and weather enthusiasts use the psychrometer to monitor outdoor humidity and moisture content.

Alternatives
Spirit-filled thermometers can be used in psychrometers instead of the mercury thermometers and provide equally accurate results. Another alternative is the digital hygrometer that uses electronic sensors and a digital program to measure the humidity of the air. Both the digital hygrometer and spirit filled hygrometer are relatively inexpensive, are readily available, and currently in use.

Cost
The spirit-filled sling psychrometer and the spirit-filled hygrometer are both similar in pricing when compared to mercury versions of the same product. The digital psychrometer was found to be more expensive than the spirit filled version, but the digital hygrometer was found to be less expensive than the spirit filled version, ranging from $15 to $60.

Advantages/Disadvantages
The digital hygrometer and digital psychrometer provide much more accurate results when properly calibrated because the possibility of human error is eliminated.

Manufacturers
The following are manufacturers of alternatives to mercury psychrometers and hydrometers:

Manufacturer Name	Product	Phone Number & Website
Bacharach	Spirit filled psychrometers	1-800-736-4666 www.bacharach.com
Testo	Digital psychrometers	973-252-1720/1-800-227-0729 www.testo.com
Miller Weber	Digital hygrometer	718-821-7110 www.millerweber.com
Mannix	Spirit filled psychrometers	516-887-7979 www.mannix-inst.com
Tramex	Digital hygrometer	+353-1-282 3688 www.tramexltd.com

Summary
The spirit filled psychrometers and digital hydrometers appear to be acceptable, cost effective alternatives to mercury filled devices.

4.8 Hydrometers

Description
A hydrometer is a device that measures the density or specific gravity of a liquid. Hydrometers are calibrated based upon the specific gravity of water at 60°C being 1.000. Liquids denser than water will have a higher specific gravity, while liquids less dense will have a lower specific gravity. The hydrometer is used for many applications. For example it is used in the petroleum and dairy industries, as well as in amateur wine and beer making.

Alternatives
An alternative to a mercury hydrometer is the spirit filled hydrometer. The spirit filled hydrometer comes customized to suit individual applications. The manufacturer should be consulted to use the most appropriate hydrometer.

Cost
The cost of a mercury hydrometer ranges from $12 to $30, or about $2 less on average than a spirit filled hydrometer.

Advantages/Disadvantages
The accuracy of a spirit filled hydrometer is considered to be comparable to a mercury hydrometer.

Manufacturers
The following are manufacturers of alternatives to mercury hydrometers:

Manufacturer Name	Product	Phone Number Website
Miller Weber	Alcohol/spirit filled hydrometer	718-821-7110 www.millerweber.com
Ertco (ever ready thermometers)	Alcohol/spirit filled hydrometer	1-800-453-7826 www.ertco.com
ICL Calibration Laboratories	Alcohol/spirit filled hydrometer	www.icllabs.com

Summary
The spirit filled hydrometer is cost effective, in use, and an acceptable alternative to the mercury hydrometer.

4.9 Flow meters

Description
Flow meters are used in many areas for measuring the flow of gas, water, air, and steam. They are used in water treatment, sewage plants, power stations, and other industrial applications.

Alternatives
The manufacturers contacted stated that they did not use mercury in the manufacturing of new flow meters. However, most older flow meters still in use contain mercury. Non-mercury alternatives include digital and ball actuated flow meters.

Cost
The cost associated with flow meters depends on the application. Some flow meters are custom designed for certain applications, which can increase the cost. The manufacturers contacted declined to provide a price range because they felt it would be misleading.

Manufacturers
The following are manufacturers of alternatives to mercury containing flow meters:

Manufacturer Name	Product	Phone Number Website
Eldridge Products, Inc	Digital and ball actuated flow meters	1-800-321-3569 www.epiflow.com
Flow Technology	Digital and ball actuated flow meters	602-437-1315 www.ftimeters.com
Alloborg Instruments & Controls	Digital and ball actuated flow meters	1-800-866-3837 www.aalborg.com
John C. Ernst	Digital and ball actuated flow meters	973-989-0300 www.johnernst.com
Lake Monitors	Digital and ball actuated flow meters	1-800-850-6110 www.lakemonitors.com
Universal Flow Monitors	Digital and ball actuated flow meters	248-542-9635 www.flowmeters.com
DigiFlow Turbine Mass Flow Meter	Digital flow meters	419-756-1746 www.flow-meters-turbine-flowmeters-mass-digiflow.com
Primary Flow Signal, Inc.	Digital and ball actuated flow meters	877-737-3569 www.primaryflowsignal.com

Summary
It appears that mercury flow meters are no longer being manufactured, and alternatives to older

mercury flow meters are in use, cost effective, and acceptable.

4.10 Pyrometers

Description
Pyrometers are used to measure the temperature of extremely hot materials, and are used primarily in foundry applications. No manufacturers were identified that currently provide mercury pyrometers. Some pyrometers still in use do have mercury within the temperature-sensing device.

Alternatives
There are two alternatives available, the optical pyrometer and the digital pyrometer. An optical pyrometer is a device that allows temperature to be measured by using incandescence color. The theory behind an optical pyrometer is that when a substance is heated to about 700°C, it begins to glow a deep red color. This indicates that the object is emitting enough energy in the visible portion of the spectrum for detection. As the temperature increases, the object changes from red to orange to white, with concurrent dramatic increases in brightness. The hot target is viewed through an optical system that contains a lamp filament whose brightness can be adjusted until it equals that of the target, and gives you an already known temperature that has been measured and recorded into the pyrometer. Digital pyrometers are also available, and use a thermocouple with a digital output screen that relays the temperature.

Cost
The cost of an optical pyrometer is in the range of $3000. The cost of a digital pyrometer is less than an optical pyrometer, and can cost between $180 to $300 depending on the manufacturer. No manufacturers of a mercury pyrometer could be located, and therefore a price for a mercury pyrometer could not be determined. Manufacturers of the alternatives would not speculate about the cost of a mercury pyrometer.

Advantages/Disadvantages
Optical pyrometers are used in applications of extreme heat and are extremely accurate. The digital pyrometers are also considered to be functional and reliable for temperature reading but not as accurate as an optical pyrometer at higher temperatures.

Manufacturers
The following are manufacturers of alternatives to mercury pyrometers:

Manufacturer Name	Product	Phone Number Website
EDL	Optical/digital pyrometers	1-800-342-5335 www.edl-inc.com
MIFCO	Digital pyrometer	217-446-0941 www.mifco.com
Spectrodyne	Optical/ pyrometers	215-977-7780 www.spectrodyne.com
Precision Pyrometer	Optical/ pyrometers	1-800-468-7976 www.pyrometer.com

Summary
It appears that the mercury pyrometer is no longer being manufactured, but may be in use in some locations. The digital and optical pyrometers are reliable technologies which function as alternatives to the mercury pyrometer.

4.11 Thermostats (industrial and manufacturing)

Description
Industrial thermostats provide temperature control in manufacturing and industrial settings. The mercury thermostat uses a mercury switch to activate the heating/cooling device. The mercury in the switch is part of an electric current relay

which relies on an electric current to activate and deactivate the heating/cooling device when the mercury in the switch is tipped.

Alternatives
Digital electronic thermostats are available for industrial type workloads and temperature control. Digital thermostats use a simple device called a thermistor to measure temperature. A thermistor is a resistor whose electrical resistance changes with temperature. The microcontroller in a digital thermostat can measure the resistance and convert that number to a temperature reading.

Costs
Manufacturers were unable to provide specific price quotes because industrial thermostats are often custom tailored to meet the requirements of a specific application. The price is then derived on an application specific basis. Manufacturers believed it would be misleading to provide a price range of industrial thermostats they had previously manufactured for specific applications.

Advantages/Disadvantages
Digital thermostats have limits that should be researched by the buyer to determine the type of thermostat best suited for an industrial purpose. Many industrial thermostats are needed to regulate higher temperatures than household thermostats. Industrial thermostats are created to be more durable and withstand higher temperatures and harsher environments. Manufacturers who supply digital thermostats for light industrial purposes report that they may not meet the most demanding applications. Situations in which digital thermostats would not perform as well as mercury products are cases of extreme environmental conditions and areas at risk of explosions or fire.

Manufacturers
The following are manufacturers of industrial thermostats:

Manufacturer Name	Product	Phone Number & Website
Chromalox	Thermostats	412-967-3800 http://www.mychromalox.com/
Kelvin Technologies	Thermostats	1-800-458-5246 www.kelvintech.com

Summary
It appears that no functional alternatives to mercury thermostats for industrial settings with harsh environmental conditions are available.

4.12 Float Switches

There are two basic types of float switches: 1) a float switch can be located in a buoyant float housing and is actuated based upon rising and falling liquid levels, or 2) a float switch can be stationary and is actuated by the presence or absence of liquid. Float switches are used for liquid monitoring and control in tanks, wells, chambers, drillings, and other containers. Float switches are used to actuate alarm and control circuits. Float switches have been used for monitoring various liquids including, among others, water, sewage, wet sludge, oil, chemicals, grease, and liquid nitrogen.

A float switch is a versatile component used to meet the needs of thousands of varied products and applications. A float switch can be incorporated into a product (e.g. bilge pumps, automobiles, etc.), or can be purchased as a component to be used in a customer specific application (e.g. waste treatment plant). Examples of some float switch products and applications are provided below:

- Pump control: bilge, sump, utility, shower, effluent, waste, lubrication, etc.
- Equipment Control: magnetic valve, cooling equipment, motors, etc.
- Alarm/Outputs: programmable logic controllers, distributed control systems,

supervisory control and data acquisition, etc.

- Industrial/manufacturing: processing liquids, waste treatment, air conditioners, semiconductor manufacturing, automatic plating machinery, etc.
- Residential: sump pumps, septic tanks, hot water heaters, automatic plumbing fixtures, etc.
- Marine: bilge pumps, shower pumps, ocean liner sewage disposal, balance tank on ships, etc.
- Automobile: fuel tank, windshield wash reservoir, etc.
- Municipal: pumping stations, waste water treatment, sewage plants, etc.
- Commercial: boilers, vending machines, electrical equipment such as liquid insulated transformers, etc.
- Miscellaneous: food processing, irrigation systems, petrochemical processing, laundry tray, food warmers, steam cookers, mineral processing, hydraulic equipment, water filters, pharmaceutical processes, food processing, power stations, etc.

There are numerous design parameters that affect the specification and selection of a float switch for a particular product or application. Float switch design and product options vary greatly by manufacturer. The design requirements have a significant impact on technology selection, manufacturer selection, product model selection, product option selection, and ultimate product cost. The following is a concise listing of some of the more critical design parameters:

- Switch points: number of control points, number of alarm points, field adjustable points, etc.
- Level detection: point level, continuous level
- Accuracy: tolerances, calibration requirements
- Liquid environment: viscosity, conductivity, foam, bubbles, turbulence, contaminants, debris, etc.
- Mounting: side, bottom, or top of enclosure, free standing/suspended cable, pipe mount, stem mount, etc.
- Output contact rating: inductive load, resistive load, current, voltage, power, etc.
- Buoyancy: ball, counterweight, specific gravity, etc.
- Life expectancy: switch, controlled equipment, etc.
- Regulatory approval: Underwriters Laboratories, Canadian Standards Association, etc.
- Operating parameters: differential between control/alarm points, angle of operation, etc.
- Environmental conditions: temperature, pressure, explosiveness, shock, vibration, corrosiveness, moving equipment, etc.
- Input power requirements: 115 Volts AC, 230 Volts AC, 24 Volts DC, 12 Volts DC, other
- Switch: number of poles, number of throws, normally open, normally closed, relay, etc.

- Other parameters: signal time delay (to compensate for wave action), float switch enclosure material, intrinsically safe, cleaning requirements, space available for operation, etc.

Mercury Float Switch

Description

A mercury float switch is typically located in a buoyant float housing and is actuated based upon the rising and falling liquid levels. The mercury float switch contains a small tube with electrical contacts at one end of the tube. As the tube lifts, the mercury collects at the lower end, providing a conductive path to complete the circuit. When the switch is tilted back the circuit is broken. The mercury float switch operates in a similar fashion to the mercury tilt switch. The mercury content reported to IMERC for float switches was in the range of greater than 1,000 mg/switch.

Cost

The cost of a mercury float switch is approximately $15 to $150 depending upon product type or application requirements. Two manufacturers were identified that have both mercury and mercury free float switches with the same functionality. These manufacturers charge the same price for the mercury float switch and the mercury-free mechanical float switch. One manufacturer was identified that provides the mercury-free mechanical float switch at a cost less than the mercury float switch for the same functionality.

One manufacturer charged more for a metallic ball float switch than for a mercury float switch with comparable functionality.

Advantages/Disadvantages

The mercury float switch has high reliability and long operational life because it has few components and is not subject to arcing. Life-cycle testing has been conducted for more than one million cycles. The mercury float switch can handle a high inductive load, has a quiet operation, has no bounce on contact, and can be hermetically sealed to provide increased protection from various environmental factors (e.g. dust, moisture, etc.). The mercury float switch can use one float for both on and off functions.

The mercury float switch requires a swing area to properly operate. If the application is in a tight location (e.g. windshield washer reservoir), then a magnet/reed float switch may be more appropriate. Because the switch contains mercury, it is becoming less desirable for many applications, including the food and beverage industry.

Manufacturers

The following are manufacturers of mercury float switches.

Manufacturer Name	Product	Phone Number & Website
Advanced Control Technology, Inc.	7000 Series	888-340-8820 www.actsensors.com
Comus International	Numerous models	973-777-8405 www.comus-intl.com
Conery Manufacturing Inc.	2900 Series	419-289-1444 www.conerymfg.com
Contegra Inc.	FS 96	651-905-0900 www.contegra.com
Electro-sensors, Inc.	MLS Series	800-328-6170 www.electro-sensors.com
ITT Industries McDonnell & Miller	E-8, 80, 65, and 165 series	773-267-1600 www.mcdonnellmiller.com
ITT Industries Rule Industries	Models 35, 37, & 40	978-281-0440 www.rule-industries.com
Mercury Displacement Industries Inc.	A, B, C, & D Series	616-663-8574 www.mdius.com
Scientific Technologies Inc.	FG Series	888-525-7300 www.levelandflow.com

Manufacturer Name	Product	Phone Number & Website
Septronics, Inc.	4701, 4704 Series	888-565-8908 www.septronicsinc.com
Signal Systems International Inc.	FS121, CW101 Series	732-793-4668 www.signalsystem.com

Alternative 1: Mechanical Switch

Description

A mechanical float switch is typically located in a buoyant float housing and is actuated based upon the rising and falling liquid levels. The mechanical switch can be a snap switch or micro-switch that can be actuated using a variety of methods. The most common method is that the lever arm is actuated by a metallic rolling ball that changes position based upon gravity and the position of the buoyant float housing.

Cost

The cost of a mechanical float switch is approximately $10 to $150 depending on product or application requirements. Two manufacturers were identified that have both mercury and mercury-free float switches with the same functionality. These manufacturers charge the same price for the mercury float switch and the mercury free mechanical float switch. One manufacturer was identified that provides the mercury free mechanical float switch at a cost less than the mercury float switch for the same functionality.

Advantages/Disadvantages

The mechanical float switch has high reliability, long operational life, can handle high inductive loads, and can be hermetically sealed to provide increased protection from various environmental factors (e.g. dust, moisture, etc.). Mechanical switches are often designed to have an operational life in excess of one million cycles. The mechanical float switch can use one float for both on and off functions.

The mechanical float switch typically needs a swing area to properly operate. However, this is not the case for mechanical float switches that use magnets in a vertical stem to activate the micro-switch.

Manufacturers

The following are manufacturers of mechanical float switches:

Manufacturer Name	Product	Phone Number Website
Advanced Control Technology, Inc.	7300 Series	888-340-8820 www.actsensors.com
Aggressive Systems, Inc.	AMF Series	248-477-5300 www.aggressivesystems.com
Attwood Marine	4201 and 4202 Series	Steelcase: 616-897-2376 www.attwoodmarine.com
Contegra Inc.	FS90 Series	651-905-0900 www.contegra.com
Dwyer Instruments, Inc. (Mercoid)	L6, L8 Series	219-879-8000 www.dwyer-inst.com
ITT Industries Jabsco	FS20	949-609-5106 www.jabsco.com
ITT Industries Rule Industries	ECO-Switch Model 39	978-281-0440 www.rule-industries.com
Kari-Finn (Finland) U.S. Rep: STI Automation Sensors Division	Numerous models	Scientific Technologies Inc.: 888-525-7300 www.kari-finn.fi
Kobold	NGS series	800-998-1020 www.kobold.com
Lovett Marine	Models 3208 and 3209	800-673-5976 www.lovettmarine.com
Mercury Displacement Industries Inc.	Numerous models	616-663-8574 www.mdius.com

Manufacturer Name	Product	Phone Number Website
MJK Automation (Denmark) Danfoss Graham – U.S. Representative	7030 Series	Danfoss Graham: 414-355-8800 www.mjk.dk
Nivelco (Hungary) Hitech – U.S. Representative	Nivofloat and NivoMag MK-200 Series	Hitech 215-321-6012 www.nivelco.com
Scientific Technologies Inc.	FT, FTN, and MLS Series	888-525-7300 www.levelandflow.com
Septronics, Inc.	SD and HD models	888-565-8908 www.septronicsinc.com
Zoeller	Numerous models	800-928-7867 www.zoeller.com

Alternative 2: Magnetic Dry Reed Switch

Description

Permanent magnets are embedded in the float housing that move vertically along the tubing or stem. The reed switches are embedded in the stem. The magnets activate the reed switches in the stem at pre-determined levels for control or alarm purposes.

Cost

The magnetic dry reed float switch cost is approximately $6 to $500 depending on product or application requirements.

Advantages/Disadvantages

The magnetic dry reed switch is ideal for use in small or narrow enclosures. The magnetic dry reed switch has a long operational life.

The magnetic dry reed switch cannot handle a high inductive load, and therefore has a low contact rating. The magnetic dry reed switch must be used in a clean environment, because debris collected on the stem will impair proper functioning. The reed switch can have its contacts welded together when exposed to high voltage sources.

Manufacturers

The following are manufacturers of magnetic dry reed switches:

Manufacturer Name	Product	Phone Number Website
Advanced Control Technology, Inc.	Numerous models	888-340-8820 www.actsensors.com
Aggressive Systems, Inc.	AOE model	248-477-5300 www.aggressivesystems.com
Barksdale, Inc.	BLS Series	800-835-1060 www.barksdale.com
Clark Reliance Corporation Jerguson Gage and Valve Division	Magnicator II Model RS-2	281-240-4243 www.clark-reliance.com
Comus International	Numerous models	973-777-8405 www.comus-intl.com
Crydom Magnetics (UK)	RSF Series	619-210-1600 www.crydom.co.uk
Dwyer Instruments, Inc.	F7 Series	219-879-8000 www.dwyer-inst.com
Flowline Liquid Intelligence	Numerous models	562-598-3015 www.flowline.com
Innovative Components	LS and SM Series	860-621-7220 www.liquidlevel.com
Kobold	Model N	800-998-1020 www.kobold.com
K-Tech Industrial Products Inc.	Numerous models	905-840-7106 www.process-controls.com/KTech

Manufacturer Name	Product	Phone Number Website
Nivelco (Hungary) Hitech – U.S. Representative	NivoPoint	Hitech 215-321-6012 www.nivelco.com
Scientific Technologies Inc.	FCN, LF, FL, SLS, and TLS Series	888-525-7300 www.levelandflow.com
Signal Systems International Inc.	Numerous models	732-793-4668 www.signalsystem.com

Manufacturer Name	Product	Phone Number Website
Kobold	OPT Series	800-998-1020 www.kobold.com
Pulnix America Inc.	FL, FLH Series	800-445-5444 www.pulnix.com
Scientific Technologies Inc.	OPL Series	888-525-7300 www.levelandflow.com

Alternative 3: Optical Float Switch

Description

The optical float switch utilizes optical principles to detect the presence or absence of a liquid as compared with air. The sensor contains a small infrared LED and a phototransistor light receiver to detect the presence of liquid.

Cost

The cost of an optical float switch is approximately $120 to $400 depending on product or application requirements.

Advantages/Disadvantages

The optical sensor is unaffected by liquid color or density. The optical float switch has very slight hysteresis, high repeatability, and is highly chemical resistant.

The optical float switch has a higher price range than other float switch technologies.

Manufacturers

The following are manufacturers of optical float switches:

Manufacturer Name	Product	Phone Number Website
Com connection	Fiber Optic Float Switch	954-600-1962 http://comconnection.tripod.com
Dwyer Instruments, Inc.	OLS Series	219-879-8000 www.dwyer-inst.com

Alternative 4: Conductivity

Description

The conductivity float switch uses electrodes to measure conductivity and sense the presence or absence of a liquid. It relies on the conducting properties of liquids to complete an electrical circuit between electrodes, or between an electrode and the metal tank.

Cost

The cost of a conductivity float switch is approximately $40 to $800 depending on product or application requirements.

Advantages/Disadvantages

The conductivity float switch has no moving parts and is therefore very reliable and can be used in vessels with moving equipment that may damage other types of float switches. The conductivity sensor can sense the presence of different liquids. For bilge pump applications, it can detect gas, oil, and diesel fuel in bilge water that can trigger an automatic shutdown of the pump. This prevents pumping of contaminants into waterways.

The conductivity float switch must be used in a conductive liquid for proper operation.

Manufacturers
The following are manufacturers of conductivity float switches:

Manufacturer Name	Product	Phone Number Website
Advanced Control Technology, Inc.	Numerous models	888-340-8820 www.actsensors.com
Aggressive Systems, Inc.	IPF model	248-477-5300 www.aggressivesystems.com
ITT Industries McDonnell & Miller	LPC series	773-267-1600 www.mcdonnellmiller.com
Kari-Finn (Finland) U.S. Rep: STI Automation Sensors Division	Numerous models	STI: 888-525-7300 www.kari-finn.fi
Kobold	NEH, NEW Models	800-998-1020 www.kobold.com
MJK Automation (Denmark) Danfoss Graham – U.S. Representative	Conduct-ivity Level Switch 501	Danfoss Graham: 414-355-8800 www.mjk.dk
Nivelco (Hungary) Hitech – U.S. Representative	NivoCont K Series	Hitech 215-321-6012 www.nivelco.com Leif Lindvall
Product Innovators	Bilge Buddy	845-796-4526 www.411web.com/P/PRODUCTINNOVATORS/Default.htm
Scientific Technologies Inc.	ELS Series	888-525-7300 www.levelandflow.com

Alternative 5: Metallic Ball

Description
A rolling metallic ball is used to make or break the actual electrical connection for a circuit. The metallic ball moves based on the float movement as the liquid level rises and falls.

Cost
One manufacturer reported that the cost of their metallic ball switch is about 10 – 15% higher than their mercury float switch with similar functionality.

Advantages/Disadvantages
The metallic ball float switch can have a long life if it is only used for small rated loads.

The metallic ball float switch is not suitable for applications subject to shock or vibration because it can experience false contacts due to bounce. The metallic ball float switch requires a swing area for proper operation. The metallic ball can become welded to the electrical contacts due to overheating or arcing. The metallic ball float switch cannot handle loads greater than two amps without experiencing arcing issues.

Manufacturers
The following is a manufacturer of metallic ball float switches:

Manufacturer Name	Product	Phone Number Website
Comus International	Numerous models	973-777-8405 www.comus-intl.com

Alternative 6: Sonic/Ultrasonic

Description
The sonic/ultrasonic float switch utilizes a sensor containing a piezo-electrical crystal. The crystal excites oscillations, allowing the liquid level to be measured by oscillation frequency. As the probe tip becomes immersed in liquid, the

crystals acoustically couple and the switch changes state.

Cost
The cost of a sonic/ultrasonic float switch is approximately $150 to $600 depending on product or application requirements.

Advantages/Disadvantages
The sonic/ultrasonic float switch is highly accurate and can be used for non-conductive liquids as well as highly viscous liquids. The sensor can be quickly removed for cleaning as required by the food, beverage, and pharmaceutical industries.

The sonic/ultrasonic sensor needs to be rigid mounted for proper operation.

Manufacturers
The following are manufacturers of sonic/ultrasonic float switches:

Manufacturer Name	Product	Phone Number Website
Advanced Control Technology, Inc.	ELC - 8	888-340-8820 www.actsensors.com
Cosense Inc.	LL Series	631-231-0735 www.cosense.com
Dwyer Instruments, Inc.	GS Series	219-879-8000 www.dwyer-inst.com
Flowline Liquid Intelligence	Numerous models	562-598-3015 www.flowline.com
Kobold	NWS Model	800-998-1020 www.kobold.com
MJK Automation (Denmark) Danfoss Graham – U.S. Representative	MJK 7005	Danfoss Graham: 414-355-8800 www.mjk.dk
Ohmart Vega	Vegaswing Series	800-367-5383 www.ohmartvega.com
Scientific Technologies Inc.	DFN-30 Series	888-525-7300 www.levelandflow.com
Siemens Milltronics	ULS 200 Series	817-277-3543 www.milltronics.com

Alternative 7: Pressure Transmitter

Description
The pressure transmitter float switch utilizes one of two technologies:

1) The float switch is actuated by a piezo-recitative mechanism that senses the hydrostatic pressure within a container.
2) The float switch is actuated by compression of a captive air column in the detecting pipe beneath a diaphragm.

Cost
One manufacturer sells one of its pressure transmitter models for $825. A cost range for all available models was not determined, but will depend on product or application requirements.

Advantages/Disadvantages
The piezo-recitative technology provides highly reliable results. The diaphragm technology can be used in applications where electrical power is not available or hazardous conditions exist.

Manufacturers
The following are manufacturers of pressure transmitter float switches:

Manufacturer Name	Product	Phone Number & Website
Dwyer Instruments, Inc.	PLT Series	219-879-8000 www.dwyer-inst.com

Manufacturer Name	Product	Phone Number & Website
MJK Automation (Denmark) Danfoss Graham – U.S. Representative	MJK 7050, 7060	Danfoss Graham: 414-355-8800 www.mjk.dk
Scientific Technologies Inc.	NLS Series	888-525-7300 www.levelandflow.com

Alternative 8: Alloy

Description
A gallium indium alloy replicates the fluid and electrical properties of mercury. This alloy is used as a direct replacement of mercury within the switch.

Cost
The alloy float switch has limited commercial usage and is still in the early development stage. The cost of an alloy float switch is significantly higher than a mercury switch, ball contact switch, or magnetic/reed switch.

Advantages/Disadvantages
The gallium indium alloy functions as a direct replacement for mercury within the switch and therefore provides similar advantages such as quiet operation, high reliability, and long operational life. This alloy eliminates bounce problems and false contacts associated with the metallic ball contact device.

The gallium indium alloy cannot be used in applications less than 20 degrees Fahrenheit. This precludes its use for many non-water applications. The gallium indium alloy is difficult to handle, will oxidize easily, and is potentially toxic.

Manufacturers
The following are manufacturers of alloy float switches:

Manufacturer Name	Product	Phone Number Website
Comus International	Alloy float switch	973-777-8405 www.comus-intl.com

Alternative 9: Thermal

Description
The thermal float switch utilizes the thermal dispersion principle of the dissipation of heat by a liquid to detect the presence or absence of a liquid as compared with air. The sensor typically contains a resistor in the form of a thermistor. A thermistor is a semiconductor material that detects heat and converts heat into an electrical signal. The switch is actuated when heat generated by the thermistor is dissipated by a liquid.

Cost
The cost of a thermal float switch was obtained for one model from one manufacturer for $87. A range of values was not available at the time this report was completed.

Advantages/Disadvantages
The thermal float switch can be used for caustic liquids such as acids and alkalines. Light to moderate buildup on the sensor will not affect thermal dispersion performance.

The thermal float switch is not suited for high temperature applications, and cannot be used for high viscosity liquids.

Manufacturers
The following are manufacturers of thermal float switch sensors:

Manufacturer Name	Product	Phone Number & Website
JC Controls	SN Series	877-837-6677 www.ln2.net
Scientific Technologies Inc.	TDL Series	888-525-7300 www.levelandflow.com

Alternative 10: Capacitance

Description
The capacitance level float switch is typically comprised of two electrodes separated by an insulating medium. Air provides a reference capacitance value, and when the probe is covered by liquid the resultant capacitance change causes a signal to actuate the switch.

Cost
The cost of a capacitance float switch is approximately $150 to $500 depending on product or application requirements.

Advantages/Disadvantages
The capacitance float switch contains no moving parts, has extremely high chemical resistance, and moderate vibration resistance.

The capacitance float switch cannot be used for highly viscous liquids.

Manufacturers
The following are manufacturers of capacitance float switches:

Manufacturer Name	Product	Phone Number Website
Dwyer Instruments, Inc.	CLS Series	219-879-8000 www.dwyer-inst.com
Flowline Liquid Intelligence	Numerous models	562-598-3015 www.flowline.com
Kobold	NTS Series	800-998-1020 www.kobold.com
Robertshaw	Model 304B	865-981-3100 www.robertshawindustrial.com
Scientific Technologies Inc.	CP30 Series	888-525-7300 www.levelandflow.com

Summary
There are numerous mercury free alternative technologies currently in use for float switch products and applications. It appears that these mercury free alternatives are cost competitive and can meet the functional requirements for new float switch products and applications. However, these mercury free alternatives may not meet the requirements for retrofitting all existing float switch products and applications.

4.13 Tilt Switches

Tilt switches sense changes in position or rotation and actuate a switch based upon these changes. The tilt switch can be used to activate alarms, control equipment, turn on lights, or accomplish other functions.

A tilt switch is a versatile component used to meet the needs of hundreds of position monitoring/control products and applications. A tilt switch can be incorporated into a product (e.g. video cameras, motion detectors, etc.), or can be purchased as a component to be used in a customer specific application (e.g. mining operations). Examples of some tilt switch products and applications are provided below:

- Test & Laboratory Equipment: precision measuring devices, plotters, power supplies, etc.
- Heavy equipment: construction vehicles, cranes, hoists, chutes, scissor lifts, static platforms, etc.
- Industrial: processing equipment, conveyor controls, extruders, speed controls, foot pedals, coal level monitoring, etc.
- Marine: rudder controls, deep sea manipulators, salt water platforms, ship & barge leveling etc.

- Medical equipment: x-ray machines, MRI scanners, position controls, wheelchairs, etc.

- Robotics: analog inputs, remote operated vehicles, creature animation, etc.

- Agriculture: tractors, conveyor controls, food processing, bins, silos, grain level monitoring, etc.

- Other: signaling alarms, lights, interfacing with programmable logic controllers, personnel digital assistants, cell phones, computer security, anti tamper devices, utility metering, pump control, digital cameras, video cameras, portable space heaters, pinball game machine, swimming pools, payphones, survey leveling equipment, gyroscopes, steam irons, anti-locking brake systems, digital compass correction, submarines, virtual reality equipment, oil rig leveling, laser instruments, geophysical monitoring, laser leveling, grading, continuous casting, weapons platform leveling, wheel alignment, land navigation, auto security, RVs, exercise equipment, automobiles, glove compartments, video cameras, commercial popcorn poppers, electric organs, space heaters, oil well pump control, machine tools, fishing lures, greenhouses, motion detectors, pneumatic tube communication, man-lifts, antenna positioning, mining, aircraft, transportation, etc.

There are numerous design parameters that affect the specification and selection of a tilt switch for a particular product or application. Tilt switch basic design and product options vary greatly by manufacturer. The design requirements have a significant impact on technology selection, manufacturer selection, product model selection, product option selection, and ultimate product cost. The following is a concise listing of some of the more critical design parameters:

- Measurement requirements: tilt or rotation angle, number of axes, etc.

- Switch points: number of control points, number of alarm points, field adjustable points, etc.

- Accuracy: tolerances, calibration requirements

- Output contact rating: inductive loading (amps, voltage, power), resistive loading (amps, voltage, power)

- Life expectancy: switch, controlled equipment, etc.

- Regulatory approval: Underwriters Laboratories, Canadian Standards Association, etc.

- Operating parameters: differential between control/alarm points, angle of operation, etc.

- Environmental conditions: temperature, pressure, explosiveness, shock, vibration, corrosiveness, moving equipment, etc.

- Input power requirements: 115 Volts AC, 230 Volts AC, 24 Volts DC, 12 Volts DC, other

- Switch output: single pole single throw, double pole double throw, normally open, normally closed, relay, etc.

- Other parameters: display requirements, enclosure material, intrinsically safe, cleaning requirements, space available for operation, signal time delay, etc.

Mercury Tilt Switches

Description

Mercury tilt switches are small tubes with electrical contacts at one end of the tube. As the

tube lifts, the mercury collects at the lower end, providing a conductive path to complete the circuit. When the switch is tilted back the circuit is broken. The mercury content reported by manufacturers to IMERC for tilt switches ranged from 400 mg to 71,000 mg/switch.

Cost
The cost of a mercury tilt switch is approximately $2 to $300 depending on product or application requirements.

Advantages/Disadvantages
The mercury tilt switch has high reliability and long operational life because it has few components and is not subject to arcing. Life cycle testing has been successfully conducted for more than one million cycles. The mercury tilt switch can handle a high inductive load, has a quiet operation, has no bounce on contact, and can be hermetically sealed to provide increased protection from various environmental factors (e.g. dust, moisture, etc.).

The mercury tilt switch contains mercury, which is becoming less desirable for many applications including the food and beverage industry.

Manufacturers
The following are manufacturers of mercury tilt switches.

Manufacturer Name	Product	Phone Number & Website
Abra Electronics	Model 35-760	800-717-2272 www.abra-electronics.com
Celduc Relais (France) Laube Technology – US Representative	IB600099 Series	Laube Technology: 805-388-1050 www.celduc-relais.com
Comus International	Numerous models	973-777-8405 www.comus-intl.com
Electro-Sensors, Inc.	MTS Series	800-328-6170 www.electro-sensors.com
George Risk Industries	4561 Series	800-523-1227 www.grisk.com
Kahl Scientific Instrument Corporation	Series 03EA	619-444-2158 www.kahlsico.com
Siemens Milltronics	Mill-tronics Tilt Switches	817-277-3543 www.milltronics.com
Signal Systems International Inc.	Series 3004	732-793-4668 www.signalsystem.com

Alternative 1: Metallic Ball

Description
A rolling metallic ball is used to make the actual electrical connection. The metallic ball moves based on the movement of the tilt switch housing, or can be moved by actuator magnets using the principle of spherical magnetism.

Cost
The cost of a metallic ball tilt switch is approximately $1 to $11 depending on product or application requirements.

Advantages/Disadvantages
The metallic ball tilt switch is suited for applications with high levels of electromagnetic interference (EMI) such as generators and motors, or high stress applications that require a robust switch. The metallic ball tilt switch can have a long life if it is only used for small rated loads.

The metallic ball tilt switch is not suitable for applications subject to shock or vibration because it can experience false contacts due to bounce. The metallic ball can become welded to the electrical contacts due to overheating or arcing. The metallic ball tilt switch cannot handle loads greater than two amps without experiencing arcing issues.

Manufacturers
The following are manufacturers of metallic ball tilt switches:

Manufacturer Name	Product	Phone Number Website
Comus International	Numerous Models	973-777-8405 www.comus-intl.com
Magnasphere Corp.	Magna-sphere Switch	262-792-1306 www.magnaspherecorp.com
Signal Systems International Inc.	NM 1001, NM 2001, NM 3001, NM 4001	732-793-4668 www.signalsystem.com

Alternative 2: Electrolytic Tilt Switch

Description
The electrolytic tilt switch contains multiple electrodes and is filled with an electrically conductive fluid. As the sensor tilts, the surface of the fluid remains level due to gravity. The conductivity between the electrodes is proportional to the length of electrode immersed in the fluid. Electrically, the sensor is similar to the potentiometer, with resistance changing in proportion to tilt angle. The electrolyte material can vary in conductivity and viscosity to meet different design parameters.

Cost
The cost of an electrolytic tilt switch is approximately $5 to $50 depending on product or application requirements.

Advantages/Disadvantages
Electrolytic tilt switches provided excellent repeatability, stability, and accuracy. These sensors are rugged and can be used in environments of extreme temperature, humidity, and shock. Electrolytic tilt sensors have low power consumption.

Electrolytic tilt switches are complex devices due to their sensitivity to internal circuitry and external environmental influences.

Manufacturers
The following are manufacturers of electrolytic tilt switches:

Manufacturer Name	Product	Phone Number Website
Advanced Orientation Systems, Inc. (AOSI)	SW Series	908-474-9595 www.aositilt.com
Applied Geomechanics	755, 756, 757, and 758 Series	831-462-2801 www.geomechanics.com
Fredericks Company	Numerous models.	215-947-2500 www.frederickscom.com
Nanotron, Inc.	Ultimate I and II Series	480-966-9006 www.nanotronusa.com
Spectron Glass and Electronics, Inc.	The SP5000 and AU6000 series	631-582-5600 www.spectronsensors.com

Alternative 3: Potentiometers

Description
Potentiometers consist of a curved conductive track with a connection terminal at each end and a moveable wiper connected to a third terminal. As the shaft of the potentiometer is rotated, the length of the electrical path and resistance changes proportionally. Potentiometers can be used to detect linear motion as well as single turn or multiple turn rotation.

Cost
Potentiometers were found to range from approximately $0.25 for simple, high volume applications to $300 for high quality audio applications.

Advantages/Disadvantages
Potentiometers are inexpensive, reliable, and have long operational life, often greater than 20 million cycles. Potentiometers are also available in micro-miniature size for space saving design requirements.

Manufacturers
The following are manufacturers of potentiometers:

Manufacturer Name	Product	Phone Number Website
ETI Systems	LCP8, SP12B, Series	760-929-0749 www.etisystems.com/singledesign.htm
Precision Electronic	RV4, RV6 Series	416-744-8840 www.precisionelectronics.com
Tocos America, Inc.	G3, G4 Series	847-884-6664 www.tocos.com
Vishay	249, 357, 533 Series	402-563-6866 www.vishay.com

Alternative 4: Mechanical Switch

Description
The mechanical tilt switch can be a snap switch or micro-switch that can be actuated in a variety of methods. The most common method is that the lever arm is actuated by a metallic rolling ball that changes position based upon gravity and the changing position of the switch housing.

Cost
The cost of a mechanical tilt switch is approximately $100 to $350 depending on product or application requirements.

Advantages/Disadvantages
The mechanical tilt switch has high reliability, long operational life, can handle high inductive loads, and can be hermetically sealed to provide increased protection from various environmental factors (e.g. dust, moisture, etc.). Mechanical tilt switches are often designed to have an operational life in excess of one million cycles. The mechanical tilt switch requires only a small amount of pressure to actuate the switch action. The mechanical tilt switch can be used as a limit switch to detect the position of some moving part. Numerous limit switches can be used to sense multiple positions.

Manufacturers
The following are manufacturers of mechanical tilt switches:

Manufacturer Name	Product	Phone Number & Website
Binmasater	BM-T Series	800-278-4241 www.binmaster.com
Monitor Technologies LLC	TC Series	800-601-6302 www.monitortech.com
Omron Electronics	D7E Series	847-882-2288 www.omron.com

Alternative 5: Solid-State

Description
The solid-state tilt switch is often referred to as an inclinometer or accelerometer depending upon the application. Various operational methods are used including:

- Using a Hall effect integrated circuit sensor that provides a voltage output ratio as a function of the mechanical angle of the shaft
- Using a highly stable silicon micro-machined capacitive inclination sensor element
- Using force balance accelerometer technology

Cost
The cost of a solid-state tilt switch is approximately $100 - $250 depending on product or application requirements.

Advantages/Disadvantages
The solid-state tilt switch offers high resolution, accuracy, fast response, and maintains its accuracy over temperature ranges. The solid-state tilt switch requires a low supply voltage and has a long operational life, often greater than ten million cycles. The solid-state tilt switch can be used in strong vibration and shock environments.

The initial cost is higher than mercury, potentiometer, or electrolytic tilt switches.

Manufacturers
The following are manufacturers of solid-state tilt switches:

Manufacturer Name	Product	Phone Number & Website
Clarostat Sensors and Controls	HRS100 Series	800-872-0042 www.clarostat.com
Columbia Research Labs	SI-701 Series	800-813-8471 www.columbiaresearchlab.com
Crossbow	CXTA and CXTLA Series	408-965-3300 www.xbow.com
Jewell Instruments LLC	LSO Series	800-227-5955 www.jewellinstruments.com
Omron Electronics	D6B Series	847-882-2288 www.omron.com

Alternative 6: Capacitive

Description
The capacitive tilt switch utilizes a capacitive based sensor that produces output directly proportional to the relative tilt. The sensor is typically composed of hermetically sealed capacitive domes with a high dielectric constant fluid that fills the space between the domes.

Cost
The cost of a capacitive tilt switch is approximately $80 to $250 depending on product or application requirements.

Advantages/Disadvantages
The capacitive tilt switch has high accuracy, high long-term stability, and low power requirements. The capacitive tilt switch is suitable for applications requiring high measurement accuracy with low linearity deviations, and for measurement of relatively large inclination angles.

Manufacturers
The following are manufacturers of capacitive tilt switches:

Manufacturer Name	Product	Phone Number Website
Measurement Specialties	Accustar and Accuswitch Series	800-745-8008 www.schaevitz.com
Rieker Inc.	N Series and NG Series	610-534-9000 www.riekerinc.com
Seika (Germany) Reiker Inc. – U.S. Representative	NG2, NG3, and NG4 Series	Reiker Inc. 610-534-9000 www.seika.de

Summary
There are numerous mercury free alternative technologies currently in use for tilt switch products and applications. It appears that these mercury free alternatives are cost competitive and can meet the functional requirements for new tilt switch products and applications. However, these mercury free alternatives may not meet the requirements for retrofitting all existing tilt switch products and applications.

An example of a successful tilt switch replacement program is the “Switch the Switch” program initiated by the Michigan based Clean Car Campaign. Mercury tilt switches in hood lights and trunk lights were replaced with mercury free tilt switches in automobiles across

the nation. This was a simple, drop-in exchange that took about ten minutes per switch to accomplish. Across the United States, thirteen tilt switch replacement events took place. Some participating dealerships replaced mercury switches in vehicles on their lots, while other dealerships offered the service, free of charge, to their customers. The participating municipal and state agencies replaced the mercury tilt switches in their fleets of vehicles. (Clean Car Campaign, 2002)

4.14 Pressure Switches

A pressure switch is a device that converts a pressure change into an electrical switching function. The pressure change might be measured as pressure, vacuum, or differential between two pressure inputs. In every case, the pressure switch will employ a diaphragm, piston, or other pressure-responsive sensor, which has been coupled to actuate a mechanical switch, mercury switch, or transistor. Examples of pressure responsive sensors used in pressure switches include:

- Diaphragm: A diaphragm actuated pressure switch has a large surface area and very flexible diaphragm material. This type of sensor is able to convert a relatively small amount of pressure or vacuum into sufficient mechanical force to actuate a snap-action switch. In a pressure switch, positive pressure pushes the diaphragm. In a vacuum switch, negative pressure pulls the diaphragm. In a differential switch, both sides of the switch housing are linked to two pressure sources, and the diaphragm responds to the resulting net force.

- Piston: A piston actuated pressure switch uses a metal piston as the sensor. Its robust design and stronger materials enable this type of sensor to work at high pressures, or in hostile media.

- Bellows: A bellows actuated pressure switch uses a bellows elastic element that expands and contracts axially with changes in pressure. Changes in the measured pressure cause the bellows to work against an adjustable spring. This spring determines the pressure required to actuate the switch. Through suitable linkage, the spring causes the contacts to open or close the electrical circuit automatically when the operating pressure falls below or rises above a specified value.

- Flex Circuit: A flex circuit diaphragm is a small metal diaphragm etched from one layer of a circuit board. This diaphragm is able to make contact with another layer, combining sensor and switch. The advantage of this device is that it can open and close at a very high frequency over a very long duty cycle.

Each type of sensor provides performance tradeoffs that must be evaluated for each particular application. For example, bellows actuated pressure switches have excellent sensitivity, however they are subject to metal fatigue in rapidly cycling applications.

A pressure switch is a versatile component used to meet the needs of hundreds of pressure monitoring/control products and applications. A pressure switch can be incorporated into a product (e.g. boiler, air conditioner, vacuum cleaner, etc.), or can be purchased as a component to be used in a customer specific application (e.g. semiconductor processing). Examples of some pressure switch products and applications are provided below:

- Heating, ventilation, and air conditioning: electrostatic air cleaners, filter indicators, reservoir level, gas fired heating, ventilation, utility heaters, heat pumps, furnaces, flue gas, fuel delivery, etc.

- Medical: respiratory sensors, therapy tent nebulizers, automated blood pressure systems, sip and puff movement controls, anesthesia leak detection, saline pumps, tourniquet systems, reverse osmosis purification systems, dental aspirator pumps, respiratory therapy, disposable surgical vacuum systems, etc.

- Automotive: tire pressure, emission control, manifolds, air conditioning, engine crankcase pressure, air brakes, lumbar seat pressure, exhaust gas re-circulation, etc.

- Appliance: commercial dish washers, floor scrubbers, vacuum cleaners, food storage sealers, air conditioners, commercial fryers, hot water dispensers, hot water heaters, etc.

- Other: fire pump controllers, scrubbers, venting hoods, construction equipment, tape braking systems, tape tension controls, door safety, spa pumps, machine tools, automated test equipment, packaging machinery, pulp digesters, boilers, well heads, polymerization reactor vessels, mine gas samplers, garage doors, industrial gas pressure sensing, vacuum radon detection, missile guidance applications, spray painting equipment, semiconductor process equipment, injection water systems, submarine navigation control, robotics, organs, pump control, automobiles, pressurized air systems, bioprocess applications, sanitary systems, hydraulic systems, sprayers, pressurized tanks, altitude sensing, portable test equipment, fire protection systems, and waste treatment plants.

There are numerous design parameters that affect the specification and selection of a pressure switch for a particular product or application. Pressure switch basic design and product options vary greatly by manufacturer. The design requirements have a significant impact on technology selection, manufacturer selection, product model selection, product option selection, and ultimate product cost. For example, sensor selection is a key determinant of range, sensitivity, accuracy, life expectancy, and cost of a pressure switch. The following is a concise listing of some of the more critical design parameters:

- Variable measured: pressure, vacuum, differential

- Operating parameters: set-point, dead-band, factory set, field adjustable

- Enclosure: general purpose, weather resistant, explosion proof, etc.

- Regulatory approval: Underwriters Laboratories, Canadian Standards Association, etc.

- Switch type: mercury, snap switch, micro-switch, transistor, etc.

- Switch: number of poles, number of throws, amperage, voltage, hermetically sealed, etc.

- Load: resistive, inductive, other

- Accuracy: repeatability, calibration requirements

- Monitoring: local, remote

- Mounting: vertical, horizontal

- Materials: enclosure, sensor, switch, etc.

- Visual display: status, power on, etc.

- Sensor type: diaphragm, bellows, piston, bulb & capillary, etc.

- Pressure: range to be measured, maximum operating pressure, etc.

- Life expectancy: time in service, number of cycles
- Electrical connection: terminal block, conduit, etc.
- Physical: size, weight, etc.
- Power input: 120/240Volts AC, 12/24Volts DC, current, etc.
- Environmental conditions: shock, vibration, explosion, corrosiveness, temperature, humidity, radio frequency interference, etc.
- Other: pressure surge protection, test button, reset button, etc.

Mercury Pressure Switches

Description

The mercury pressure switch typically uses a piston, diaphragm, or bellows acting as the pressure sensor to actuate the mercury switch. The mercury content reported by manufacturers to IMERC for pressure switches was in the range of greater than 1,000 mg.

Cost

The cost of a mercury pressure switch is approximately $150 to $170 based on pricing obtained for only two product models. The range could be much greater depending on various product and application requirements. One manufacturer provides comparable pricing for mercury pressure switches and mechanical pressure switches with similar functionality.

Advantages/Disadvantages

The mercury pressure switch has high reliability and long operational life because it has few components and is not subject to arcing. Life cycle testing has been successfully conducted for more than one million cycles. The mercury float switch can handle a high inductive load, has a quiet operation, has no bounce on contact, and can be hermetically sealed to provide increased protection from various environmental factors.

The mercury pressure switch contains mercury, which is becoming less desirable for many applications including the food and beverage industry.

Manufacturers

The following are manufacturers of mercury pressure switches.

Manufacturer Name	Product	Phone Number & Website
Dwyer Instruments (Mercoid)	PQ, PR, BB, DP, and DA Series	219-879-8000 www.dwyer-inst.com
Encertec	Model AP-153-37	336-288-7226 http://www.encertec.com/spare%20parts%20list.htm

Alternative 1: Mechanical Pressure Switches

Description

The mechanical pressure switch typically uses a piston, diaphragm, bellows, or combination piston/diaphragm as the pressure sensor. The sensor can either 1) directly actuate the switch, or 2) use a pushrod, lever, or compression spring to actuate a snap acting micro-switch.

Cost

The cost of a mechanical pressure switch is approximately $40 to $600 depending on product or application requirements.

Advantages/Disadvantages

Mechanical pressure switches have high reliability, a long operational life, and can also provide high accuracy when used with a diaphragm sensor. Certain models of the

mechanical pressure switch use a diaphragm and negative rate Belleville spring that provides superior resistance to shock and vibration.

Manufacturers

The following are manufacturers of mechanical pressure switches:

Manufacturer Name	Product	Phone Number & Website
Barksdale, Inc.	D1, B1, E1S, C9612 Series	800-835-1060 www.barksdale.com
Custom Control Sensors, Inc.	6800 and 6900 Series	818-341-4610 www.ccsdualsnap.com
Dwyer Instruments (Mercoid)	PG, DP, APS, AVS, and DS-7300 Series	219-879-8000 www.dwyer-inst.com
Hobbs Corporation (Invensys Company)	Series 3000 and 5000, Series III and V	217-753-7752 www.hobbs-corp.com
Kobold	KPH 8000 and KPH 8200 Series	800-998-1020 www.kobold.com
Micro Pneumatic Logic, Inc. (MPL)	MPL 500 Series	954-973-6166 www.pressureswitch.com
Neo-dyn/ITT Industries	100P, 152P, 160P, 142P, and 182P Series	661-295-4000 www.neodyn,com
SOR Inc.	Series 20	800-676-6794 www.sorinc.com
Tecmark Corporation	Series 3000	440-205-7600 www.tecmarkcorp.com
Texas Instruments	Numerous models	888-438-2214 www.ti.com
United Electric Controls	Spectra 10, Deltapro 24, and Spectra 12 Series	617-926-1000 www.ueonline.com
Weed Instrument	Model GR2/4	800-880-9333 www.weedinstrument.com

Alternative 2: Solid-State Pressure Switches

Description

Solid-state pressure switches contain one or more strain gauge pressure sensors, a transmitter, and one or more switches all in a compact package. In addition to opening or closing the pressure switch circuit, they can provide a proportional analog or digital output. Diffused silicon piezoresistive sensors are widely used in solid-state pressure switches. The sensor contains homogeneous silicon measuring cells containing two vacuum-welded silicon plates. The piezoresistive effect causes element resistance to change proportionally with measured pressure. Thin film strain gauges can also be used as the pressure sensor. A microprocessor is used to process the strain gauge sensor information and actuate the switching element. The switching element is typically a transistor.

Cost

Solid-state pressure switches cost approximately $200 - $350 depending on product or application requirements. This is higher than the cost for mechanical or mercury pressure switches. Solid-state pressure switches become more cost effective when monitoring more than one point and other of its various features are needed.

Advantages/Disadvantages

Solid-state pressure switches provide higher accuracy than mechanical switches. Solid-state pressure switches can improve process quality, resulting in reduced scrap and waste. Solid-state pressure switches have long life at rated loads that can often be ten million cycles or greater. Solid-state sensors usually have built-in temperature compensation to ensure accuracy

over a wide temperature range. The solid-state pressure switch can provide proportional analog or digital output. The electronic control unit can be mounted remotely from the sensor. Solid-state pressure sensors often have a built-in keypad and display to simplify setup and ongoing field adjustments. Solid-state pressure switches provide a wide range of set-point and dead-band adjustment. The transistor switch is highly reliable, has no contact bounce, accommodates fast switching, and has no arcing.

The transistor is usually restricted to low-level direct current voltage applications. High temperatures or transient pressure spikes can damage a solid-state pressure sensor.

Manufacturers

The following are manufacturers of solid-state pressure switches:

Manufacturer Name	Product	Phone Number Website
Barksdale, Inc.	PS Series	800-835-1060 www.barksdale.com
Kobold	PDD Series	800-998-1020 www.kobold.com
SOR Inc.	SGT Series	800-676-6794 www.sorinc.com
United Electric Controls	One Series	617-926-1000 www.ueonline.com

Summary

There are numerous mercury-free alternative technologies currently in use for pressure switch products and applications. It appears that these mercury-free alternatives are cost competitive and can meet the functional requirements for new pressure switch products and applications. However, these mercury free alternatives may not meet the requirements for retrofitting all existing pressure switch products and applications.

4.15 Temperature Switches

A temperature switch is a device that converts a temperature change into an electrical switching function. The temperature switch uses a temperature responsive sensor that is coupled to a switch. The switch can be a mercury switch, solid state, micro-switch, or snap switch. The following are examples of temperature sensors commonly used in temperature switches:

Thermocouple: A thermocouple is comprised of two wire strips of dissimilar metals. These metal wires are joined at one end and the voltage is measured at the other end. Changes in the temperature at the juncture induce a change in electromotive force at the other end. As the temperature goes up, the output electromotive force of the thermocouple rises. There are many different types of thermocouples made of different types of wire with very different properties.

Resistance Temperature Detectors (RTD): An RTD is based on the fact that the electrical resistance of a metal changes as its temperature changes. The resistance will rise more or less linearly with temperature. RTDs use a length of conductor (platinum, nickel, iron or copper) wound around an insulator. Newer styles use a thin film of the conductor deposited on a ceramic substrate. RTDs are stable and have a fairly wide temperature range, but are not as rugged and inexpensive as thermocouples. Since they require the use of electric current to make measurements, RTDs are subject to inaccuracies from self-heating.

Thermistor: A thermistor is also based on the fact that the electrical resistance of a material changes as its temperature changes. Thermistors rely on the resistance change in a ceramic semiconductor, with the resistance dropping non-linearly with a temperature rise. Thermistors tend to be more accurate than RTDs and thermocouples, but they have a much more limited temperature range because of their marked non-linearity. Thermistors can be a low cost solution to temperature measurement. They tend to have

large signal outputs and their small size permits fast response to temperature changes.

Integrated Circuit Sensor: The newest type of temperature sensor on the market is the integrated circuit temperature transducer. Integrated circuit sensors can be designed to produce either voltage or current output and are extremely linear. Integrated circuit sensors are a very effective way to produce an analog voltage proportional to temperature. They have a limited temperature range and are used to measure temperatures from -50° to 300° F.

A temperature switch is a versatile component used to meet the needs of hundreds of temperature monitoring/control products and applications. A temperature switch can be incorporated into a product (e.g. food warming trays, hot water boilers, etc.), or can be purchased as a component to be used in a customer specific application (e.g. plastics injection molding process). Examples of some temperature switch products and applications are provided below:

Ovens, sterilizers, moulding machines, heat exchangers, labelling machines, water baths, heat sealers, refrigerating equipment, ventilating equipment, alarm systems, bearings, gear reducers, bucket elevators, hammer mills, generators, conveyors, dryer bearings, mechanical drives, grinders, pumps, motors, presses, mixers, appliances, vending machines, platens, plastic laminating presses, dental equipment, popcorn machines, hot stamping, food warming trays, hydraulic laminating presses, livestock applications, hot water boilers, hot water storage tanks, heavy oil pre-heaters, watering fountains, label adhesive applicators, paint drying equipment, typesetting machines, hot stamp printers, vending machines, deep fat cookers, and textiles.

There are numerous design parameters that affect the specification and selection of a temperature switch for a particular product or application. Temperature switch basic design and product options vary greatly by manufacturer. The design requirements have a significant impact on technology selection, manufacturer selection, product model selection, product option selection, and ultimate product cost. For example, sensor selection is a key determinant of range, sensitivity, accuracy, life expectancy, and cost of a temperature switch. The following is a concise listing of some of the more critical design parameters:

- Operating parameters: Set-point, dead-band, factory set, field adjustable
- Enclosure: general purpose, weather resistant, explosion proof, etc.
- Regulatory approval: Underwriters Laboratories, Canadian Standards Association, etc.
- Switch type: mercury, snap switch, micro-switch, transistor, etc.
- Switch: number of poles, number of throws, amperage, voltage, hermetically sealed, etc.
- Load: resistive, inductive, other
- Accuracy: repeatability, calibration requirements
- Monitoring: local, remote
- Mounting: vertical, horizontal
- Materials: enclosure, sensor, switch, etc.
- Visual display: status, power on, etc.
- Sensor type: RTD, integrated circuit, thermistor, thermocouple, etc.
- Temperature: range to be measured, maximum operating temperature, storage temperature, etc.

- Life expectancy: time in service, number of cycles
- Electrical connection: terminal block, conduit, etc.
- Physical: size, weight, etc.
- Power input: 120/240VAC, 12/24VDC, current, etc.
- Environmental conditions: shock, vibration, explosion, corrosiveness, temperature, humidity, RFI, etc.
- Other: temperature surge protection, test button, reset button, etc.

Mercury Temperature Switches

Description

The temperature switch employs a temperature responsive sensor, which is coupled to the mechanical means of actuating a mercury switch. The temperature responsive sensor is typically either a thermocouple, resistance temperature detector (RTD), or gas actuated bourdon tube. The mercury content reported by manufacturers to IMERC for temperature switches was in the range of greater than 1,000 mg.

Cost

The cost of a mercury temperature switch is approximately $150 to $250 depending on product or application requirements. For one manufacturer, the cost of a temperature switch with a snap action switch is less than the cost of a mercury temperature switch with the same functionality.

Advantages/Disadvantages

The mercury temperature switch has high reliability and long operational life because it has few components and is not subject to arcing. Life cycle testing has been successfully conducted for more than one million cycles. The mercury temperature switch can handle a high inductive load, has a quiet operation, has no bounce on contact, and can be hermetically sealed to provide increased protection from various environmental factors.

The mercury temperature switch contains mercury, which is becoming less desirable for many applications including the food and beverage industry.

Manufacturers

The following table lists a manufacturer of mercury temperature switches.

Manufacturer Name	Product	Phone Number & Website
Dwyer Instruments (Mercoid)	M-51, FM, DA-36, DA-37 Series	219-879-8000 www.dwyer-inst.com

Alternative 1: Mechanical Temperature Switches

Description

The mechanical temperature switch employs a temperature responsive sensor, which is coupled to the mechanical means of actuating a mechanical switch. The temperature responsive sensor can typically be a thermocouple, bulb and capillary, resistance temperature detector (RTD), welded alloy, or gas actuated bourdon tube.

Cost

The cost of a mechanical temperature switch is approximately $8 to $600 depending on product or application requirements. For one manufacturer, the cost of a temperature switch with a snap action switch is less than the cost of a mercury temperature switch with the same functionality.

Advantages/Disadvantages

The mechanical temperature switch has high reliability, long operational life, and can handle high inductive loads. The reliability and accuracy of a mechanical temperature switch is largely dependent on the sensor technology used.

The mechanical temperature switch provides similar functionality to the mercury temperature switch without the attendant mercury management issues.

Manufacturers

The following are manufacturers of mechanical temperature switches:

Manufacturer Name	Product	Phone Number Website
Barksdale, Inc.	THR, TPR, T1X, L1X Series	800-835-1060 www.barksdale.com
Chromalox	AR, ARR, and 3000 Series	800-443-2640 www.chromolox.com
Custom Control Sensors, Inc.	6900 and 604 Series	818-341-4610 www.ccsdualsnap.com
Dwyer Instruments (Mercoid)	RRT, D-7435, DA-36, and DA-37 Series	219-879-8000 www.dwyer-inst.com
Kidde-Fenwal, Inc.	Series 15000, 16000, 17000, and 18000	508-881-2000 www.fenwalcontrols.com
Kobold	TWR and TRS Series	800-998-1020 www.kobold.com
Neo-dyn/ITT Industries	Series 100T and 132T	661-295-4000 www.neodyn,com
Selco	S200 and SIO Series	800-257-3526 www.selcoproducts.com
United Electric Controls	55 Series C54S-103 B54-103	617-926-1000 www.ueonline.com
Weed Instrument	Model PR7 Series	800-880-9333 www.weedinstrument.com

Alternative 2: Solid State Temperature Switches

Description

The solid-state temperature switch utilizes temperature coefficient thermistors, RTDs, or integrated circuits sensor to monitor temperature, and a semiconductor for the switching output.

Cost

The cost of a solid-state temperature switch is approximately $350 to $600 depending on product or application requirements. The cost of a solid-state temperature switch is generally higher than the cost of a mercury or mechanical temperature switch.

Advantages/Disadvantages

The use of solid-state technology provides improved accuracy, repeatability, and reliability as compared with mechanical or mercury temperature switches. Switching point, hysteresis, and other parameters are often field programmable. Solid-state temperature switches provide tighter control that can increase the life of controlled equipment. Solid-state temperature switches operate with low voltage and low current consumption. Solid-state temperature switches do not require calibration.

Solid-state temperature switches usually have a higher initial cost than mechanical or mercury temperature switches.

Manufacturers

The following are manufacturers of solid-state temperature switches:

Manufacturer Name	Product	Phone Number Website
Kobold	TDD – 2, TDD - 4	800-998-1020 www.kobold.com
Maxitronic	HB Series	800-659-8520 www.maxitronic.com
Seiko Instruments USA	S-8130AC Series	310-517-7771 www.seiko-usa-ecd.com

Manufacturer Name	Product	Phone Number Website
United Electric Controls	D1C2L1N, D1C2L2A, D1A2L1N	617-926-1000 www.ueonline.com

Summary

There are numerous mercury free alternative technologies currently in use for temperature switch products and applications. It appears that these mercury free alternatives are cost competitive and can meet the functional requirements for new temperature switch products and applications. However, these mercury free alternatives may not meet the requirements for retrofitting all existing temperature switch products and applications.

4.16 Relays

A relay is an electrically controlled device that opens or closes electrical contacts to effect the operation of other devices in the same or another electrical circuit. Relays are often used to switch large current loads by supplying relatively small currents to a control circuit. There are two general families of relays: electro-mechanical and semiconductor. Electro-mechanical relays include mercury displacement, mercury wetted reed relay, mercury contact relay, dry reed relay, and other miscellaneous electro-mechanical relays. Semiconductor relays include solid-state relays and silicon controlled rectifiers.

A relay is a versatile component used to meet the needs of hundreds of varied products and applications. A relay can be incorporated into a product (e.g. copiers, heaters, conveyors, etc.), or can be purchased as a component to be used in a customer specific application (e.g. petrochemical processing). Examples of some relay products and applications are provided below:

- Commercial aircraft: power control, master power switches, motor control switching, heavy current load switching, instrument panel, generator switching, alternator power switching, antenna changeover, channel selection, etc.
- Air conditioning and heating equipment: compressor motors, fan motors, coolant pump motors, duct heaters, etc.
- Lighting controls: street lamps, dimmer controls, parking lots, scoreboards, high intensity lamps, traffic signals, tungsten lamps, etc.
- Telecommunications: trunk switching, test panels, telecomm circuit boards, load switches, radio base stations, ground start, input/output cards, control panel exchanges, antenna switches, loop current test, etc.
- Hospitals: surgical equipment, X-ray machine control, energy management systems, surgical lighting, etc.
- Food Industry: food processing, deep fryers, pizza ovens, baking ovens, electric grills, dishwashers, etc.
- Office equipment: copiers, computer power supplies, blue print machines, etc.
- Manufacturing: injection molding machines, kilns, ink heating, vacuum forming, soldering systems, semiconductor processing, programmable logic controllers, etc.
- Production test equipment: component testers, cable testers, circuit testing, etc.
- Laboratory test instruments: voltmeters, ohmmeters, recorders, environmental chambers, etc.
- Machine tool control: solenoid operated valves, heavy motor starting, signal lights, etc.

- Miscellaneous: mining equipment, pool heaters, dry cleaning equipment, notebook computers, ceramic heaters, industrial furnaces, alarm systems, battery chargers, farm incubators, chemical tank heaters, film packaging, glass furnaces, engraving equipment, plastic extruders, steam generators, automobiles, printing machines, silicon carbide heaters, controlled rectifiers, graphite heaters, infrared dryers, book binding machines, trucks, conveyors, appliances, missiles, aerospace, petrochemical processing, coin operated machines, ships, laboratory baths, flask heaters, robotics, packaging machines, pharmaceutical processes, textiles, paper & pulp drying, infrared ovens, high temperature materials processing, electric ranges, multiplexers, communication modules, modems, data access arrangement circuits, etc.

The global market for relays was $4.658 billion in 2001 revenues. Approximately 89.1% of these revenues were for electromechanical relays and 10.9% was for semiconductor relays. The three largest industry applications were telecommunications (25.3%), transportation (18.4%), and industrial automation (12.4%).

There are numerous design parameters that affect the specification and selection of a relay for a particular application. The following is a concise listing of some of the more critical factors:

- Mounting: printed circuit board, din rail, bracket/flange mount, socket/plug-in style, surface mount, etc.
- Reliability: failure rate, mean cycles before failure (MCBF), etc.
- Enclosure: open, National Electrical Manufacturers Association (NEMA), hermetically sealed, etc.
- Pole specifications: single pole, double pole, triple pole, etc.
- Throw specifications: single throw, double throw, etc.
- Isolation: optically isolated, etc.
- Contact ratings: maximum switching current (amps), maximum switching voltage, maximum switching power
- Contacts: normally open, normally closed, contact material, etc.
- Materials: contacts, insulation, soldering fluxes, finishes, etc.
- Regulatory approval: Underwriters Laboratories, Canadian Standards Association, etc.
- Resistance: contacts, coil, insulation
- Voltage: Direct current or alternating current
- Load types: inductive, motor, lamp, etc.
- Load characteristics: inrush current, step up, ramp up, soft start, etc.
- Life expectancy: electrical components, mechanical components, controlled equipment, etc.
- Physical: weight, size, noise level, etc.
- Coil ratings: voltage range, resistance range, nominal power, etc.
- Performance specifications: make/operate time, break/release time, contact chatter, contact bounce, time delay, etc.
- Environment: operating temperature, shock, vibration, acceleration, humidity, etc.

- Control panel: space available, natural convection available, etc.

- Output device for solid-state relays: metal oxide semiconductor field effect transistor (MOSFET), silicon controlled rectifier, bipolar transistor, triac, etc.

- Other features: time delay, instrinsically safe, visual indicators, sealed enclosure, test button, latching controls, energy efficiency, etc.

Original equipment manufacturers that use relays as a component within their products or equipment were interviewed by Venture Development Corporation. They were asked to identify the most important criterion for their selection of relays in their products. The following table illustrates the results:

Table 4.6: Most Important Relay Product Selection Criteria

Product Selection Criteria	Percent of OEM Respondents Citing as Most Important
Reliability/Quality/Durability	41.4%
Contact Current Specifications	27.6%
Physical Characteristics	27.6%
Lifespan/Cycles	24.1%
Coil/Control Specifications	19.0%
Resistance Parameters	15.5%
Ease of Maintenance & Replacement	13.8%
Isolation Parameters	15.5%
Regulatory/Customer Requirements	10.3%
Energy Efficiency	3.4%
Other	12.1%

Source: Venture Development Corporation

4.16.A Mercury Displacement Relay

Description

The mercury displacement relay uses a metallic plunger device to displace mercury. The plunger is lighter than mercury so it floats on the mercury. The plunger also contains a magnetic shell or sleeve, so it can be pulled down into the mercury with a magnetic field. The plunger provides the same functionality in a mercury displacement relay as an armature in a mechanical relay. When the coil power is off, the mercury level is below the electrode tip and no current path exists between the insulated center electrode and the mercury pool. When coil power is applied the plunger is drawn down into the mercury pool by the pull of the magnetic field and the plunger centers itself within the current path. Upon removing the coil power, the buoyancy force of the mercury causes the plunger assembly to again rise to the starting position. This drops the level of the mercury and breaks the current path through the center electrode and the mercury pool.

The amount of mercury in mercury displacement relays varies considerably based on number of poles, current rating, termination requirements, and other factors. The mercury content reported by manufacturers to IMERC for relays was in the range of greater than 1,000 mg. The mercury can be released to the environment during product use. For example, if the load is short circuited, the MDR can burst. Some manufacturers offer free take-back programs for their mercury relays.

Mercury displacement relays are used in high current, high voltage applications such as industrial process controllers, power supply switching, resistance heating, tungsten lighting, welding, high current/voltage lighting, flood lights, copiers, battery chargers, energy management systems, and industrial ovens.

Cost

The cost of a mercury displacement relay is approximately $20 to $150 depending on product or application requirements. The cost of a mercury displacement relay is comparable with other electromechanical relays. The cost of a mercury displacement relay is less than a solid state relay for low current applications, but cost becomes comparable for higher current applications.

Advantages/Disadvantages

Mercury displacement relays have hermetically sealed contacts that provide internal and external protection from arcing and environmental abuse. The mercury rewets the contact electrode providing a new contact surface with each actuation, so the surface does not pit or weld. Mercury displacement relays can cycle faster than a mechanical relay, and have low contact resistance because large electrodes and surrounding mercury volume creates large contact mating areas. Mercury displacement relays have quiet operation because acoustical noise from rebounding contacts is eliminated. Mercury displacement relays have long life because they contain one moving part and no pivots, hinges, pins or mechanical linkages resulting in limited wear. Mercury displacement relays last on average between 1,000,000 to 10,000,000 cycles. Factors that affect the longevity of the relay include: voltage being switched, ratio of line voltage to rated voltage, and number of cycles per hour. Mercury displacement relays have bounce free operation because the mercury surface tension enable the mercury to bridge the contacts during the plunger settling time.

Mercury displacement relays need to be mounted in a specific orientation in order for the mercury to function properly. Mercury displacement relays can burst, causing an on-site hazardous waste problem, if the relay is overheated due to rapid cycling or if the load is short-circuited. In addition, disposal of worn out contactors can be expensive. Control of equipment is limited compared with solid-state relays. Thermal shock can occur for the equipment being controlled by the relay.

Manufacturers

The following are manufacturers of mercury displacement relays:

Manufacturer Name	Product	Phone Number & Website
Chromalox	HGR series	800-443-2640 www.chromolox.com
Magnecraft & Struthers-Dunn	WM and WML Series	843-393-5778 www.magnecraft.com
Mercury Displacement Industries Inc.	Numerous models	616-663-8574 www.mdius.com
Watlow Electronic Manufacturing Company	HG Series	507-454-5300 www.watlow.com

4.16.B Mercury Wetted Reed Relay

Description

A mercury wetted reed relay is a type of electro-mechanical relay that employs a hermetically sealed reed switch. The reeds are thin flat ferromagnetic blades that serve as a contact, spring, and magnetic armature. The mercury wetted reed relay consists of a glass encapsulated reed with its base immersed in a pool of mercury and the other end capable of moving between two sets of contacts. The mercury flows up the reed by capillary action and wets the contact surface of the reed and the stationary contacts. The mercury wetted reed relay is usually actuated by a coil around the capsule.

Wetted mercury reed relays are typically small circuit controls that are used in electronic devices for switching or signal routing functions. Reed relays are primarily used in test, calibration, and measurement equipment applications where stable contact resistance over the life of the product is necessary.

Cost

Prices for the mercury wetted reed relay ranged from approximately $10 for printed circuit board mounted low amperage devices, to $40 for larger 5 amp devices. For one manufacturer, the cost of mercury wetted relay was the same as a dry magnetic reed relay for a similar device. For another manufacturer, the cost of a mercury wetted relay was double the cost of a dry magnetic reed relay for a similar device. Overall,

prices for mercury wetted relays appear to be comparable to prices for dry reed relays. However, life cycle costs are higher for the mercury wetted reed relay due to the higher costs associated with shipping, management, and disposal of the mercury containing device.

Advantages/Disadvantages

Hermetically sealed contacts in a clean atmosphere are unaffected by dust, corrosion, or oxidation, and also eliminate the opportunity for sticking, binding, or wearing of hinged joints. With proper circuitry, magnetic reed relays can offer a life span in excess of one billion operations. The mercury wetted reed relay can operate in the millisecond range. Although slower than solid-state relays, reed relays are sufficiently faster than other electro-mechanical relays and therefore can be used in high speed switching applications. When compared to solid-state relays, the necessary coupling circuitry between the logic and input and output devices is less complicated and less expensive for reed relays. The mercury wetted reed relay has the following advantages over a dry reed relay: no contact bounce, longer life, and lower contact resistance.

Reed relays used for inductive loads such as motors, relay coil, solenoids, etc., are subject to high induced voltages during opening of the load circuit contacts. This high transient voltage may cause damage to the reed switch or significantly reduce its life. Reed relays used for capacitive loads such as capacitors, incandescent lamps or long cables, are subject to high surge/inrush current. Therefore, protective circuits such as surge suppressors or current limiting resistors are often used. Reed relays located near sources of strong magnetic interference such as steel plates, transformers, etc. can experience changes in operational characteristics and false operation is likely. The wetted mercury reed relay must be mounted in the vertical position for proper operation.

Mercury wetted reed relays can be replaced by dry reed magnetic relays for most applications with the exception of applications that require no contact bounce, long operational life, or low contact resistance.

Manufacturers

The following are manufacturers of mercury wetted reed relays:

Manufacturer Name	Product	Phone Number & Website
American Relays, Inc.	Numerous DIP, SIP, and encapsulated, models	562-944-0447 www.americanrelays.com
Celduc Relais (France) Laube Technology – US Representative	F81A, F72C2 Series	Laube Technology: 805-388-1050 www.celduc-relais.com
Computer Components, Inc.	Numerous models	800-864-2815 www.relays-unlimited.com
Crydom Magnetics (UK)	DIP Series	Crydom USA 619-210-1600 www.crydom.co.uk
Meder Electronic, Inc.	MRE and MT Series	800-870-5385 www.meder.com
SRC Devices	MSS Series, HGWM Series	858-292-8770 www.srcdevices.com

4.16.C Mercury Contact Relay

Description

The mercury contact relay establishes contact between electrodes in a sealed capsule as a result of the capsule being tilted by an electro-magnetically actuated armature, either on pickup or dropout. No manufacturers were identified that currently produce this type of mercury relay, and therefore there will be no further coverage of this type of relay in this report.

Alternative 1: Dry Magnetic Reed Relay

Description

A dry magnetic reed relays consists of a pair of low reluctance, ferromagnetic, slender flattened reeds. These reeds are hermetically sealed into a glass tube with a controlled atmosphere in cantilever fashion so that the ends align and overlap with a small air gap. Since the reeds are ferromagnetic, the extreme ends will assume opposite magnetic polarity when brought into the influence of a magnetic field. When the magnetic flux density is sufficient, the attraction force of the opposing magnetic poles overcomes the reed stiffness causing them to flex toward each other and make contact. This operation can be repeated millions of times at extremely high speeds. Energizing the coil sets up a magnetic field that acts in the same manner as the permanent magnet. At the contact area, these relays are usually plated with rhodium, ruthenium, or gold to provide a low contact resistance when they meet.

Dry magnetic reed relays are typically small circuit controls that are used in electronic devices. Reed relays are primarily used in test, calibration, and measurement equipment applications where stable contact resistance over the life of the product is necessary.

Cost

The cost of dry magnetic reed relays are approximately $2 to $15 depending on product or application requirements. For one manufacturer, the cost of mercury wetted relay was the same as a dry magnetic reed relay for a similar device. For another manufacturer, the cost of mercury wetted relay was double the cost for a dry magnetic reed relay for a similar device.

Advantages/Disadvantages

The dry magnetic reed relay has long operational life, fast cycling time, no mercury life cycle impacts to address, and can be mounted in any position for proper operation.

The dry magnetic reed relay experiences similar effects from electromagnetic interference as the mercury wetted reed relay. Exposure to high voltage may cause the contacts to weld together. The dry magnetic reed relay has more contact bounce than mercury wetted reed relays, shorter operational life than mercury wetted reed relays, and has higher contact resistance than the mercury wetted relay.

Manufacturers

The following are manufacturers of dry magnetic reed relays:

Manufacturer Name	Product	Phone Number & Website
American Relays, Inc.	Numerous models	562-944-0447 www.americanrelays.com
Celduc Relais (France) Laube Technology – US Representative	D31 and D41 Series	Laube Technology: 805-388-1050 www.celduc-relais.com
Computer Components, Inc.	Numerous models	800-864-2815 www.relays-unlimited.com
Coto Technology	Numerous models	401-943-2686 www.cotorelay.com
Crydom Magnetics (UK)	S Series	Crydom USA 619-210-1600 www.crydom.co.uk
Magnecraft & Struthers-Dunn	W107 Series	843-393-5778 www.magnecraft.com
Meder Electronic, Inc.	H, LI, HE, MRX, MT and other series	800-870-5385 www.meder.com
NTE Electronics, Inc.	R56 Series	973-748-5089 www.nteinc.com
SRC Devices	Series DSS4 and PRMA	858-292-8770 www.srcdevices.com

Alternative 2: Other Electro-Mechanical Relays

Description

There are several classifications of electro-mechanical relays including mercury

displacement, mercury wetted reed, dry reed, and other electro-mechanical relays. This section will focus on the other electro-mechanical relays that include general purpose, definite purpose, heavy duty, and printed circuit board mounted relays. Most electromechanical relays are driven electro-magnetically, by passing a current through a coil and generating a magnetic flux. This flux then causes an armature to move prompting isolated electrical contacts to open or close.

Cost
The cost for other electro-mechanical relays is approximately $1 to $35 depending upon product or application requirements. As the power level requirement goes up, the price for other electro-mechanical relays rises and they become less cost competitive with solid-state relays.

Advantages/Disadvantages
Other electro-mechanical relays are often used as safety devices because of the complete mechanical break in the electrical circuit, whereas solid-state units are subject to leakage current. Other electro-mechanical relays are often selected because of their low initial cost. Electromechanical relays are desirable when electrical interference is likely to be present or when low heat dissipation is required.

Other electro-mechanical relays will typically wear out either mechanically or electrically within several hundreds of thousands of cycles. This is a shorter operational life than for either mercury or solid-state relays. Labor costs and production down time to change a failure are significant when selecting this type of relay for high cycling applications. Other electro-mechanical relays also have a slow cycle time. Therefore, the control of equipment is poor for many sensitive applications. The controlled equipment may be damaged and heater life can be shortened due to thermal shock.

Manufacturers
The following are manufacturers of other electro-mechanical relays:

Manufacturer Name	Product	Phone Number & Website
Chromalox	CONT Series	800-443-2640 www.chromolox.com
Computer Components, Inc.	Numerous models	800-864-2815 www.relays-unlimited.com
Magnecraft & Struthers-Dunn	W199 Series	843-393-5778 www.magnecraft.com
Meder Electronic, Inc.	TC Series	800-870-5385 www.meder.com
NTE Electronics, Inc.	R10 Series	973-748-5089 www.nteinc.com
Omron Electronics	MJN and MGN Series	847-882-2288 www.omron.com
SRC Devices	LM Series	858-292-8770 www.srcdevices.com
Teledyne	Numerous models	800-284-7007 www.teledynerelays.com

Alternative 3: Solid State Relay

Description
A solid-state relay is a semiconductor, electronic switching device that operates a load circuit without the use of physical mechanical contacts. The solid-state relay contains an input circuit, an opto-coupler chip, and an output circuit designed to switch either an alternating current or direct current voltage. Solid state relays control power by switching on and off at the zero cross point.

Cost
The cost of a solid-state relay is approximately $1 to $150 depending on product or application requirements.

Advantages/Disadvantages
Solid state relays provide the following advantages: very long operational life, immunity

to electromagnetic interference, lower power consumption, high operating speeds, bounce-free operation, low level control signals, small package size, and multi function integration. The printed circuit board mounted solid-state relay has a tremendous size advantage over the electromagnetic relay, resulting in critical printed circuit board space savings. The solid-state relay is also more immune to physical shock, vibration, and damage. Solid-state relay operational testing by one manufacturer resulted in a mean time between failure (MTBF) of thirty-three years. Compared to the dry reed relay, the solid-state relay has no contact bounce, and longer operational life.

Solid-state relays experience voltage drops across the device resulting in heat generation. The more current put through the device, the greater the quantity of heat that needs to be dissipated. Overheating protection is usually provided by heat sinks or cooling fans. Solid-state relays require proper fusing for short circuit protection. Solid-state relays also may require protection from transient voltage spikes. This is usually provided by metal oxide varistors. Solid-state relays only turn circuits on or off, resulting in controlled equipment receiving either full current or no current. Some solid-state relay manufacturers use infrared light emitting diodes (LEDs) made of gallium/aluminum/arsenic to control the optically coupled input. The solid-state relay experiences current leakages, and the contact resistance is typically higher than mercury wetted relays.

Manufacturers

The following are manufacturers of solid-state relays:

Manufacturer Name	Product	Phone Number & Website
ABB SSAC	Numerous models	315-638-1300 www.ssac.com
Carlo Gavazzi (Switzerland) U.S. Rep - Allied	RN and RS1A Series	Allied: 800-433-5700 www.carlogavazzi.com
Celduc Relais (France) Laube Technology – US Representative	SC Series	Laube Technology: 805-388-1050 www.celduc-relais.com
Chromalox	7750 Series	800-443-2640 www.chromolox.com
Clare	CPC, LCA Series	978-524-6700 www.clare.com
Computer Components, Inc.	Numerous models	800-864-2815 www.relays-unlimited.com
Continental Industries Inc.	SV, RS, and RV Series	703-669-1306 www.ciicontrols.com
Crouzet Corporation	84132 and 84130 Series	972-471-2555 www.crouzet.com
Crydom Magnetics (UK)	H12 Series	Crydom USA 619-210-1600 www.crydom.co.uk
International Rectifier	PV Series	310-322-3331 www.irf.com
NTE Electronics, Inc.	RS1 and RS3 Series	973-748-5089 www.nteinc.com
Solid State Optronics, Inc.	Numerous models	888-377-4776 www.ssousa.com
Teledyne	C3P24D25 Model	800-284-7007 www.teledynerelays.com
Tyco Electronics	SSRD, SSRQ, and SSRT Series	800-468-2023 www.relay.tycoelectronics.com
Vishay	LH Series	402-563-6866 www.vishay.com
Watlow Electronic Manufacturing Company	SSR Series	507-454-5300 www.watlow.com

Alternative 4: Silicon Controlled Rectifiers

Description

The silicon controlled rectifier functions as a switch that can rapidly turn power on or off in a variety of applications. The silicon controlled rectifier is made up of four layers of semiconductor material. Silicon controlled rectifiers can deliver electrical power to controlled equipment in several ways:

- Phase-angle-fired controls – Provides smooth, variable application of power to heaters.
- Zero-voltage switching controls – Proportionally turns on and off each full cycle of the power line.
- On/off controls – Function similar to electro-mechanical or mercury relays, but has much faster cycle times.

Cost

The cost of a silicon controlled rectifier is approximately $30 to $150 depending on product or application requirements. The cost of silicon controlled rectifiers is higher than electro-mechanical relays at low power, but becomes more comparable with electromechanical relays at mid to high power levels.

Advantages/Disadvantages

The silicon controlled rectifier is an extremely fast switch that can be cycled in milliseconds. Silicon controlled rectifiers offer the following advantages: improved response time, closer process control, extended life of controlled equipment, reduced maintenance costs, silent operation, and reduced peak power consumption. The level of process control that can be achieved with a silicon controlled rectifiers is unattainable with any other relay type. Silicon controlled rectifiers are excellent for addressing high inrush current, soft start, step up, ramp up, or other applications where variable power is required and satisfied by using phase angle functionality.

The silicon controlled rectifier needs to be physically disconnected before servicing controlled equipment, and has heat dissipation requirements. The silicon controlled rectifier costs more than other relays for low current applications.

Manufacturers

The following are manufacturers of silicon controlled rectifiers:

Manufacturer Name	Product	Phone Number & Website
Avatar Instruments	A1P, A3P, B, C1P, D, CZ, and R Series	610-543-5155 www.avatarinstruments.com
Carlo Gavazzi (Switzerland) U.S. Rep - Allied	RM1A and RE Series	Allied: 800-433-5700 www.carlogavazzi.com
Chromalox	4001 SCR Series	800-443-2640 www.chromolox.com
Tyco Electronics	SSR Series	800-468-2023 www.relay.tycoelectronics.com
Watlow Electronic Manufacturing Company	DIN-A-MITE Series	507-454-5300 www.watlow.com

Alternative 5: Hybrid (Electro-mechanical and Solid-State)

Description

Hybrid relays combine electromechanical and solid-state technologies, offering the advantages of both without the disadvantages associated with either individually. The switching of a hybrid relay is controlled by a microprocessor. When switched on, the circuit is closed by the solid-state element and the load energized, while absorbing transient peaks. The solid-state

element is then short-circuited a few milliseconds later by an electromechanical relay contact, which maintains the load. The reverse cycle operates when the control signal disappears and the circuit is de-energized. The hybrid power relay is designed to cycle power on and off for a variety of applications including heating, ventilation, air conditioning and lighting.

Cost

The cost of a hybrid relay is approximately $40 to $140 depending on product or application requirements. One manufacturer prices its hybrid relay slightly less than its mercury displacement relay with comparable functionality.

Advantages/Disadvantages

By combining solid state and electromechanical relay technology, the hybrid relay eliminates the internal heating effect caused by current flow through electronic power components. This eliminates the need for integrated heat sinks and consequently reduces the physical size of the relay. The hybrid relay provides a long operation life, often greater than five million cycles. The hybrid relay has a virtually silent operation, enabling the relay to be mounted in noise sensitive areas.

A wide range of hybrid relays is not currently available to meet all design parameters. However, the hybrid relay is a good alternative for retrofitting mercury relays when the hybrid relay can cover the necessary design parameters.

Manufacturers

The following are manufacturers of hybrid relays:

Manufacturer Name	Product	Phone Number & Website
Carlo Gavazzi (Switzerland) U.S. Rep - Allied	RZ Series	Allied: 800-433-5700 www.carlogavazzi.com
Crouzet Corporation	84138 Series	972-471-2555 www.crouzet.com
Watlow Electronic Manufacturing Company	E-Safe Relay	507-454-5300 www.watlow.com

Summary

There are numerous mercury free alternative technologies currently in use for relay products and applications. It appears that these mercury free alternatives are cost competitive and can meet the functional requirements for most, but not all new relay products and applications. In addition, these mercury free alternatives may not meet the requirements for retrofitting existing relay products and applications in some circumstances.

4.17 Flame Sensor

Mercury Flame Sensor

Description

Flame sensors are used as a safety device in gas appliances. The flames sensor will stop the flow of gas if there is no heat being produced by an open flame meaning the pilot light is out, or the product is malfunctioning. The mercury within the bulb of the sensor vaporizes and expands when the pilot light is on causing the gas valve to open.

Cost

The difference in cost of flame sensors as a component is difficult to find. One cost comparison made was between gas ranges that contain a mercury flame sensor and those that have an electronic ignition system. The prices were comparable ranging from $300 up to $1000. A low-end quality name gas range with an electronic ignition and a gas range with a mercury flame sensor were both around $300. The leading manufacturer of mobile home products also offers an electronic ignition system in its ranges and hot water heaters. No cost difference was noted in any product literature, and almost every model manufactured was offered either as electronic ignition flame detection or a mercury flame sensor.

Advantages/Disadvantages

The mercury flame sensor provides the safety of controlling the flow of gas when no flame is lit. This prevents natural gas from leaking out and creating a serious situation. A majority of the manufacturers identified offered an electronic ignition flame detection unit that does not use mercury in its sensor.

Manufacturers

The following are manufacturers of mercury flame sensors:

Manufacturer Name	Product	Phone Number & Website
Andy Baumen Associates, Ltd.	Mercury Flame Sensor	1-800-387-817 www.andybaumenltd.com
Channel Products Inc.	Mercury Flame Sensor	440-423-0113
Key Gas Components	Mercury Flame Sensor	216-881-1300 www.keygas.com
White-Rodgers	Mercury Flame Sensor	314-577-1300 www.white-rodgers.com
Fenwal	Mercury Flame Sensor	508-881-2000 www.fenwalcontrols.com
Derlite Limited	Mercury Flame Sensor	44-1208-72565 www.derlite.com
Harper-Wyman Co.	Mercury Flame Sensor	630-870-3300 www.harper-wyman.com
Invensys Appliance Controls	Mercury Flame Sensor	804-756-6524 www.invensys.com
Johnson Controls	Mercury Flame Sensor	414-524-1200 www.johnsoncontrols.com
Major International	Mercury Flame Sensor	847-593-0796 www.majorinternational.com
Sit La Precisa S.p.A.	Mercury Flame Sensor	+39-049-8293111 www.sitgroup.it

Alternative 1: Electronic Ignition System

Description

Using an electronic ignition system in gas appliances eliminates the need for a standing pilot light. The electronic ignition sparks when the gas is turned on to ensure rapid lighting of gas and to prevent gas discharge before sparking.

Cost

The difference in cost between a range with an electronic ignition and the cost of a range with a mercury flame sensor is negligible. A low end quality name gas range with an electronic ignition starts at $300 and can run up to $1000. A majority of the manufacturers identified offered an electronic ignition flame detection unit that does not use mercury in its sensor.

The leading manufacturer of mobile home products also offers an electronic ignition system in its ranges and hot water heaters. No cost difference was noted in any product literature, and almost every model manufactured was offered either as electronic ignition flame detection or a mercury flame sensor.

Advantages/Disadvantages

One key concern when using an electronic ignition gas product is the fact that electricity must be present in order to light the appliance. In remote areas where electricity is not offered safety becomes a concern. The electronic ignition flame detection products can still be lit without electricity, but offer no safety to control the gas flow. The mercury flame sensors do not require electricity to function, but ensure the detection of a flame and the control of gas flow. The electronic ignition system ranges do not contain any mercury containing devices or sensors, and are a good alternative.

Manufacturers

The following are manufacturers of electronic ignition systems:

Manufacturer Name	Product	Phone Number & Website
Andy Baumen Associates, Ltd.	Electronic Flame Sensor	1-800-387-817 www.andybaumenltd.com
Ventronics, Inc.	Electronic Flame Sensor	908-272-9262 www.ventronicsinc.com
Trivar Inc.	Electronic Flame Sensor	905-671-1744 www.trivar.com
Steelman Industries, Inc.	Electronic Flame Sensor	903-984-3061 www.steelman.com
Capable Controls	Electronic Flame Sensor	630-860-6514
Derlite Limited	Electronic Flame Sensor	44-1208-72565 www.derlite.com
Harper-Wyman Co.	Electronic Flame Sensor	630-870-3300 www.harper-wyman.com
Invensys Appliance Controls	Electronic Flame Sensor	804-756-6524 www.invensys.com
Johnson Controls	Electronic Flame Sensor	414-524-1200 www.johnsoncontrols.com
Major International	Electronic Flame Sensor	847-593-0796 www.majorinternational.com
Sit La Precisa S.p.A.	Electronic Flame Sensor	+39-049-8293111 www.sitgroup.it

Summary

The electric ignition system is a cost effective and functional replacement for the mercury flame sensor. Electronic ignition systems are currently in use for many applications. In remote areas where electricity is intermittent or unavailable, the electronic ignition system is not a safe alternative to the mercury flame sensor.

5.0 Conclusions and Recommendations

5.1 Conclusions

Researching alternatives to the priority mercury added products showed that many of these mercury-containing products can be replaced with non-mercury products of equal or greater functionality at comparable costs.

For most priority products examined in this study, at least one manufacturer of the mercury free alternative was identified where the cost differences between mercury and non-mercury technologies were minimal. The research findings suggest that many non-mercury alternatives are available to address the full range of functions required by consumer products.

Examples of some product specific mercury replacement programs were discussed in the findings section of this report. In addition, there are mercury replacement programs that address multiple mercury containing products. For example, the Mercury Pollution Prevention Initiative involves three Indiana steel mills that are inventorying mercury containing products, identifying non-mercury alternatives, and replacing the mercury products with non-mercury alternatives. Products included in this effort are barometers, manometers, hydrometers, pyrometers, thermometers, thermostats, pressure switches, tilt switches, float switches, and relays. The inventory effort identified approximately one thousand pounds of mercury in equipment and devices at these three steel mills. The three mills have committed to a reduction of 330 pounds of mercury in equipment by the end of 2000, a reduction of 660 pounds by the end of 2004, and a reduction of 900 pounds by the end of 2008. (Delta Institute, 2001)

Legislation to address mercury containing products has been in existence since the early 1990s. In 1993, Sweden banned or phased-out the manufacture, import, or sale of thermometers, barometers, manometers, tilt switches, float switches, pressure switches, thermostats, relays, and other types of measuring instruments. Some exemptions remain for spare parts of existing products and applications. Other European countries have banned or restricted the import, sale, and/or use of various mercury containing products. (UNEP, 2002)

In the United States, there is legislation at the state level to address the sale of various mercury containing products. For example, Rhode Island and Connecticut have recently adopted into law mercury product phase-out legislation based on the NEWMOA Mercury Model Legislation.

Sphygmomanometers
Alternatives to mercury sphygmomanometers are available from a number of manufacturers. The basic function and purchase price of the aneroid (dial) sphygmomanometer appear to be comparable to that of the mercury sphygmomanometer. A relatively new class of electronic blood pressure monitors is also now available. This type of device, with an entry level price of approximately $700 (roughly five times the cost of the least expensive mercury gauge), is promoted as being more forgiving of operator technique and providing more comprehensive information about blood pressure.

Esophageal (Bougie) Tubes
Tungsten gel-filled bougies are readily available from medical device manufacturers and appear to be quite acceptable to practitioners.

Gastrointestinal Tubes
The research suggests that gastrointestinal tubes are not widely used and tubes seem to be consistently sold empty of mercury. Thus, a facility electing to use these tubes would supply its own mercury for weighting. One manufacturer advised using sterile water for weighting, although it may result in a longer time for the medical procedure.

Manometers
Mercury manometers can be replaced by digital or vacuum gauge manometers. Both alternatives are available and cost competitive. The digital manometer is very accurate, and routine

calibration of the digital manometer will ensure its accuracy.

Basal thermometers
Mercury free basal thermometers are readily available and it appears that digital and liquid-in-glass alternatives would be functional and acceptable to consumers. The digital basal thermometers offer features that the mercury thermometers lack: easy-to-read digital display, beep upon achieving maximum temperature, and memory functionality. One supplier offers a liquid-in-glass thermometer that is similar in appearance and function to a mercury basal thermometer. Although mercury-free basal thermometers are slightly more expensive than the mercury counterpart (by a few dollars), this is an infrequent purchase and is in the same price range as some single-use fertility related products (e.g. over-the-counter pregnancy test kits).

Thermometers (other non-fever)
Many viable alternatives exist to the mercury thermometer for multiple applications. The alternatives to mercury thermometers are widely available in the United States, have been in use and are considered to be comparable in accuracy to mercury thermometers. The overall cost to switch from mercury to non-mercury is minimal.

Barometers
Aneroid barometers can be manufactured with or without mercury. Some digital barometers can perform other tasks, and therefore cost more. The digital barometer can be very inexpensive if it is only needed to perform the task of measuring atmospheric pressure. The aneroid and digital barometers appear to be cost competitive alternatives to the mercury barometer.

Hygrometers/Psychrometers
Both the hygrometer and psychrometer are used to measure the relative humidity. They both can be replaced with a spirit-filled thermometer instead of a mercury thermometer and provide the same functionality at similar costs.

Hydrometers
The hydrometer has many different applications; its primary use is in the beer and wine making industry. The use of a spirit filled hydrometer is preferable because it is reliable and cost competitive with the mercury hydrometer.

Flow Meters
During this study, no manufacturers of mercury flow meters were identified. The reliability of the digital flow meters and other mercury free flow meters are of high caliber, and are in use in numerous application.

Pyrometers
During this study, no manufacturers of mercury pyrometers were identified. The alternatives to a mercury pyrometer (used mainly in foundries to measure the temperature of extremely hot materials) include the digital pyrometer and the optical pyrometer. The optical pyrometer is manufactured for large industrial type foundries. The digital pyrometer seems to be a much more economical choice than the optical pyrometer for smaller foundries.

Thermostats
Rugged industrial thermostats are made to withstand explosions and extreme environmental conditions. The manufacturers of digital thermostats indicated that they are not designed for rugged industrial use, but can be used in low-level industrial applications. In some circumstances the mercury thermostat may be replaced with a digital thermostat. However, for extreme environmental conditions, the manufacturer should be contacted to help determine the appropriate technology.

Flame Sensors
The mercury containing flame sensor is used in many applications as a safety device to prevent the flow of gas when a pilot lamp is not lit. An alternative to the mercury flame sensor is the electronic ignition system. The electronic ignition system can be used in similar applications as the mercury flame sensor and is available for most products. The mercury flame sensor is often used in remote areas where

electricity is not always available. Without electricity the electronic ignition system cannot automatically light the pilot or range. The pilot or range can however be lit by hand, but this poses a safety issue.

Switches and Relays

There were many common findings and conclusions during this research for float switches, pressure switches, temperature switches, tilt switches, mercury wetted reed relays, and mercury displacement relays. The following is a summary of these similarities:

- These components are used in a wide range of products and applications.
- Numerous design parameters need to be considered prior to final component selection.
- Several different mercury free alternative technologies were identified to replace each of the mercury switches and relays.
- Several manufacturers were identified for most mercury free alternative technologies.
- Manufacturers of mercury containing products often provide mercury free alternatives.
- Manufacturers often provide more than one mercury free alternative technology.
- The mercury free technologies identified provide a variety of options for each major design parameter.
- Mercury free alternatives were identified to meet the needs from low cost, simple applications to higher cost, more demanding applications.
- Although, it is difficult to precisely compare pricing for the various switch and relay technologies because there are many design features and options available for each component, it appears that mercury and non-mercury switches/relays with similar functionality for many applications are comparable in price.
- At least one manufacturer was identified that produced both the mercury and non-mercury relay/switch with comparable functionality at comparable costs.

The key differences identified between the mercury switches and relays are as follows:

<u>*Switches:*</u> No design parameters for new switch products/applications were identified where the mercury containing component could not be replaced by a mercury free alternative for a comparable cost.

<u>*Relays:*</u> The majority of design parameters for new relay products/applications could be met by a mercury free alternative for a comparable cost. However, in some cases the design parameters could not be met by a mercury free alternative. For example, a mercury wetted reed relay application that requires long life, no contact bounce, and low contact resistance cannot be satisfied by any single mercury free alternative.

Mercury free alternatives appear to be available in the United States marketplace to meet the various design parameters that specify float, tilt, pressure, and temperature switches in new products and applications. Mercury free alternatives appear to be available in the United States marketplace to meet most, but not all, design parameters specifying the use of mercury wetted reed and mercury displacement relays in new products and applications.

Although there are readily available mercury free alternatives for new products and applications, complications can appear when retrofitting existing mercury switches or relays in existing products and applications. The relay or

switch component of an existing product or application can wear out and require replacement before the end of service life for the product or application. In some instances, the mercury switch or relay is embedded in an existing application in such a way that currently available mercury free alternatives cannot be retrofitted into the existing product or application. The following two scenarios illustrate this situation:

Retrofit Scenario 1: Mercury Tilt Switch
The Michigan based Clean Car Campaign initiated its "Switch the Switch" program in 2001 to replace mercury tilt switches with mercury free tilt switches in automobiles across the nation. This program used the metallic ball tilt switch to replace mercury tilt switches found in hood lights and trunk lights. This was a simple, drop-in exchange that took about ten minutes to accomplish.

Tilt switches are also used in antilock braking systems (ABS) for certain trucks and sport utility vehicles. However, the ABS system usually consists of two to three mercury tilt switches that are physically embedded in a plastic box that is integrated with the braking mechanism. Because of this complex design, there is not a simple drop-in mercury free tilt switch commercially available for retrofitting the ABS tilt switch system.

Retrofit Scenario 2: Mercury Displacement Relay
An industrial application utilizes a control panel populated with twenty mercury displacement relays to control on-site equipment that requires high current. This equipment also requires fast cycling for proper control. One of the mercury displacement relays fails, and there is now a need to replace this failed mercury relay in the existing control panel. A review of the mercury free alternatives reveals that a new mercury displacement relay may be the only cost effective option because of the following:

1) Solid-state relays and silicon controlled rectifiers have power dissipation issues that need to be addressed. These relays cannot be easily retrofitted to existing control panels because they may not fit in the available footprint, or there may not be enough ventilation to cool the device. In this case, a significant control panel retrofit expense would be required to accommodate the solid-state relay or silicon controlled rectifier.
2) A mercury free electro-mechanical relay may not be sufficient to meet the demands of this fast cycle application.
3) A dry reed relay may not be sufficient to meet the high current demands of this existing application.
4) The market for hybrid relays appears to not be mature enough to cover the other design parameters for this particular existing application.

As the two examples above illustrate, the retrofitting of mercury switches and relays in existing products or applications can present challenges. The cost of the relay or switch component is often a small fraction of the total cost of the product or application. In situations where a mercury free alternative cannot be used for retrofit purposes, it would be unreasonable and cost prohibitive to require the consumer to replace the entire product or retrofit the application.

Relays and switches are used in hundreds of existing products and applications. Each product or application would need to be examined on a case-by-case basis to determine if retrofitting with a non-mercury alternative is cost competitive. Therefore, it is not possible to specify situations in which retrofitting of existing products or applications is cost competitive without conducting further study of individual products and/or applications. However, there are certain common factors that could negatively affect the cost competitiveness of retrofitting with non-mercury alternatives. These factors include:

- Numerous switches and/or relays are combined to perform a particular function
- The switch or relay is integrated with other components of the product or application
- There are heat dissipation issues presented by using the mercury free alternative
- The physical size limitations of the product/application cannot be met by the mercury free alternative
- A custom-designed rather than off-the-shelf switch or relay is used to meet unique operating requirements

5.2 Recommendations

The product research conducted for this report suggests that there are cost competitive, viable non-mercury alternatives for a large majority of the priority mercury containing products. In most cases, the purchase price of an alternative is comparable to the mercury device and if the downstream costs are considered, mercury free alternatives can be considerably more cost effective. Additional information to assist with the transition to mercury free alternative products is provided in Appendix 3.

Non-mercury alternatives have been researched and recommended for the following products: sphygmomanometers, esophageal dilators, manometers, barometers, non-fever thermometers, hygrometers, psychrometers, hydrometers, flow meters, and pyrometers. The two products where alternative replacements cannot be recommended for all applications are gastrointestinal tubes and industrial thermostats. More research is needed to understand gastrointestinal tubes applications and the viability of mercury replacement.

It appears that digital thermostats cannot withstand the harsh environmental conditions demanded by certain industrial settings, and mercury thermostats are currently the only industrial type thermostats available that can perform effectively.

There are cost competitive, viable mercury free alternatives available and recommended for the following components of new products and applications: flame sensors, float switches, tilt switches, temperature switches, and pressure switches. The majority of design parameters for new relay products/applications could be met by a mercury free alternative for a comparable cost. However, in some cases the design parameters could not be met by a mercury free alternative. Also, the use of electronic ignition systems is not recommended to replace mercury flame sensors in remote areas where electricity is unavailable.

Mercury free alternatives were identified and recommended to meet the needs of retrofitting existing relay/switch products or applications. However, there are certain retrofit circumstances in which the cost implications preclude the use of the mercury free alternatives.

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Appendix 1: Medical Device Reports for Spilled Mercury

The United States Food and Drug Administration (FDA) regulates the use of medical devices in the United States. In 1990, the Medical Device Reporting (MDR) system was implemented as a mechanism for the Food and Drug Administration to receive significant medical device adverse events from manufacturers, importers and user facilities, so they can be detected and corrected quickly. The following MDRs demonstrated the potential for health or environmental problems with mercury in healthcare. In addition to remediation associated with the mercury release (both environmental and health related), each MDR requires investigation and documentation at the reporting facility, the manufacturer, and the FDA.

Date FDA Received Report	Reference & Description
05/09/2002	Baumanometer Stand-by Blood Pressure Machine "A blood pressure unit blew, **causing 2.5 ounces of mercury to vaporize**."
10/23/2000	Baumanometer "Glass tube containing mercury on Baumanometer cracked causing **mercury to spill** in facility."
01/05/2000	Rusch Maloney Esophageal Bougie "It is reported that the tip of the bougie broke off during use. Distal end was not retrieved at the time of the event. Upon removal of the device, it was noted that **mercury was leaking** from the broken end of the tube."
10/12/1999	Pilling-Weck Maloney Esophageal Dilator 24 Fr. "During procedure, a bougie dilator for esophagus was transected inside the stomach, **allowing mercury from the dilator to escape.**.. The bougie that was used for the procedure had been expired."
07/14/1999	Rusch Cantor Tube "It is alleged that a Cantor tube was inserted and **mercury instilled**. A subsequent x-ray indicated the **presence of mercury in the stomach**."

Appendix 2: Cost of Mercury Spills

Cost Estimate for Clean-up	Reference & Description
Small spill - $1000 Large spill - $tens of thousands	http://www.melg.org/mcea/rcbmcrmt.htm "Mercury Contamination Risk Control", Middle Cities Risk Management Trust, Okemos, MI " A typical thermometer contains ½ to 3 grams (.018 to .11 ounces) of mercury. A typical household mercury fever thermometer contains approximately 1 gram of mercury. A typical barometer contains 1 pound (454 grams) of mercury and poses a significant spill risk. The cost of cleaning up a spill will vary by the size of the spill and the degree of exposure to property and people. Small spill clean-ups usually cost around $1,000 and large spills can go into the tens of thousands of dollars."
3 oral fever thermometers - $5000 Not uncommon … to exceed $25,000	http://cc.ysu.edu/eohs/bulletins/MERCURY.htm "The Hazards of the Element Called Mercury," Youngstown State University "Unfortunately, it does not take a large amount of mercury to produce a problem. In one specific instance, three oral fever thermometers were broken. The mercury fell onto the floor in an office that was approximately ten square feet in size. Following the accident, the mercury vapors present in the air of that room were about three times that permitted by OSHA. Consequently, the room had to be decontaminated, all carpeting had to be discarded at a total cost of about $5000. This was a very small mercury spill. It is not uncommon for cleanup costs of mercury spills to exceed $25,000."
Reported costs went up to $130,000	c) http://www.des.state.nh.us/nhppp/hospital_survey.htm New Hampshire Mercury Reduction Project: Hospital Baseline Survey 1999 Preliminary survey results, New Hampshire Department of Environmental Services "Spills and Breakages - Seven hospitals indicated some kind of mercury spill or equipment breakage and release during 1998. The actual number of spills may be higher, as small spills and breakages may not always be reported. Most hospitals did not have any idea of the cost of clean-up, but reported costs went up to $130,000!!"
~$5,000 for 1 broken sphygmomanometer One hospital spent $10,054 to clean up a spilled sphygmomanometer	http://dnr.metrokc.gov/swd/bizprog/waste_pre/MIRTsem8.htm Medical Industry Waste Prevention Round Table Reducing Mercury in Hospitals and Biomedical Facilities (A MIRT Seminar, May 23, 2001), King County, Seattle, WA " Economic Considerations · Clean up costs – It often costs ~$5,000 for 1 broken sphygmomanometer - you could buy 30 or 40 non-mercury ones for that cost. One local hospital recently spent $10,054 dollars to clean up a spilled sphygmomanometer. · Regulatory Costs - 30-ppt pretreatment level in some places (fines) · Hazardous Waste training costs · Joint Commission on Accreditation of Health Care Organizations (JCAHO) compliance - JAHCO is starting to ask questions"
$570,000 to clean up after sink trap work Environmental service (alone) for any spill costs $1000-1500	http://dnr.metrokc.gov/swd/bizprog/waste_pre/MIRTsem8.htm "Question: How did you get voluntary switch-out of Hg? Answer: VA People remember the Hg spills and are willing to work to avoid going through it again. UW always calls in Foss Env. for any spills. Just for Foss's services costs $1000-$1500. Someone at Bowling Green University changed their sink traps, piled them up and carried them across campus. Mercury was spread everywhere. Cost $570,000 to clean up."
$350,000 to clean up contamination and restore building to original condition	http://204.178.120.25/library/college.htm XL Environmental, Exton, PA “ Spill Spreads Mercury Contamination - A large university in Ohio contracted plumbing work on one of its science labs. While dismantling laboratory piping, the contractor discovered an existing mercury spill that resulted in mercury contamination throughout the building. Costs to clean up the contamination and restore the building to its original condition were $350,000.”

Appendix 3: Transition to Mercury Free Products

There are many challenges to substituting more benign alternatives for mercury containing products and components. Most alternatives are not drop-in substitutions. That is, although an alternative may ultimately achieve the same outcome, such as providing an accurate measure of blood pressure or sensing a flame, there are usually design considerations or different techniques or practices that must be learned and communicated. Even under the best of circumstances progress involves risk and there may be unexpected outcomes, both favorable and undesired.

On the bright side, one manufacturer reported that he continues to learn about the utility of his company's oscillometric blood pressure monitor from doctors using the device. The breadth of blood pressure information offered by the monitor was unexpectedly revealing of a patient's condition, far exceeding the diagnostic utility of the simple systolic and diastolic blood pressures provided by a mercury sphygmomanometer. In another example, a digital manometer used for calibrating sphygmomanometers can result in more accurate calibration than the mercury manometer. Depending on the quality of instruments used, the difference can be as great as having a sphygmomanometer with an accuracy of $\pm$ 3.1mm Hg by using a digital manometer for a reference, versus $\pm$ 6 mm Hg by using a mercury manometer. (Welch Allyn, 2002)

On the negative side, many well designed products and practices will need to be rethought and mercury-free components may not even fit in the footprint of an existing product. There is also a learning curve associated with new designs and components and it is likely that there will be glitches and unintended outcomes as products are changed over. One example is the replacement of a mercury column thermometer in an industrial setting. After a mercury thermometer broke in use and required clean up, a mercury-free alternative was sought. An alcohol thermometer was chosen from a catalog because it was similar in size, shape and temperature range and appeared to be a drop-in substitution. The alcohol thermometer proved to be unsuitable when the alcohol column quickly separated due to the bumping and jarring the thermometer received in the application. When the supplier was consulted, after the fact, a much more appropriate alternative was recommended and it performed capably.

Fortunately there are many resources available for smoothing the transition away from mercury components and products. These include manufacturers' technical support staff, online how-to guides, email lists that share questions and answers, and pollution prevention organizations that can provide guidance. A sampling of useful resources follows. (Many of these resources are related to healthcare, an industry that has been at the forefront of mercury reduction).

Organizations' Websites

Health Care Without Harm (HCWH)
http://www.noharm.org
The mercury section of the HCWH website contains a wealth of information about reducing mercury in healthcare. The Health Care Without Harm coalition is an international campaign to reform the environmental practices of the health care industry. Health Care Without Harm (HCWH) is comprised of more than 300 organizations in 27 countries and includes major health care systems, regulatory bodies, and industry leaders.

Hospitals for a Healthy Environment (H2E)
http://www.h2e-online.org/
The goal of H2E is to educate health care professionals about pollution prevention opportunities in hospitals and healthcare systems. H2E fosters the development and communication of best practices, model plans for waste management, resource directories, case studies, and how-to tools for minimizing the volumes of waste generated and the use of persistent,

bioaccumulative, and toxic chemicals. H2E is a joint project of the American Hospital Association (AHA), the Environmental Protection Agency, Health Care Without Harm and the American Nurses Association. In addition, various state and local resources are active participants in the effort to help hospitals. Two areas of note are the Listserv, an online forum for discussion, and the H2E website's Mercury area.

- H2E Listserv

http://www.h2e-online.org/programs/list.htm
The Hospitals for a Healthy Environment (H2E) Listserv is a communication tool for health care professionals to share information about minimizing the volume and toxicity of health care waste. Healthcare facilities across the country are designing and implementing many projects, including starting recycling programs, eliminating mercury containing devices, and purchasing environmentally preferable products. There are countless opportunities to share questions, answers, and advice through this Listserv.

- H2E Mercury Resources

http://www.h2e-online.org/tools/mercury.htm
The Mercury area of the H2E website includes many resources and links for reducing mercury. One very nice document is the "Mercury Virtual Elimination Plan", found at: http://www.h2e-online.org/tools/merc-over.htm
This is a comprehensive how-to guide to help hospitals assess existing mercury sources, develop action plans for elimination, and set up an environmentally preferable purchasing plan to keep a facility mercury-free.

Northeast Waste Management Officials' Association (NEWMOA)
http://www.newmoa.org
http://www.newmoa.org/Newmoa/htdocs/prevention/mercury/
The information resources available in the mercury area of the NEWMOA website are designed to help the NEWMOA states achieve their "virtual elimination" goal for mercury by focusing in particular on efforts to reduce or eliminate mercury from the waste stream.

Sustainable Hospitals Project
http://www.sustainablehospitals.org
The Sustainable Hospitals Project (SHP) provides technical support to the healthcare industry for selecting products and work practices that eliminate or reduce occupational and environmental hazards. The SHP website lists alternative products and manufacturer contacts and SHP maintains a technical help line (phone & email) to provide technical support and help hospitals improve their practices.

Journal Article & Reports

Vincent J. Canzanello, MD; Patricia L. Jensen, RN; Gary l Schwartz, MD, "Are Aneroid Sphygmomanometers Accurate in Hospital and Clinic Settings?", Arch Intern Med, 2001; 161:729-731.
This article summarizes an evaluation done at Mayo Clinic in Rochester, Minnesota to assess the accuracy of aneroid sphygmomometers used in their hospitals. Their conclusion was "Aneroid sphygmomanometers provide accurate pressure measurements when a proper maintenance protocol is followed."

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8. Prevention and control technologies and practices
9. Initiatives for controlling releases and limiting use and exposure

Appendix. Overview of Existing and Future National Actions, Including Legislation, relevant to mercury; by Region.

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Manufacturer's Resources

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Online Case Studies & Mercury Videos

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The Michigan Department of Environmental Quality , Bowling Green University, Ohio Environmental Protection Agency and Radar Environmental have produced two video clips which allow viewers to see mercury vapor rising from elemental mercury. Two short online videos show mercury vapor at room temperature rising from a petri dish of mercury and from mercury spilled from a broken fever thermometer onto a carpet. Available at: http://www.ecosuperior.com/pages/mercuryvapour.html (September, 2002).

Appendix 4: Maine DEP Letter to Manufacturers of Mercury-added Products

The information request below was sent to manufacturers who filed information on mercury-added products with the Interstate Mercury Education and Reduction Clearinghouse (IMERC). As explained in section 2.0 of this report, IMERC was formed under the auspices of the Northeast Waste Management Officials' Association to, among other things, coordinate implementation of state laws that prohibit sale of mercury-added products unless the manufacturer has disclosed the amount and purpose of the mercury. Maine, New Hampshire, Connecticut and Rhode Island have such laws.

May 1, 2002

Dear [*manufacturer*]:

Enclosed please find a copy of *An Act to Phase Out the Availability of Mercury-added Products* as recently enacted by the Maine Legislature.

The law contains two sections. Section 1 prohibits the sale or distribution of a mercury-added thermostat in Maine for most residential and commercial applications after January 1, 2006. It also provides an exemption process from the prohibition where specified demonstrations can be made.

Section 2 of the bill requires the Department to review information on mercury-added products and, based on that review, prepare a comprehensive strategy to reduce their mercury content. The strategy is due to the Legislature by next January, and presumably will be considered by the Legislature as it contemplates additional legislation regarding mercury-added products.

One of our main sources of information that will be utilized in this effort is the data you and other manufacturers already provided under the mercury product notification law enacted last year. As you will recall, that law-38 MRSA §1661-A-prohibits the sale of mercury-added products in Maine after January 1, 2002 unless the manufacturer has notified the Department as to the amount and purpose of the mercury.

Preparation of the strategy the Legislature seeks will also require additional information, such as the availability of non-mercury alternatives, and on manufacturers' plans (if any) to phase out the use of mercury. This is why I write to you now - to provide you with the opportunity to provide specific information on your product(s) that can be considered by the Department in the development of its strategy. The additional information you provide will be considered in conjunction with research performed by a consultant the Department intends to retain shortly.

At this time, we are focusing our inquiry on mercury-added products (other than lamps and dental amalgam) that contain more than 100 milligrams of mercury or, for formulated products like cosmetics and cleansers; that have a mercury concentration exceeding 50 ppm. If you make such a product or products, we invite you to submit the following information:

- Your plan, if any, for reducing or phasing out the use of mercury, including relevant

timetables for such reductions or elimination,

- Information bearing on the availability, feasibility and affordability of non-mercury alternatives to the product;
- The public health, environmental or other societal benefits (if any) of continuing to use mercury in the product; and
- Any other information you believe relevant to the development of the Department's strategy.

The timetable for completing this strategy is driven by the Legislature's January 1, 2003 deadline. To meet this deadline, we need to receive your information by June 30, 2002 so that it can be adequately considered by the Department and its consultant before preparation of a draft document. The draft document should be available in early fall, and I will provide one at your request.

Thank you for your help, and please feel free to call me at (207) 287-8556 or email me at Enid.Mitnik@state.me.us if you have questions.

Sincerely,

Enid Mitnik

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Logistics, Contracting, Warehouse** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Electrical/Gas Powered Equipment	Energy/Fuel Consumption, Air Emissions	Use of Natural Resources, Air Pollution	1	1	4	2	**8**
Report Processing	Paper Usage, Potential Usage of Non-Recycled Paper	Use of Natural Resources	1	1	4	2	**8**
Wooden Pallet Usage	Resource Consumption	Use of Natural Resources	1	1	2	2	**6**
Chemical Storage	Potential for Spills	Environmental Contamination	1	3	4	2	**10**
Silver Recovery	Disposal of Silver Solution	Chemical Contamination	2	1	2	2	**7**

Master Index

Topic	**Guidebook Series**

- B -

Topic	**Guidebook Series**

- C -

Topic — Guidebook Series

- D -

- E -

Topic	Guidebook Series
Environment of Care Newsletter Indexes	Environment of Care
Environmental	
Audit Guide	Environmental Compliance
Compliance Resources	Environmental Compliance
Compliance Strategy	Environmental Compliance
Concepts	GEMS
Hygiene Technical Resources	Program Administration
Operating Unit Aspect Templates	GEMS
Policy	GEMS
Technical Resources	GEMS
Environmental Radiation	Environmental Compliance
Ergonomics	
Ergonomics Program	Ergonomics
Ergonomics Training	Ergonomics
Exposure Controls	Ergonomics
Safe Patient Handling & Movement	Ergonomics
Ethylene Oxide (EtO)	
Medical Surveillance	Occupational Health
Program	Industrial Hygiene
Program Training	Industrial Hygiene
Excavations	General Safety
Experimental Use Permits (EUP)	Environmental Compliance
Exposure Control	
Antineoplastics	Industrial Hygiene
Antineoplastics, Additional Controls/Disposals	Industrial Hygiene
Asbestos Containing Material (ACM)	Industrial Hygiene
Containment/Decontamination	Occupational Health
Contaminated Equipment/Laundry	Occupational Health

Topic	Guidebook Series

Topic	Guidebook Series
Federal Facility Standards and Compliance	Environmental Compliance
Federal Fire Safety Act of 1992	Fire Safety
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Compliance	Environmental Compliance
Fire Alarm, Manual	Fire Safety
Fire and Smoke Control	Fire Safety
Fire Department	
Community	Fire Safety
Connections	Fire Safety
HazWoper	Industrial Hygiene
HazWoper Training	Industrial Hygiene
Respirator Program	Industrial Hygiene
Staffing	Fire Safety
VA	Fire Safety
VA, IH Issues	Industrial Hygiene
Fire Extinguishers, Portable	Fire Safety
Fire Fighting Services	Fire Safety
Fire Hazards, Severe	Fire Safety
Fire Investigation	Program Administration
Fire Protection Systems (Excluding Water)	Fire Safety
Fire Pumps	Fire Safety
Fire Safety - Life Safety Code Compliance	Fire Safety
Fire/Explosion Hazards	Fire Safety
Flammable/Combustible	
Liquids	Environmental Compliance
Materials	Environmental Compliance
Storage Buildings/Warehouses	Environmental Compliance

Topic — Guidebook Series

Topic	**Guidebook Series**
Hazardous Materials (HazMat) (Cont'd)	
Asbestos	Industrial Hygiene
Blood Borne Diseases	Occupational Health
Ethylene Oxide	Industrial Hygiene
Formaldehyde	Industrial Hygiene
Lead	Industrial Hygiene
Miscellaneous Chemicals	Industrial Hygiene
Hazardous Materials Storage Areas Inspected	Industrial Hygiene
Hazardous Substances, Specific	Industrial Hygiene
Hazardous Waste Management	Environmental Compliance
HazWoper	
Evacuation Plan	Industrial Hygiene
Medical Surveillance	Occupational Health
Program	Industrial Hygiene
Program Training	Industrial Hygiene
Hearing Conservation	
Audiometric Testing	Occupational Health
Program	Industrial Hygiene
Program Training	Industrial Hygiene
Heat Stress	
Control	Industrial Hygiene
Program	Industrial Hygiene
Program Training	Industrial Hygiene
Healthcare Failure Mode and Effect Analysis (HFMEA)	Environment of Care
High Value Equipment	Fire Safety
Historical Properties	Environmental Compliance
Hot Work Program	Fire Safety

Topic	**Guidebook Series**

- J -

- K -

- L -

Topic	**Guidebook Series**

- M -

Topic	Guidebook Series

- N -

- O -

- P -

Topic	Guidebook Series

Topic	Guidebook Series

- R -

Topic	**Guidebook Series**

- S -

Topic	Guidebook Series

- T -

- U -

Topic	**Guidebook Series**

- V -

- W -

- Z -

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Medical Media** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	4	2	**8**
Disposal of Videotapes	Generation of Waste	Environmental Contamination	2	1	3	3	**9**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	3	**7**
Printing	Disposal of Printer Cartridges	Environmental Contamination	0	0	3	2	**5**
Maintenance of Equipment	Generation of Waste Batteries	Environmental Contamination	1	1	2	2	**6**
Photo Processing	Generation of Waste Batteries	Environmental Contamination	1	3	3	4	**11**
Chemical Usage	Employee Exposure, Waste Disposal	Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Adhesive Spray Booth	Air Emissions	Environmental Contamination	0	3	2	3	**8**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Microbiology Laboratory** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Lab Equipment	Energy Consumption	Use of Natural Resources	1	1	3	3	**8**
Chemical Usage	Hazardous Waste Disposal, Wastewater Discharge	Environmental Contamination	0	3	4	3	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	0	2	3	3	**8**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Use of Fume Hoods	Energy Consumption, Air Emission	Use of Natural Resources, Environmental Contamination	1	3	4	3	**11**
Use of Autoclave	Energy Consumption, Release of Microbes Into the Environment	Use of Natural Resources, Disease, Employee Health	0	3	4	4	**11**
Slide Preparation	Generation of Hazardous Waste, Transportation of Hazardous Waste, Disposal to Sewage System	Environmental Contamination, Water Usage	0	4	3	3	**10**

Handling of Micro-Organisms	Release of Microbes Into the Environment	Disease, Patient Safety, Employee Health	1	3	2	4	**10**
Neutralization of Lab Chemicals	Potential for Explosive Reactions, Employee Exposure	Environmental Contamination	2	3	3	4	**12**
Use of Bunsen Burner	Energy Consumption	Use of Natural Resource	0	1	1	4	**6**

FACILITY AUDIT AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and
[Insert Name of Hospital]

I. INTRODUCTION

In recognition that environmental auditing plays a critical role in protecting human health and the environment by identifying, correcting, and ultimately preventing violations of environmental regulations, **[Hospital]** and the United States Environmental Protection Agency, Region 2 (the "Region") hereby agree that **[Hospital]** shall conduct a self-audit program (the "Audit Program") for compliance with the regulations promulgated or authorized by the United States Environmental Protection Agency ("EPA") set forth in Section II below. The Agreement shall be governed by the terms of EPA's Policy entitled "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations," 65 Federal Register 19618 (4/11/00, the "Policy"), except to the extent that those terms are explicitly modified below.

II. SCOPE OF THE AUDIT

A. **[Hospital]** shall conduct an audit (the "Audit") of its compliance with the regulations cited below in subsections 1 - 6 of Section II.B. The Audit will encompass all **(enter number)** campuses of **[Hospital]**, including any associated off-site facilities such as _____ (if applicable). Appendix A attached hereto lists the campuses and other units associated

with each covered campus (
A Covered Campuses) that are covered by this agreement.

B. Under the Audit Program, **[Hospital]** will audit compliance with the following federal regulatory programs:

1. Air Programs

Part 511	The New Jersey Implementation Plan Regulations (promulgated pursuant to Section 110 of the Clean Air Act), including the New Source Review regulations 40 CFR Part 52 Subpart HH (52.1670 et seq.), New Jersey Administrative Code ("NJAC") 7:27
Part 52	Section 21 Prevention of Significant Deterioration of Air Quality
Part 60	Standards of Performance for New Stationary Sources
Part 61	National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
Part 62	Subpart HHH - Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
Part 63	National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)
Part 68	Chemical Accident Prevention Provisions
Part 70	State Operating Permit Programs (N.J.A.C. 7:27-22)
Part 82	Protection of Stratospheric Ozone

2. Water Programs

Part 112	Oil Pollution Prevention
Part 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (N.J.A.C. 7:14A)
Part 141	National Primary Drinking Water Regulations (N.J.A.C. 7:10)
Part 142	National Primary Drinking Water Regulations Implementation (N.J.A.C. 7:10)
Part 143	National Secondary Drinking Water Regulations (N.J.A.C. 7:10)
Part 144	Underground Injection Control ("UIC") Program (N.J.A.C. 8)
Part 145	State UIC Program Requirements (N.J.A.C. 7:14A-8)
Part 146	UIC Program: Criteria and Standards (N.J.A.C. 7:14A-8)
Part 147	State UIC Programs (N.J.A.C. 7:14A-8)
Part 148	Hazardous Waste Injection Restrictions (N.J.A.C. 7:14A-8)
Part 403	General Pretreatment Regulations for Existing and New Sources of Pollution (N.J.A.C. 7)

1 The term "Part" refers to the subdivisions of the subchapters of Title 40 Code of Federal Regulations ("C.F.R.").

3. Pesticide Programs

Part 160	Good Laboratory Practice Standards
Part 162	State Registration of Pesticide Products
Part 170	Worker Protection Standard
Part 171	Certification of Pesticide Applicators
Part 172	Experimental Use Permits

4. Solid and Hazardous Wastes

Part 260	Hazardous Waste Management System:General (N.J.A.C.7:26 G-4) [2]
Part 261	Identification and Listing of Hazardous Waste (N.J.A.C. 7:26G-5)
Part 262	Standards Applicable to Generators of Hazardous Waste (N.J.A.C. 7:26G-6)
Part 263	Standards Applicable to Transporters of Hazardous Waste (N.J.A.C. 7:26G-7)
Part 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (N.J.A.C. 7:26G-8)
Part 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (N.J.A.C. 7:26G-9)
Part 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (N.J.A.C. 7:26G-10))
Part 268	Land Disposal Restrictions (N.J.A.C. 7:26G-11)
Part 273	Standards for Universal Waste Management
Part 279	Standards for the Management of Used Oil
Part 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks ("USTs")

5. Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs

Part 302	Designation, Reportable Quantities, and Notification
Part 355	Emergency Planning and Notification
Part 370	Hazardous Chemical Reporting: Community Right-to-Know
Part 372	Toxic Chemical Release Reporting: Community Right-to-Know

6. Toxic Substances

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2 New Jersey has been authorized by the Region for many of the federal regulations comprising Parts 260 - 268. Once authorized, a state regulation becomes the applicable regulation. [Resource Conservation and Recovery Act ("RCRA"), as amended, §3006(b), 42 U.S.C. §6926(b)]. For purposes of this Agreement **[Hospital]** will audit for compliance with authorized New Jersey State counterparts of the federal regulations, where applicable.

Part 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
Part 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
Part 763	Asbestos

C. The types of facilities and documents to be audited on the Covered Campuses are set forth in Appendix B. The benefits of this Agreement shall extend to only those facilities within the Covered Campuses that are audited.

III. DISCLOSURE

[Hospital] shall disclose all EPA-enforceable regulatory violations discovered during the Audit and eligible under the Audit Policy. **[Hospital]** will voluntarily disclose these violations to the Region, in accordance with the Policy, in written disclosure reports to be submitted in accordance with the schedule set forth below in Section IV. Each such disclosure report shall contain, with reference to each violation disclosed, the following additional information: the actions selected by **[Hospital]** to correct the violation within 60 days, or as otherwise approved pursuant to Section V below; the status of the corrective action; and the means taken by **[Hospital]** to prevent recurrence of the violation. All disclosure reports will be submitted by the scheduled date, and the Region agrees to waive the 21-day disclosure requirement provided for in the Policy.

Once the action designed to correct a particular violation has been completed, and a report submitted to the Region notifying it of the completion of the corrective action, no further reporting on that violation, or the status of corrective action, is required. On **[Date of Termination of Agreement - usually sixty days after the scheduled submittal of the last disclosure report]**, this Agreement shall terminate for all purposes, except that **[Hospital]** shall remain obligated to complete the action necessary to correct any disclosed violation, and to report to the Region in writing (1) the completion of any corrective action, previously unreported, within thirty days after such corrective action has been completed, and (2) the costs of coming into compliance for each violation disclosed under this Audit Agreement, and the amount of pollutants no longer released to the environment as a result of the corrective actions.

This Audit Agreement does not cover any pre-Agreement activities, including regulatory compliance issues discovered by **[Hospital]** or its environmental consultant(s) prior to the effective date of this Agreement.

IV. SCHEDULE

A. Within 10 days of the effective date of this agreement, **[Hospital]** will identify suitable personnel or consultants (where appropriate) to perform each of the six regulatory program audits identified in Section II above and shall further identify the applicable criteria pursuant to which each such regulatory program audit shall be conducted. **[Hospital]** shall submit to EPA the audit protocols and audit checklists for each of the six regulatory program audits, tailored to the Hospital, and shall provide copies of these audit instruments to the Region. **[Hospital]** is willing to share any materials it develops with other institutions and the U.S. Environmental Protection Agency.

B. Within 30 days of the signing of the agreement, the Audit shall commence.

C. **[Hospital]** shall complete the regulatory audits required by the Sections listed in this agreement, and shall submit disclosure reports to the Region, in accordance with the Policy and the Agreement, identifying all EPA-enforceable violations discovered during the course of these audits according to the schedule set forth in Appendix C.

V. CORRECTIVE ACTION

[Hospital] shall correct each violation identified during the Audit, and shall take steps necessary to prevent the recurrence of each such violation. **[Hospital]** shall correct any violations identified during the Audit as soon as possible, but within 60 days of discovery. In those instances in which **[Hospital]** is unable to correct an identified violation within the 60-day deadline, it shall request an extension of time from the Region in writing and provide a correction schedule, accompanied by a justification of the requested extension. Any extension of the 60-day correction period shall be subject to the Region's approval. Such approval will not be unreasonably withheld.

If **[Hospital]** discovers or otherwise becomes aware of a concern or concerns that may present an imminent and substantial endangerment to human health or the environment, and such concern(s) may exist at other **[Hospital]** campuses covered by this Agreement, notwithstanding any other language herein to the contrary, **[Hospital]** agrees to address such concern(s) at all covered campuses as expeditiously as possible and promptly take such action as may be necessary at all covered campuses to protect human health and the environment. **[Hospital]** shall notify EPA (initial notice may be by phone) of such concern(s) within 24 hours of discovery or becoming aware of such concern(s) and shall notify EPA in writing within five business days of such discovery of **[Hospital]**'s proposed remedial action.

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VI. CIVIL PENALTIES FOR DISCLOSED VIOLATIONS

Except as provided in Section II.D.8 of the Policy, the Region will not impose gravity-based penalties for violations voluntarily discovered if they are timely disclosed and corrected, and provided that the applicable provisions of the Policy and this Agreement are met. The Region will consider the least expensive means for coming into compliance in calculating potential economic benefit penalties for any disclosed violations, provided that such methods comply with regulatory requirements. Where any disclosed violations entail economic benefits, and the potential economic benefit for such corrective actions are calculated to be less than $10,000 for the sum total of all violations at a facility, the penalties will be considered de minimus and will be waived by the Region.

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VII. MISCELLANEOUS PROVISIONS

A. Notification and Certification of Disclosure Reports: **[Hospital]** designates as its responsible official, responsible for submitting disclosure reports to the Region, the following individual:

Name of Responsible Official
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The responsible official shall certify that each disclosure report submitted to the Region is true, accurate and complete in the form set forth in 40 C.F.R.

270.11(d).

[Hospital] designates as its contact person, to be the recipient of all communications from the Region concerning this Agreement, the following individual:

Name of Contact Person
Title
Name of Hospital

Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The Region designates the following individual as its contact person:

Charles Zafonte
Multimedia Enforcement Coordinator
DECA-CAPSB
U.S. Environmental Protection Agency, Region 2
290 Broadway (21ST Floor)
New York, New York 10007-1866
Phone: (212) 637-3515
Fax: (212) 637-4086
zafonte.charles@epa.gov

The parties may redesignate their contact person and responsible official in writing.

B. Compliance With Law and Regulation: Neither the existence of this Agreement, nor compliance with this Agreement relieves **[Hospital]** of its obligation of continued compliance with the regulations covered by this Agreement, and all other federal, state and local laws and regulations.

C. Reservation of Right: The Region reserves its right to proceed against **[Hospital]** for all violations outside the scope of the Audit, and violations within the scope of the Audit that were not timely reported or timely corrected. In any enforcement proceeding, the Region may enforce the provision of 40 C.F.R. allegedly violated, or its authorized or approved state counterpart, if said counterpart is federally enforceable as a matter of law.

D. Authority of Signatories: The signatories hereto represent that they have the authority to bind the parties.

E. Modification: This Agreement may be modified by a writing signed by both parties.

F. Coordination With the State Environmental Agency: The Region has informed the New Jersey Department of Environmental Protection (NJDEP) of this Agreement and shall provide a copy to the NJDEP. Nothing herein restricts the NJDEP from acting as it deems appropriate.

G. Effective Date: This Agreement is effective on the date that it is signed by both parties, or the last party if not signed on the same date.

WE, THE UNDERSIGNED, HEREBY AGREE TO BE BOUND BY THIS AGREEMENT:

For **[Hospital]**:

Name of Responsible Official
Title
Address
City, State, Zip Code

Date:

For EPA - Region 2:

Alan J. Steinberg, Regional Administrator
USEPA - Region 2
290 Broadway
New York, New York 10007
Date:

Appendix A

Covered Campuses and Off-Site Facilities Associated with Those Campuses

[List of Campuses and off-site facilities covered under the Audit Agreement goes here.]

Appendix B

SCOPE OF AUDIT PROGRAM

The following list provides the activities, areas, and/or shops that the review of the campus(es) must cover. This list not meant to be all-inclusive. [Please select and include areas that exist at your campus.]

Documents to Review (for the three years prior to the Program Period)

_ Verify EPA identification numbers and permits
_ Hazardous waste manifests
_ Training records
_ Land disposal restriction notifications
_ Exception reports
_ Lead disclosure statements in leases, or associated with leases of residential housing let by the university in its capacity as a lessor, as defined in 40 C.F.R. 745.103
_ Contingency plans and annual reports (for contingency plans, only the current plan will be reviewed)
_ Required certifications

Facilities Operation and Maintenance

_ Air conditioning/refrigeration service
_ Appliance and equipment repair, including medical equipment
_ Building cleaning and maintenance
_ Building renovation and construction
_ Cafeteria
_ Chemical storage areas
_ Drinking water treatment systems
_ Fabrication shops
_ Furniture repair
_ Heating and power plants (e.g., boilers, emergency generators)
_ House or architectural structure painting
_ Landscaping operations
_ Laundry
_ PCB transformers and switches
_ Pesticide storage facilities
_ Resource recovery/incinerator facilities
_ Waste disposal areas (landfills)
_ Wastewater treatment facilities

_ Waste treatment facilities such as autoclaves

Fleet Maintenance

_ Automotive, truck, and ambulance servicing areas
_ Gasoline service stations
_ Garages

Hazardous Waste / Tanks / Wells

_ Aboveground and current operating underground storage tanks and their containment areas/systems, and documentation concerning closures of regulated tanks previously removed from service.
_ Dry wells, septic systems, cesspools, floor drains, sink drains, and disposal wells.
_ Facilities treating, storing or disposing of hazardous wastes.
_ Hazardous waste satellite accumulation areas.
_ Hazardous waste storage areas.
_ Tanks that have been permanently or temporarily closed.
_ Transformers and oil-containing electrical equipment (PCB and non-PCB).
_ Universal waste storage areas.

Laboratories

_ All clinical, pathology and dental laboratories
_ All teaching and research laboratories with regular chemical use.

Patient Care

_ Anesthesiology
_ Chemotherapy
_ Dentist  s offices
_ Doctor  s offices
_ Floor Pharmacies
_ Histology
_ Intensive Care Units
_ Neonatal Areas
_ Nursing Stations
_ Operating Rooms
_ Pathology, microbiology
_ Patient  s Rooms
_ Patient treatment areas

_ X-Ray/Radiology

Main Pharmacy

_ Storage areas
_ Outdated pharmaceuticals

Sterile Supply and Materials Management

_ Autoclaving Units
_ Ethylene Oxide (EtO) Units
_ Glutaraldehyde
_ Use and disposal of disinfectants

Use and Disposal of Known Chemicals/Products of Concern

_ Computers/monitors, circuit boards, and other lead-bearing electronics
_ Ethanol and formaldehyde/ethanol solutions
_ Fluorescent light bulbs and other types of lamps, including high-intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps
_ Formaldehyde/Formalin
_ Mercury and Mercury-containing devices and products
_ PVC-containing devices
_ Xylene
_ Batteries
_ Solvents
_ Photographic chemicals and scrap film

Other Services

_ Athletic and training facilities
_ Photo processing/publishing
_ Morgue/Crematorium
_ Animal care areas

Appendix C

SCHEDULE OF AUDITS

[Insert a schedule of when audits will be done at each campus/location. Provide details as necessary such as deadlines for submitting the disclosure report, the regulatory areas being audited, and the names of campuses, buildings, or other location-specific info.]

Example:

Location	Programs to be Audited	Date Disclosure Report will be Submitted
Campus A, e.g.: Pharmacy Physical Plant Print Shop	e.g., RCRA, CWA	

FACILITY AUDIT AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and
[Insert Name of Hospital]

I. INTRODUCTION

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II. SCOPE OF THE AUDIT

A. **[Hospital]** shall conduct an audit (the Audit) of its compliance with the regulations cited below in subsections 1 - 6 of Section II.B. The Audit will encompass all **(enter number)** campuses of **[Hospital]**, including any associated off-site facilities such as _____ (if applicable). Appendix A attached hereto lists the campuses and other units associated

with each covered campus ( Covered Campuses) that are covered by this agreement.

B. Under the Audit Program, **[Hospital]** will audit compliance with the following federal regulatory programs:

1. Air Programs

Part 52[1] Section 21 Prevention of Significant Deterioration of Air Quality
Part 60 Standards of Performance for New Stationary Sources
Part 61 National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
Part 62 Subpart HHH - Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
Part 63 National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)
Part 68 Chemical Accident Prevention Provisions
Part 70 State Operating Permit Programs
Part 82 Protection of Stratospheric Ozone
All applicable provisions of; and the New York State Implementation Plan Regulations (promulgated pursuant to Section 110 of the Clean Air Act) including the New Source Review regulations (Title 6NYCRR, Chapter III, Part 200, et seq)

2. Water Programs

Part 112 Oil Pollution Prevention
Part 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
Part 141 National Primary Drinking Water Regulations
Part 142 National Primary Drinking Water Regulations Implementation

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[1] The term  Part refers to the subdivisions of the subchapters of Title 40 Code of Federal Regulations ( C.F.R.).

Part 143 National Secondary Drinking Water Regulations

Part 144 Underground Injection Control ( UIC) Program

Part 145 State UIC Program Requirements
Part 146 UIC Program: Criteria and Standards
Part 147 State UIC Programs
Part 148 Hazardous Waste Injection Restrictions
Part 403 General Pretreatment Regulations for Existing and New Sources of Pollution

3. Pesticide Programs

Part 160 Good Laboratory Practice Standards
Part 162 State Registration of Pesticide Products
Part 170 Worker Protection Standard
Part 171 Certification of Pesticide Applicators
Part 172 Experimental Use Permits

4. Solid and Hazardous Wastes

Part 260 Hazardous Waste Management System: General (Part 370, 6 New York Code of Rules and Regulations ( 6 NYCRR)
Part 261 Identification and Listing of Hazardous Waste (Part 371, 6 NYCRR)
Part 262 Standards Applicable to Generators of Hazardous Waste (Part 372, 6 NYCRR)
Part 263 Standards Applicable to Transporters of Hazardous Waste (Part 372, 6 NYCRR)
Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Subpart 373-2, 6 NYCRR)
Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Subpart 373-3, 6 NYCRR)
Part 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (Subpart 374-1, 6 NYCRR)
Part 268 Land Disposal Restrictions (Part 376, 6 NYCRR)
Part 273 Standards for Universal Waste Management (Subpart 374-3, 6 NYCRR)
Part 279 Standards for the Management of Used Oil

Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks

( USTs)

New York State has been authorized by the Region for many of the federal regulations comprising Parts 260-266, 268 and 273 (New York is not authorized for Parts 279 and 280). Once authorized, a state regulation becomes the applicable regulation. [Resource Conservation and Recovery

Act ( RCRA), as amended, 3006(b), 42 U.S.C. 6926(b)]. For purposes of this Agreement, the institution will audit for compliance with authorized New York State counterparts of the federal regulations, where applicable, found at 6 NYCRR Parts 370 -373, 376 and Subpart 374-3.

5. Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs

Part 302 Designation, Reportable Quantities, and Notification
Part 355 Emergency Planning and Notification
Part 370 Hazardous Chemical Reporting: Community Right-to-Know
Part 372 Toxic Chemical Release Reporting: Community Right-to-Know

6. Toxic Substances

Part 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures
Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
Part 763 Asbestos

C. The types of facilities and documents to be audited on the Covered Campuses are set forth in Appendix B. The benefits of this Agreement shall extend to only those facilities within the Covered Campuses that are audited.

III. DISCLOSURE

[Hospital] shall disclose all EPA-enforceable regulatory violations discovered during the Audit and eligible under the Audit Policy. **[Hospital]** will voluntarily disclose these violations to the Region, in accordance with the Policy, in written disclosure reports to be

submitted in accordance with the schedule set forth below in Section IV. Each such disclosure report shall contain, with reference to each violation disclosed, the following additional information: the actions selected by **[Hospital]** to correct the violation within 60 days, or as otherwise approved pursuant to Section V below; the status of the corrective action; and the means taken by **[Hospital]** to prevent recurrence of the violation. All disclosure reports will be submitted by the scheduled date, and the Region agrees to waive the 21-day disclosure requirement provided for in the Policy.

Once the action designed to correct a particular violation has been completed, and a report submitted to the Region notifying it of the completion of the corrective action, no further reporting on that violation, or the status of corrective action, is required. On **[Date of Termination of Agreement - usually sixty days after the scheduled submittal of the last disclosure report]**, this Agreement shall terminate for all purposes, except that **[Hospital]** shall remain obligated to complete the action necessary to correct any disclosed violation, and to report to the Region in writing (1) the completion of any corrective action, previously unreported, within thirty days after such corrective action has been completed, and (2) the costs of coming into compliance for each violation disclosed under this Audit Agreement, and the amount of pollutants no longer released to the environment as a result of the corrective actions.

This Audit Agreement does not cover any pre-Agreement activities, including regulatory compliance issues discovered by **[Hospital]** or its environmental consultant(s) prior to the effective date of this Agreement.

IV. SCHEDULE

A. Within 10 days of the effective date of this agreement, **[Hospital]** will identify suitable personnel or consultants (where appropriate) to perform each of the six regulatory program audits identified in Section II above and shall further identify the applicable criteria pursuant to which each such regulatory program audit shall be conducted. **[Hospital]** shall submit to EPA the audit protocols and audit checklists for each of the six regulatory program audits, tailored to the Hospital, and shall provide copies of these audit instruments to the Region. **[Hospital]** is willing to share any materials it develops with other institutions and the U.S. Environmental Protection Agency.

B. Within 30 days of the signing of the agreement, the Audit shall commence.

C. **[Hospital]** shall complete the regulatory audits required by the Sections listed in this agreement, and shall submit disclosure reports to the Region, in accordance with the Policy and the Agreement, identifying all EPA-enforceable violations discovered during the course of these audits according to the schedule set forth in Appendix C.

V. CORRECTIVE ACTION

[Hospital] shall correct each violation identified during the Audit, and shall take steps necessary to prevent the recurrence of each such violation. **[Hospital]** shall correct any violations identified during the Audit as soon as possible, but within 60 days of discovery. In those instances in which **[Hospital]** is unable to correct an identified violation within the 60-day deadline, it shall request an extension of time from the Region in writing and provide a correction schedule, accompanied by a justification of the requested extension. Any extension of the 60-day correction period shall be subject to the Region's approval. Such approval will not be unreasonably withheld.

If **[Hospital]** discovers or otherwise becomes aware of a concern or concerns that may present an imminent and substantial endangerment to human health or the environment, and such concern(s) may exist at other **[Hospital]** campuses covered by this Agreement, notwithstanding any other language herein to the contrary, **[Hospital]** agrees to address such concern(s) at all covered campuses as expeditiously as possible and promptly take such action as may be necessary at all covered campuses to protect human health and the environment. **[Hospital]** shall notify EPA (initial notice may be by phone) of such concern(s) within 24 hours of discovery or becoming aware of such concern(s) and shall notify EPA in writing within five business days of such discovery of **[Hospital]**'s proposed remedial action.

VI. CIVIL PENALTIES FOR DISCLOSED VIOLATIONS

Except as provided in Section II.D.8 of the Policy, the Region will not impose gravity-based penalties for violations voluntarily discovered if they are timely disclosed and corrected, and provided that the applicable provisions of the Policy and this Agreement are met. The Region will consider the least expensive means for coming into compliance in calculating potential economic benefit penalties for any disclosed violations, provided that such methods comply with regulatory requirements. Where any disclosed violations entail economic benefits, and the potential economic benefit for such corrective actions are calculated to be less than $10,000 for the sum total of all violations at a facility, the penalties will be considered de minimus and will be waived by the Region.

VII. MISCELLANEOUS PROVISIONS

A. Notification and Certification of Disclosure Reports: **[Hospital]** designates as its 
responsible official, responsible for submitting disclosure reports to the Region, the following individual:

Name of Responsible Official
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The responsible official shall certify that each disclosure report submitted to the Region is true, accurate and complete in the form set forth in 40 C.F.R.

270.11(d).

[Hospital] designates as its 
contact person, to be the recipient of all communications from the Region concerning this Agreement, the following individual:

Name of Contact Person
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The Region designates the following individual as its contact person:

Charles Zafonte
Multimedia Enforcement Coordinator
DECA-CAPSB
U.S. Environmental Protection Agency, Region 2
290 Broadway (21ST Floor)
New York, New York 10007-1866

Phone: (212) 637-3515
Fax: (212) 637-4086
zafonte.charles@epa.gov

The parties may redesignate their contact person and responsible official in writing.

B. Compliance With Law and Regulation: Neither the existence of this Agreement, nor compliance with this Agreement relieves **[Hospital]** of its obligation of continued compliance with the regulations covered by this Agreement, and all other federal, state and local laws and regulations.

C. Reservation of Right: The Region reserves its right to proceed against **[Hospital]** for all violations outside the scope of the Audit, and violations within the scope of the Audit that were not timely reported or timely corrected. In any enforcement proceeding, the Region may enforce the provision of 40 C.F.R. allegedly violated, or its authorized or approved state counterpart, if said counterpart is federally enforceable as a matter of law.

D. Authority of Signatories: The signatories hereto represent that they have the authority to bind the parties.

E. Modification: This Agreement may be modified by a writing signed by both parties.

F. Coordination With the State Environmental Agency: The Region has informed the New York State Department of Environmental Conservation (NYSDEC) of this Agreement and shall provide a copy to the NYSDEC. Nothing herein restricts the NYSDEC from acting as it deems appropriate.

G. Effective Date: This Agreement is effective on the date that it is signed by both parties, or the last party if not signed on the same date.

WE, THE UNDERSIGNED, HEREBY AGREE TO BE BOUND BY THIS AGREEMENT:

For **[Hospital]**:

Name of Responsible Official
Title
Address
City, State, Zip Code

Date:

For EPA - Region 2:

Alan J. Steinberg, Regional Administrator
USEPA - Region 2
290 Broadway
New York, New York 10007
Date:

Appendix A

Covered Campuses and Off-Site Facilities Associated with Those Campuses

[List of Campuses and off-site facilities covered under the Audit Agreement goes here.]

Appendix B

SCOPE OF AUDIT PROGRAM

The following list provides the activities, areas, and/or shops that the review of the campus(es) must cover. This list not meant to be all-inclusive. [Please select and include areas that exist at your campus.]

Documents to Review (for the three years prior to the Program Period)

_ Verify EPA identification numbers and permits
_ Hazardous waste manifests
_ Training records
_ Land disposal restriction notifications
_ Exception reports
_ Lead disclosure statements in leases, or associated with leases of residential housing let by the university in its capacity as a lessor, as defined in 40 C.F.R. 745.103
_ Contingency plans and annual reports (for contingency plans, only the current plan will be reviewed)
_ Required certifications

Facilities Operation and Maintenance

_ Air conditioning/refrigeration service
_ Appliance and equipment repair, including medical equipment
_ Building cleaning and maintenance
_ Building renovation and construction
_ Cafeteria
_ Chemical storage areas
_ Drinking water treatment systems
_ Fabrication shops
_ Furniture repair
_ Heating and power plants (e.g., boilers, emergency generators)
_ House or architectural structure painting
_ Landscaping operations
_ Laundry
_ PCB transformers and switches
_ Pesticide storage facilities
_ Resource recovery/incinerator facilities
_ Waste disposal areas (landfills)
_ Wastewater treatment facilities

_ Waste treatment facilities such as autoclaves

Fleet Maintenance

_ Automotive, truck, and ambulance servicing areas
_ Gasoline service stations
_ Garages

Hazardous Waste / Tanks / Wells

_ Aboveground and current operating underground storage tanks and their containment areas/systems, and documentation concerning closures of regulated tanks previously removed from service.
_ Dry wells, septic systems, cesspools, floor drains, sink drains, and disposal wells.
_ Facilities treating, storing or disposing of hazardous wastes.
_ Hazardous waste satellite accumulation areas.
_ Hazardous waste storage areas.
_ Tanks that have been permanently or temporarily closed.
_ Transformers and oil-containing electrical equipment (PCB and non-PCB).
_ Universal waste storage areas.

Laboratories

_ All clinical, pathology and dental laboratories
_ All teaching and research laboratories with regular chemical use.

Patient Care

_ Anesthesiology
_ Chemotherapy
_ Dentist  s offices
_ Doctor  s offices
_ Floor Pharmacies
_ Histology
_ Intensive Care Units
_ Neonatal Areas
_ Nursing Stations
_ Operating Rooms
_ Pathology, microbiology
_ Patient  s Rooms
_ Patient treatment areas

_ X-Ray/Radiology

Main Pharmacy

_ Storage areas
_ Outdated pharmaceuticals

Sterile Supply and Materials Management

_ Autoclaving Units
_ Ethylene Oxide (EtO) Units
_ Glutaraldehyde
_ Use and disposal of disinfectants

Use and Disposal of Known Chemicals/Products of Concern

_ Computers/monitors, circuit boards, and other lead-bearing electronics
_ Ethanol and formaldehyde/ethanol solutions
_ Fluorescent light bulbs and other types of lamps, including high-intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps
_ Formaldehyde/Formalin
_ Mercury and Mercury-containing devices and products
_ PVC-containing devices
_ Xylene
_ Batteries
_ Solvents
_ Photographic chemicals and scrap film

Other Services

_ Athletic and training facilities
_ Photo processing/publishing
_ Morgue/Crematorium
_ Animal care areas

Appendix C

SCHEDULE OF AUDITS

[Insert a schedule of when audits will be done at each campus/location. Provide details as necessary such as deadlines for submitting the disclosure report, the regulatory areas being audited, and the names of campuses, buildings, or other location-specific info.]

Example:

Location	Programs to be Audited	Date Disclosure Report will be Submitted
Campus A, e.g.: Pharmacy Physical Plant Print Shop	e.g., RCRA, CWA	

FACILITY AUDIT AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and
[Insert Name of Hospital]

I. INTRODUCTION

In recognition that environmental auditing plays a critical role in protecting human health and the environment by identifying, correcting, and ultimately preventing violations of environmental regulations, **[Hospital]** and the United States Environmental Protection Agency, Region 2 (the "Region") hereby agree that **[Hospital]** shall conduct a self-audit program (the "Audit Program") for compliance with the regulations promulgated or authorized by the United States Environmental Protection Agency ("EPA") set forth in Section II below. The Agreement shall be governed by the terms of EPA's Policy entitled "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations," 65 Federal Register 19618 (4/11/00, the "Policy"), except to the extent that those terms are explicitly modified below.

II. SCOPE OF THE AUDIT

A. **[Hospital]** shall conduct an audit (the "Audit") of its compliance with the regulations cited below in subsections 1 - 6 of Section II.B. The Audit will encompass all **(enter number)** campuses of **[Hospital]**, including any associated off-site facilities such as _____ (if applicable). Appendix A attached hereto lists the campuses and other units associated

with each covered campus ( Covered Campuses) that are covered by this agreement.

B. Under the Audit Program, **[Hospital]** will audit compliance with the following federal regulatory programs:

1. Air Programs

Part 52[1] Section 21 Prevention of Significant Deterioration of Air Quality
Part 60 Standards of Performance for New Stationary Sources
Part 61 National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
Part 62 Subpart HHH - Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
Part 63 National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)
Part 68 Chemical Accident Prevention Provisions
Part 70 State Operating Permit Programs
Part 82 Protection of Stratospheric Ozone
All applicable provisions of, and the Commonwealth of Puerto Rico Implementation Plan regulations (pursuant to Section 110 of the Clean Air Act), including the New Source Review regulations. Part 52, Subpart BBB.

2. Water Programs

Part 112 Oil Pollution Prevention
Part 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System 40CFR Part 122.
Part 141 National Primary Drinking Water Regulations
Part 142 National Primary Drinking Water Regulations Implementation

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[1] The term  Part refers to the subdivisions of the subchapters of Title 40 Code of Federal Regulations ( C.F.R.).

Part 143 National Secondary Drinking Water Regulations

Part 144 Underground Injection Control ( UIC) Program

Part 145 State UIC Program Requirements
Part 146 UIC Program: Criteria and Standards
Part 147 State UIC Programs
Part 148 Hazardous Waste Injection Restrictions
Part 403 General Pretreatment Regulations for Existing and New Sources of Pollution test

3. Pesticide Programs

Part 160 Good Laboratory Practice Standards
Part 162 State Registration of Pesticide Products
Part 170 Worker Protection Standard
Part 171 Certification of Pesticide Applicators
Part 172 Experimental Use Permits

4. Solid and Hazardous Wastes

Part 260 Hazardous Waste Management System: General
Part 261 Identification and Listing of Hazardous Waste
Part 262 Standards Applicable to Generators of Hazardous Waste
Part 263 Standards Applicable to Transporters of Hazardous Waste
Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
Part 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
Part 268 Land Disposal Restrictions
Part 273 Standards for Universal Waste Management
Part 279 Standards for the Management of Used Oil
Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks 40CFR 282.102.

5. Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs

Part 302 Designation, Reportable Quantities, and Notification
Part 355 Emergency Planning and Notification
Part 370 Hazardous Chemical Reporting: Community Right-to-Know
Part 372 Toxic Chemical Release Reporting: Community Right-to-Know

6. Toxic Substances

Part 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures
Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
Part 763 Asbestos

C. The types of facilities and documents to be audited on the Covered Campuses are set forth in Appendix B. The benefits of this Agreement shall extend to only those facilities within the Covered Campuses that are audited.

III. DISCLOSURE

[Hospital] shall disclose all EPA-enforceable regulatory violations discovered during the Audit and eligible under the Audit Policy. **[Hospital]** will voluntarily disclose these violations to the Region, in accordance with the Policy, in written disclosure reports to be submitted in accordance with the schedule set forth below in Section IV. Each such disclosure report shall contain, with reference to each violation disclosed, the following additional information: the actions selected by **[Hospital]** to correct the violation within 60 days, or as otherwise approved pursuant to Section V below; the status of the corrective action; and the means taken by **[Hospital]** to prevent recurrence of the violation. All disclosure reports will be submitted by the scheduled date, and the Region agrees to waive the 21-day disclosure requirement provided for in the Policy.

Once the action designed to correct a particular violation has been completed, and a report submitted to the Region notifying it of the completion of the corrective action, no further reporting on that violation, or the status of corrective action, is required. On **[Date of Termination of Agreement - usually sixty days after the scheduled submittal of the last disclosure report]**, this Agreement shall terminate for all purposes, except that **[Hospital]** shall remain obligated to complete the action necessary to correct any disclosed violation, and to report to the Region in writing (1) the completion of any corrective action, previously unreported, within thirty days after such corrective action has been completed, and (2) the costs of coming into compliance for each violation disclosed under this Audit Agreement, and the amount of pollutants no longer released to the environment as a result of the corrective actions.

This Audit Agreement does not cover any pre-Agreement activities, including regulatory compliance issues discovered by **[Hospital]** or its environmental consultant(s) prior to the effective date of this Agreement.

IV. SCHEDULE

A. Within 10 days of the effective date of this agreement, **[Hospital]** will identify suitable personnel or consultants (where appropriate) to perform each of the six regulatory program audits identified in Section II above and shall further identify the applicable criteria pursuant to which each such regulatory program audit shall be conducted. **[Hospital]** shall submit to EPA the audit protocols and audit checklists for each of the six regulatory program audits, tailored to the Hospital, and shall provide copies of these audit instruments to the Region. **[Hospital]** is willing to share any materials it develops with other institutions and the U.S. Environmental Protection Agency.

B. Within 30 days of the signing of the agreement, the Audit shall commence.

C. **[Hospital]** shall complete the regulatory audits required by the Sections listed in this agreement, and shall submit disclosure reports to the Region, in accordance with the Policy and the Agreement, identifying all EPA-enforceable violations discovered during the course of these audits according to the schedule set forth in Appendix C.

V. CORRECTIVE ACTION

[Hospital] shall correct each violation identified during the Audit, and shall take steps necessary to prevent the recurrence of each such violation. **[Hospital]** shall correct any violations identified during the Audit as soon as possible, but within 60 days of discovery. In those instances in which **[Hospital]** is unable to correct an identified violation within the 60-day deadline, it shall request an extension of time from the Region in writing and provide a correction schedule, accompanied by a justification of the requested extension. Any extension of the 60-day correction period shall be subject to the Region's approval. Such approval will not be unreasonably withheld.

If **[Hospital]** discovers or otherwise becomes aware of a concern or concerns that may present an imminent and substantial endangerment to human health or the environment, and such concern(s) may exist at other **[Hospital]** campuses covered by this Agreement, notwithstanding any other language herein to the contrary, **[Hospital]** agrees to address such concern(s) at all covered campuses as expeditiously as possible and promptly take such action as may be necessary at all covered campuses to protect human health and the environment. **[Hospital]** shall notify EPA (initial notice may be by phone) of such concern(s) within 24 hours of discovery or becoming aware of such concern(s) and shall

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notify EPA in writing within five business days of such discovery of **[Hospital]** s proposed remedial action.

VI. CIVIL PENALTIES FOR DISCLOSED VIOLATIONS

Except as provided in Section II.D.8 of the Policy, the Region will not impose gravity-based penalties for violations voluntarily discovered if they are timely disclosed and corrected, and provided that the applicable provisions of the Policy and this Agreement are met. The Region will consider the least expensive means for coming into compliance in calculating potential economic benefit penalties for any disclosed violations, provided that such methods comply with regulatory requirements. Where any disclosed violations entail economic benefits, and the potential economic benefit for such corrective actions are calculated to be less than $10,000 for the sum total of all violations at a facility, the penalties will be considered de minimus and will be waived by the Region.

VII. MISCELLANEOUS PROVISIONS

A. Notification and Certification of Disclosure Reports: **[Hospital]** designates as its A responsible official, responsible for submitting disclosure reports to the Region, the following individual:

Name of Responsible Official
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The responsible official shall certify that each disclosure report submitted to the Region is true, accurate and complete in the form set forth in 40 C.F.R.

270.11(d).

[Hospital] designates as its 

contact person, to be the recipient of all communications from the Region concerning this Agreement, the following individual:

Name of Contact Person
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The Region designates the following individual as its contact person:

Charles Zafonte
Multimedia Enforcement Coordinator
DECA-CAPSB
U.S. Environmental Protection Agency, Region 2
290 Broadway (21ST Floor)
New York, New York 10007-1866
Phone: (212) 637-3515
Fax: (212) 637-4086
zafonte.charles@epa.gov

The parties may redesignate their contact person and responsible official in writing.

B. Compliance With Law and Regulation: Neither the existence of this Agreement, nor compliance with this Agreement relieves **[Hospital]** of its obligation of continued compliance with the regulations covered by this Agreement, and all other federal, state and local laws and regulations.

C. Reservation of Right: The Region reserves its right to proceed against **[Hospital]** for all violations outside the scope of the Audit, and violations within the scope of the Audit that were not timely reported or timely corrected. In any enforcement proceeding, the Region may enforce the provision of 40 C.F.R. allegedly violated, or its authorized or approved state counterpart, if said counterpart is federally enforceable as a matter of law.

D. Authority of Signatories: The signatories hereto represent that they have the authority to bind the parties.

E. Modification: This Agreement may be modified by a writing signed by both parties.

F. Coordination With the Commonwealth Environmental Agency: The Region has informed the Puerto Rico Environmental Quality Board (PREQB) of this Agreement and shall provide a copy to the PREQB. Nothing herein restricts PREQB from acting as it deems appropriate.

G. Effective Date: This Agreement is effective on the date that it is signed by both parties, or the last party if not signed on the same date.

WE, THE UNDERSIGNED, HEREBY AGREE TO BE BOUND BY THIS AGREEMENT:

For **[Hospital]**:

Name of Responsible Official
Title
Address
City, State, Zip Code

Date:

For EPA - Region 2:

Alan J. Steinberg, Regional Administrator
USEPA - Region 2
290 Broadway
New York, New York 10007
Date:

Appendix A

Covered Campuses and Off-Site Facilities Associated with Those Campuses

[List of Campuses and off-site facilities covered under the Audit Agreement goes here.]

Appendix B

SCOPE OF AUDIT PROGRAM

The following list provides the activities, areas, and/or shops that the review of the campus(es) must cover. This list not meant to be all-inclusive. [Please select and include areas that exist at your campus.]

Documents to Review (for the three years prior to the Program Period)

_ Verify EPA identification numbers and permits
_ Hazardous waste manifests
_ Training records
_ Land disposal restriction notifications
_ Exception reports
_ Lead disclosure statements in leases, or associated with leases of residential housing let by the university in its capacity as a lessor, as defined in 40 C.F.R. 745.103
_ Contingency plans and annual reports (for contingency plans, only the current plan will be reviewed)
_ Required certifications

Facilities Operation and Maintenance

_ Air conditioning/refrigeration service
_ Appliance and equipment repair, including medical equipment
_ Building cleaning and maintenance
_ Building renovation and construction
_ Cafeteria
_ Chemical storage areas
_ Drinking water treatment systems
_ Fabrication shops
_ Furniture repair
_ Heating and power plants (e.g., boilers, emergency generators)
_ House or architectural structure painting
_ Landscaping operations
_ Laundry
_ PCB transformers and switches
_ Pesticide storage facilities
_ Resource recovery/incinerator facilities
_ Waste disposal areas (landfills)
_ Wastewater treatment facilities

_ Waste treatment facilities such as autoclaves

Fleet Maintenance

_ Automotive, truck, and ambulance servicing areas
_ Gasoline service stations
_ Garages

Hazardous Waste / Tanks / Wells

_ Aboveground and current operating underground storage tanks and their containment areas/systems, and documentation concerning closures of regulated tanks previously removed from service.
_ Dry wells, septic systems, cesspools, floor drains, sink drains, and disposal wells.
_ Facilities treating, storing or disposing of hazardous wastes.
_ Hazardous waste satellite accumulation areas.
_ Hazardous waste storage areas.
_ Tanks that have been permanently or temporarily closed.
_ Transformers and oil-containing electrical equipment (PCB and non-PCB).
_ Universal waste storage areas.

Laboratories

_ All clinical, pathology and dental laboratories
_ All teaching and research laboratories with regular chemical use.

Patient Care

_ Anesthesiology
_ Chemotherapy
_ Dentist  s offices
_ Doctor  s offices
_ Floor Pharmacies
_ Histology
_ Intensive Care Units
_ Neonatal Areas
_ Nursing Stations
_ Operating Rooms
_ Pathology, microbiology
_ Patient  s Rooms
_ Patient treatment areas

_ X-Ray/Radiology

Main Pharmacy

_ Storage areas
_ Outdated pharmaceuticals

Sterile Supply and Materials Management

_ Autoclaving Units
_ Ethylene Oxide (EtO) Units
_ Glutaraldehyde
_ Use and disposal of disinfectants

Use and Disposal of Known Chemicals/Products of Concern

_ Computers/monitors, circuit boards, and other lead-bearing electronics
_ Ethanol and formaldehyde/ethanol solutions
_ Fluorescent light bulbs and other types of lamps, including high-intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps
_ Formaldehyde/Formalin
_ Mercury and Mercury-containing devices and products
_ PVC-containing devices
_ Xylene
_ Batteries
_ Solvents
_ Photographic chemicals and scrap film

Other Services

_ Athletic and training facilities
_ Photo processing/publishing
_ Morgue/Crematorium
_ Animal care areas

Appendix C

SCHEDULE OF AUDITS

[Insert a schedule of when audits will be done at each campus/location. Provide details as necessary such as deadlines for submitting the disclosure report, the regulatory areas being audited, and the names of campuses, buildings, or other location-specific info.]

Example:

Location	Programs to be Audited	Date Disclosure Report will be Submitted
Campus A, e.g.: Pharmacy Physical Plant Print Shop	e.g., RCRA, CWA	

FACILITY AUDIT AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and
[Insert Name of Hospital]

I. INTRODUCTION

In recognition that environmental auditing plays a critical role in protecting human health and the environment by identifying, correcting, and ultimately preventing violations of environmental regulations, **[Hospital]** and the United States Environmental Protection Agency, Region 2 (the "Region") hereby agree that **[Hospital]** shall conduct a self-audit program (the "Audit Program") for compliance with the regulations promulgated or authorized by the United States Environmental Protection Agency ("EPA") set forth in Section II below. The Agreement shall be governed by the terms of EPA's Policy entitled "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations," 65 Federal Register 19618 (4/11/00, the "Policy"), except to the extent that those terms are explicitly modified below.

II. SCOPE OF THE AUDIT

A. **[Hospital]** shall conduct an audit (the "Audit") of its compliance with the regulations cited below in subsections 1 - 6 of Section II.B. The Audit will encompass all / **(enter number)** campuses of **[Hospital]**, including any associated off-site facilities such as _____ (if applicable). Appendix A attached hereto lists the campuses and other units associated with each covered campus ("Covered Campuses") that are covered by this agreement.

B. Under the Audit Program, **[Hospital]** will audit compliance with the following federal regulatory programs:

1. Air Programs

Part 52[1] Section 21 Prevention of Significant Deterioration of Air Quality
Part 60 Standards of Performance for New Stationary Sources
Part 61 National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
Part 62 Subpart HHH - Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
Part 63 National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)

[1] The term "Part" refers to the subdivisions of the subchapters of Title 40 Code of Federal Regulations ("C.F.R.").

Part 68 Chemical Accident Prevention Provisions
Part 70 State Operating Permit Programs
Part 82 Protection of Stratospheric Ozone
All applicable provisions of; and the New York State Implementation Plan Regulations (promulgated pursuant to Section 110 of the Clean Air Act) including the New Source Review regulations

2. Water Programs

Part 112 Oil Pollution Prevention
Part 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
Part 141 National Primary Drinking Water Regulations
Part 142 National Primary Drinking Water Regulations Implementation
Part 143 National Secondary Drinking Water Regulations
Part 144 Underground Injection Control ("UIC") Program
Part 145 State UIC Program Requirements
Part 146 UIC Program: Criteria and Standards
Part 147 State UIC Programs
Part 148 Hazardous Waste Injection Restrictions
Part 403 General Pretreatment Regulations for Existing and New Sources of Pollution

3. Pesticide Programs

Part 160 Good Laboratory Practice Standards
Part 162 State Registration of Pesticide Products
Part 170 Worker Protection Standard
Part 171 Certification of Pesticide Applicators
Part 172 Experimental Use Permits

4. Solid and Hazardous Wastes

Part 260 Hazardous Waste Management System: General (Part 370, 6 New York Code of Rules and Regulations ("6 NYCRR")[2]
Part 261 Identification and Listing of Hazardous Waste (Part 371, 6 NYCRR)
Part 262 Standards Applicable to Generators of Hazardous Waste (Part 372, 6 NYCRR)

[2] New York State has been authorized by the Region for many of the federal regulations comprising Parts 260 - 280. Once authorized, a state regulation becomes the applicable regulation. [Resource Conservation and Recovery Act ("RCRA"), as amended, §3006(b), 42 U.S.C. §6926(b)]. For purposes of this Agreement **[Hospital]** will audit for compliance with authorized New York State counterparts of the federal regulations, where applicable, found at 6 NYCRR Parts 370 -373 and Subpart 374-3.

Part 263 Standards Applicable to Transporters of Hazardous Waste (Part 372, 6 NYCRR)
Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Subpart 373-2, 6 NYCRR)
Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Subpart 373-3, 6 NYCRR)
Part 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (Subpart 374-1, 6 NYCRR)
Part 268 Land Disposal Restrictions (Part 376, 6 NYCRR)
Part 273 Standards for Universal Waste Management (Subpart 374-3, 6 NYCRR)
Part 279 Standards for the Management of Used Oil
Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks ("USTs")

5. Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs

Part 302 Designation, Reportable Quantities, and Notification
Part 355 Emergency Planning and Notification
Part 370 Hazardous Chemical Reporting: Community Right-to-Know
Part 372 Toxic Chemical Release Reporting: Community Right-to-Know

6. Toxic Substances

Part 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures
Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
Part 763 Asbestos

C. The facilities and documents to be audited on the Covered Campuses are set forth in Appendix B. The benefits of this Agreement shall extend to only those facilities within the Covered Campuses that are audited.

III. DISCLOSURE

[Hospital] shall disclose all regulatory violations discovered during the Audit. **[Hospital]** will disclose these violations to the Region, in accordance with the Policy, in written disclosure reports to be submitted in accordance with the schedule set forth below in Section IV. Each such disclosure report shall contain, with reference to each violation disclosed, the following additional information: the actions selected by **[Hospital]** to correct the violation within 60 days, or as otherwise approved pursuant to Section V below; the status of the corrective action; and the means taken by **[Hospital]** to prevent

recurrence of the violation. All disclosure reports will be submitted by the scheduled date, and the Region agrees to waive the 21-day disclosure requirement provided for in the Policy.

Once the action designed to correct a particular violation has been completed, and a report submitted to the Region notifying it of the completion of the corrective action, no further reporting on that violation, or the status of corrective action, is required. On **[Date of Termination of Agreement - usually sixty days after submittal of last disclosure report]**, this Agreement shall terminate for all purposes, except that **[Hospital]** shall remain obligated to complete the action necessary to correct any disclosed violation, and to report to the Region in writing the completion of any corrective action, previously unreported, within thirty days after such corrective action has been completed.

This Audit Agreement does not cover any pre-Agreement activities, including regulatory compliance issues discovered by **[Hospital]** or its environmental consultant(s) prior to the effective date of this Agreement.

IV. SCHEDULE

A. Within 10 days of the effective date of this agreement, **[Hospital]** will identify suitable personnel or consultants (where appropriate) to perform each of the six regulatory program audits identified in Section II above and shall further identify the applicable criteria pursuant to which each such regulatory program audit shall be conducted. **[Hospital]** shall submit to EPA the audit protocols and audit checklists for each of the six regulatory program audits, tailored to the Hospital, and shall provide copies of these audit instruments to the Region. **[Hospital]** is willing to share any materials it develops with other healthcare institutions and the Region.

B. Within 30 days of the signing of the agreement, the Audit shall commence.

C. **[Hospital]** shall complete the regulatory audits required by the Sections listed in this agreement, and shall submit disclosure reports to the Region, in accordance with the Policy and the Agreement, identifying all violations discovered during the course of these audits according to the schedule set forth in Appendix C.

V. CORRECTIVE ACTION

[Hospital] shall correct each violation identified during the Audit, and shall take steps necessary to prevent the recurrence of each such violation. Wherever possible, **[Hospital]** shall correct any violations identified during the Audit within 60 days of discovery. In those instances in which **[Hospital]** is unable to correct an identified violation within the 60-day deadline, it shall request an extension of time from the Region in writing and provide a correction schedule, accompanied by a justification of the requested extension.

Any extension of the 60-day correction period shall be subject to the Region's approval. Such approval will not be unreasonably withheld.

If **[Hospital]** discovers or otherwise becomes aware of a concern or concerns that may present an imminent and substantial endangerment to human health or the environment, and such concern(s) may exist at other **[Hospital]** campuses covered by this Agreement, notwithstanding any other language herein to the contrary, **[Hospital]** agrees to address such concern(s) at all covered campuses as expeditiously as possible and promptly take such action as may be necessary at all covered campuses to protect human health and the environment. **[Hospital]** shall notify EPA (initial notice may be by phone) of such concern(s) within 24 hours of discovery or becoming aware of such concern(s) and shall notify EPA in writing within five business days of such discovery of **[Hospital]**'s proposed remedial action.

VI. CIVIL PENALTIES FOR DISCLOSED VIOLATIONS

Except as provided in Section II.D.8 of the Policy, the Region will not impose gravity-based penalties for violations discovered if they are timely disclosed and corrected, and provided that the applicable provisions of the Policy and this Agreement are met. The Region will consider the least expensive means for coming into compliance for calculating potential economic benefit penalties for any disclosed violations, provided that such methods comply with regulatory requirements.

VII. REGIONAL INSPECTIONS

The Region will assign a low priority for compliance inspections at the Covered Campuses until after the completion of the Audit, except with respect to potential violations of regulatory provisions, or at facilities, that are outside the scope of the Audit, as defined in Section II above, or where: the Region has received a citizen's complaint; the Region has reason to believe that circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment; the Region has reason to believe that a criminal violation may, or has occurred; or where **[Hospital**], pursuant to statute, has notified the National Response Center of a release. Any civil violation discovered in a facility or unit within the scope of the Audit, that was scheduled to be audited subsequent to such discovery, shall be treated as a disclosure by **[Hospital]** and resolved under the terms of the Policy and this Agreement. Additionally, the Region retains the right to conduct during the Audit the inspections set forth in subsections A and B immediately below:

A. Oversight Inspections: Where **[Hospital]** has reported a violation that requires corrective action in the nature of a clean-up of contaminated soil or water, the Region shall have the right to conduct inspections at the corrective action site for the purpose of overseeing or monitoring the clean-up, to assure correction of the violation. No civil penalties shall be associated with or result from oversight inspections, unless circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment.

B. Confirmation Inspections: Where **[Hospital]** has disclosed a violation, selected a corrective action plan, and reported that the plan has been completed and the violation cured, the Region shall have the right to inspect the relevant facility or site to assure that the violation has in fact been corrected, or to require further appropriate corrective action, if it has not. No civil penalties shall be associated with or result from confirmation inspections, unless circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment.

VIII. MISCELLANEOUS PROVISIONS

A. Notification and Certification of Disclosure Reports: **[Hospital]** designates as its "responsible official," responsible for submitting disclosure reports to the Region, the following individual:

Name of Responsible Official
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number

The responsible official shall certify that each disclosure report submitted to the Region is true, accurate and complete in the form set forth in 40 C.F.R. §270.11(d).

[Hospital] designates as its "contact person," to be the recipient of all communications from the Region concerning this Agreement, the following individual:

Name of Contact Person
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The Region designates the following individual as its contact person:

Charles Zafonte
Multimedia Enforcement Coordinator
DECA/CAPSB
U.S. Environmental Protection Agency, Region 2
290 Broadway (21ST Floor)
New York, New York 10007-1866

Phone: (212) 637-3515
Fax: (212) 637-4086
zafonte.charles@epa.gov

The parties may redesignate their contact person and responsible official in writing.

B. Compliance With Law and Regulation: Neither the existence of this Agreement, nor compliance with this Agreement relieves **[Hospital]** of its obligation of continued compliance with the regulations covered by this Agreement, and all other federal, state and local laws and regulations.

C. Reservation of Right: The Region reserves its right to proceed against **[Hospital]** for all violations outside the scope of the Audit, and violations within the scope of the Audit that were not timely reported or timely corrected. In any enforcement proceeding, the Region may enforce the provision of 40 C.F.R. allegedly violated, or its New York State authorized or approved counterpart, if said state counterpart is federally enforceable as a matter of law.

D. Authority of Signatories: The signatories hereto represent that they have the authority to bind the parties.

E. Modification: This Agreement may be modified by a writing signed by both parties.

F. Coordination With the State Environmental Agency: The Region has informed NYSDEC of this Agreement and shall provide a copy to NYSDEC at each of the following addresses:

Mr. James H. Ferreira, Esq.
Deputy Commissioner and General Counsel
NYS Department of Environmental Conservation
625 Broadway
Albany, NY 12233-1010

Name
Regional Director, Region ?
NYS Department of Environmental Conservation
Street
City, NY Zip

Nothing herein, however, restricts NYSDEC from acting as it deems appropriate.

WE, THE UNDERSIGNED, HEREBY AGREE TO BE BOUND BY THIS AGREEMENT:

For **[Hospital]**:

Name of Responsible Official
Title
Address
City, State, Zip Code

Date:

For EPA - Region 2:

Jane M. Kenny, Regional Administrator
USEPA - Region 2
290 Broadway
New York, New York 10007

Date:

Appendix A

Covered Campuses and Off-Site Facilities Associated with Those Campuses

[List of Campuses and off-site facilities covered under the Audit Agreement goes here.]

Appendix B

SCOPE OF AUDIT PROGRAM

The following list provides the activities, areas, and/or shops that the review of the campus(es) must cover. This list not meant to be all-inclusive. [Please select and include areas that exist at your campus.]

Documents to Review (for the three years prior to the Program Period)

- Verify EPA identification numbers and permits
- Hazardous waste manifests
- Training records
- Land disposal restriction notifications
- Exception reports
- Lead disclosure statements in leases, or associated with leases of residential housing let by the university in its capacity as a lessor, as defined in 40 C.F.R. § 745.103
- Contingency plans and annual reports (for contingency plans, only the current plan will be reviewed)
- Required certifications

Facilities Operation and Maintenance

- Air conditioning/refrigeration service
- Appliance and equipment repair, including medical equipment
- Building cleaning and maintenance
- Building renovation and construction
- Cafeteria
- Chemical storage areas
- Drinking water treatment systems
- Fabrication shops
- Furniture repair
- Heating and power plants (e.g., boilers, emergency generators)
- House or architectural structure painting
- Landscaping operations
- Laundry
- PCB transformers and switches
- Pesticide storage facilities
- Resource recovery/incinerator facilities
- Waste disposal areas (landfills)
- Wastewater treatment facilities
- Waste treatment facilities such as autoclaves

Fleet Maintenance

- Automotive, truck, and ambulance servicing areas

- Gasoline service stations
- Garages

Hazardous Waste / Tanks / Wells

- Aboveground and current operating underground storage tanks and their containment areas/systems, and documentation concerning closures of regulated tanks previously removed from service.
- Dry wells, septic systems, cesspools, floor drains, sink drains, and disposal wells.
- Facilities treating, storing or disposing of hazardous wastes.
- Hazardous waste satellite accumulation areas.
- Hazardous waste storage areas.
- Tanks that have been permanently or temporarily closed.
- Transformers and oil-containing electrical equipment (PCB and non-PCB).
- Universal waste storage areas.

Laboratories

- All clinical, pathology and dental laboratories
- All teaching and research laboratories with regular chemical use.

Patient Care

- Anesthesiology
- Chemotherapy
- Dentist’s offices
- Doctor’s offices
- Floor Pharmacies
- Histology
- Intensive Care Units
- Neonatal Areas
- Nursing Stations
- Operating Rooms
- Pathology, microbiology
- Patient’s Rooms
- Patient treatment areas
- X-Ray/Radiology

Main Pharmacy

- Storage areas
- Outdated pharmaceuticals

Sterile Supply and Materials Management

- Autoclaving Units
- Ethylene Oxide (EtO) Units
- Glutaraldehyde

- Use and disposal of disinfectants

Use and Disposal of Known Chemicals/Products of Concern

- Computers/monitors, circuit boards, and other lead-bearing electronics
- Ethanol and formaldehyde/ethanol solutions
- Fluorescent light bulbs and other types of lamps, including high-intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps
- Formaldehyde/Formalin
- Mercury and Mercury-containing devices and products
- PVC-containing devices
- Xylene
- Batteries
- Solvents
- Photographic chemicals and scrap film

Other Services

- Athletic and training facilities
- Photo processing/publishing
- Morgue/Crematorium
- Animal care areas

Appendix C

SCHEDULE OF AUDITS

[Insert a schedule of when audits will be done at each campus/location. Provide details as necessary such as deadlines for submitting the disclosure report, the regulatory areas being audited, and the names of campuses, buildings, or other location-specific info.]

Example:

Location	Programs to be Audited	Date Disclosure Report will be Submitted
Campus A, e.g.: Pharmacy Physical Plant Print Shop	e.g., RCRA, CWA	

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Operating Rooms** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination, Employee Health	1	1	4	4	**10**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	2	3	4	4	**13**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Exposure	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	0	2	4	2	**8**

High Level Disinfection	Handling and Disposal of Detergent Disinfectants	Employee Exposure	0	2	4	3	**9**
Waste Anesthetic Gases	Generation of Waste Anesthetic Gases	Potential Employee/Patient Health Effects	1	2	4	3	**10**
Radiography	Generation of Spent Photo Processing Fluids	Environmental Contamination, Employee Exposure to Hazardous Chemicals	1	2	3	3	**9**
Use of Disposable/Reusable Medical Supplies	Potential for Solid Waste Generation or Increased Sterilization Activities	Increase of Solid Waste Disposal or Sterilization Process	0	1	3	3	**7**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Outpatient Clinics** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure and Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination	0	1	4	4	**9**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	2	3	4	4	**13**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Exposure	1	2	4	3	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	1	2	4	2	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Pathology/Morgue** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	2	2	4	2	**10**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	2	3	4	4	**13**
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal, Wastewater Discharge	Environmental Contamination	2	2	4	3	**11**
Chemical Storage	Potential for Spills	Environmental Contamination	1	3	4	4	**12**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Disposal of Human Tissue	Medical Waste Generation	Environmental Contamination	1	4	3	4	**12**
Autoclave Operation	Sterilization of Biological Waste, Energy Consumption	Exposure to Pathogens, Use of Natural Resources	1	2	2	3	**8**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Pharmacy** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	Local Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	0	2	3	4	**9**
Chemical Storage	Potential for Spills	Environmental Contamination	0	2	3	4	**9**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Compounding, Drug Preparation and Administration	Improper Disposal	Environmental Contamination	1	1	4	4	**10**
Generation of Pharmaceutical Waste	Handling, Storage, Labeling of Containers	Environmental Contamination	0	3	3	4	**10**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	1	2	4	2	**9**
Handling of Cardboard, Plastics	Generation of Solid Waste	Generation of Solid Waste or Potential for Recycling	0	0	3	3	**6**
Use of Fume Hoods	Energy Consumption, Air Emission	Use of Natural Resources, Environmental Contamination	1	3	4	3	**11**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **VA Police** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Automobile Surveillance	Oil and Exhaust	Contamination	1	3	4	2	**10**
Ammunition Concerns	Storage, Handling and Usage of Lead	Contamination	0	3	1	3	**7**
Report Generation	Use of Paper	Natural Resource Expense	0	1	2	3	**6**
Chemical Storage	Potential for Spills	Environmental Contamination	0	1	1	3	**5**
Chemical Usage	Oil, Lubricant and Solvent Used for Gun Cleaning	Environmental Contamination	1	2	1	3	**7**
Vest Replacement	Exporting Old Kevlar	Disposal Space Usage	0	1	1	2	**4**
Range Practice	Empty Brass Cartridge Production	Disposal Space Usage	1	1	2	2	**6**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Prosthetics** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	2	4	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Battery Consumption	Replacement and Disposal	Environmental Contamination	0	2	1	4	**7**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	0	2	4	2	**8**
Assistive Device Production and Adjustment	Grinding, Welding, Finishing, Heat Treating (Oven Usage)	Health Effects, Environmental Contamination, Waste Production	1	2	3	3	**9**
Paint Spray Booth	Air Emissions	Environmental Contamination	0	3	2	3	**8**

GEMS Quick Find Chart
(For Getting Started)

I NEED:		***GO TO:***
Help! I need a GEMS evaluation tool.	⇨	Section 3, Enclosure 3-2, GEMS Gap Analysis Tool; and Section 7, E-SAFE Criteria Statements
I need a sample GEMS Medical Center Policy.	⇨	Section 5B
How do I know if my GEMS program meets requirements?	⇨	Section 7, E-SAFE Criteria Statements
Where do I start?	⇨	Section 3, Nine Steps for a Successful GEMS
I need electronic GEMS documents that I can modify.	⇨	Section 5
I want to present an overview of the GEMS to my VAMC Management. Where can I find training materials?	⇨	See the GEMS Awareness Training PowerPoint in Section 6
I need a compliance audit guide.	⇨	See Environmental Compliance Guidebook, Book 6B
What are some environmental impacts of VA medical center operations?	⇨	See Section 4, Sample Environmental Aspects Templates
Can I see an example of ranking of significant aspects for a VAMC?	⇨	Section 4, Ranking of Aspects

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Radiology and Nuclear Medicine** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Film Processing	Health Effects, Environmental Contamination	1	3	4	4	**12**
Chemical Storage	Potential for Spills	Environmental Contamination	1	2	4	4	**11**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination	0	1	3	3	**7**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	0	3	4	4	**11**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Exposure	1	1	4	3	**9**

Cleaning & Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	0	2	4	2	**8**
Maintenance of Equipment	Generation of Batteries	Environmental Contamination	1	1	2	2	**6**
X-ray Film Silver Recovery Operation	Silver Recovery	Employee Health and Wastewater Contamination	2	3	4	3	**12**
X-ray Film Storage and Disposal	Recycling or Handling as Hazardous Waste	Waste Generation/Recycling	0	2	4	3	**9**
High Level Disinfection	Use of Cidex or Other High Level Disinfectants	Employee Health Effects	0	2	3	3	**8**
Nuclear Medicine Scanning	Administration of Radionucleotides, Handling of Mixed Wastes	Employee Chemical and Radiation Exposure	1	3	4	3	**11**
Handling and Storage of Radionucleotides	Improper Disposal and Handling of Wastes	Environmental Contamination, Human Health Effects	1	3	4	3	**11**

EPA/625/C-06/006
November 2007

Healthcare Environmental Assistance Resources

Pollution Prevention and Compliance Assistance for Healthcare Facilities

U.S. Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
Center for Environmental Research Information
Cincinnati, Ohio

NOTICE

The U.S. Environmental Protection Agency through its Office of Research and Development partially funded and managed the research described here under Cooperative Agreement #R-83045301-1 to the Kentucky Pollution Prevention Center at the University of Louisville, Louisville, Kentucky. It has been subjected to the Agency's peer and administrative review and has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

The information provided on this CD ROM is intended to provide compliance assistance to healthcare facilities. Please note that the information for healthcare facilities may not be complete and should be relied upon only as general guidance. This information should be used in conjunction with the regulations, not in place of them. This document should not be considered Agency guidance, policy, or any part of any rule-making effort, but is provided for informational and discussion purposes only. It is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. Any variation between applicable regulations and the information provided on this CD ROM is unintentional and, in the case of such variations, the requirements of the regulations govern. It is also important to note that this document is based on the federal definition of hazardous waste and many states have developed their own hazardous waste regulatory programs. This CD ROM does not contain an exhaustive list or description of all federal, state or local requirements, and other rules may apply. It is always advisable to check with your local regulatory authority to ensure compliance.

Also note this CD ROM contains internet address and direct links to internet sites. The links are active as of printing of this CD ROM. It is beyond the control of the authors of this CD ROM to anticipate changes in addresses and/or links.

FOREWORD

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory (NRMRL) is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threaten human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

Sally C. Gutierrez, Director
National Risk Management Research Laboratory

ACKNOWLEDGMENTS

This CD ROM is a collection of healthcare resources and cooperation from U.S. Environmental Protection Agency (EPA) including Office of Research & Development (ORD), Office of Enforcement and Compliance Assurance (OECA), Office of Pollution Prevention & Toxics (OPPT), Office of Policy Economics & Innovation (OPEI), Office of Water (OW), Office of Solid Waste & Emergency Response (OSWER), Office of Air and Radiation (OAR), several EPA Regions (predominately EPA Region 2), the Veterans Health Administration, State agencies, healthcare organizations, and working groups. Several key documents on this CD ROM are a result of collaborative efforts between EPA and either the Kentucky Pollution Prevention Center, or Hospitals for a Healthy Environment, or healthcare facilities.

We'd like to offer special thanks to the many reviewers in the healthcare community, State and Federal Agencies whose generous contributions of time and expertise has greatly enhanced the quality of these products.

The actual collection of materials and layout of the CD ROM was made possible by staff from EPA Region 2.

ABSTRACT

This CD ROM is a result of several healthcare guidance documents coming into existence around the same time and the need for one tool where healthcare facilities could have access to these documents and other valuable healthcare resources regardless of connection to the internet.

Through Regional EPA healthcare initiatives, namely Region's 1 and 2, it was established that many healthcare facilities pose environmental and public health concerns. Hospitals contribute to the presence of toxic chemicals such as phthalates, mercury, and dioxin in the environment. In addition, hospitals are also generators of a wide variety of hazardous wastes (e.g., chemotherapy and antineoplastic chemicals, epinephrine, pharmaceuticals, solvents, formaldehyde, photographic chemicals, radionuclides, and waste anesthetic gases), which many are mismanaged, and hospitals produce two million tons of solid waste which is 1% of the total municipal solid waste in the U.S.

Many hospitals have only one person in charge of all health, safety and environmental issues and it is very difficult for one person to manage all the environmental aspects of a healthcare facility let alone the health and safety issues as well. A hospital may have, for example, laboratories, operating rooms, pharmacies, radiological facilities, cafeterias, housekeeping and laundry units, fleet maintenance facilities, boilers, medical waste incinerators, emergency generators, grounds and landscaping facilities, underground or above ground oil and fuel storage tanks, air conditioning and refrigeration equipment, morgues, lead-based paint, and asbestos. As a result, they are regulated by a myriad of environmental statutes including the Resource Conservation and Recovery Act, Clean Air Act, Clean Water Act, Safe Drinking Water Act, Oil Pollution Act and the Emergency Planning and Community Right to Know Act, not to mention the various state and local regulations that may be more stringent than the federal laws.

This CD ROM is a tool that will help the user better understand the healthcare sector's relationship to the environment and to help them come into compliance, maintain compliance, and go beyond compliance.

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Rehabilitation/Occupational/Physical Therapy** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Exposure	1	2	2	2	**7**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	0	2	4	2	**8**
Activities to Include Ceramics, Wood Shop, Horticulture, etc.	Use of Paints, Solvents, Glazes, Pesticides, Herbicides, etc.	Health Effects, Environmental Contamination	1	3	3	4	**11**
Paint Spray Booth	Air Emissions	Air Pollution	1	3	2	4	**10**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Research Laboratory** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Electrical Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Hazardous Waste Disposal	Environmental Contamination	1	3	2	4	**10**
Chemical Storage	Potential for Spills	Environmental Contamination	0	4	4	4	**12**
Report Generation	Use of Paper	Use of Natural Resources	0	0	2	3	**5**
Use of Radioactive Material	Hazardous Waste Disposal	Environmental Contamination, Employee Exposure	0	4	4	4	**12**
Use of Fume Hoods	Energy Consumption, Air Emissions	Use of Natural Resources, Environmental Contamination	2	3	4	3	**12**
Receive Specimens	Biomedical Waste Generation	Environmental Contamination	1	3	4	4	**12**
Use of Refrigeration/ Freezer	Energy Consumption, Waste Disposal	Use of Natural Resources, Environmental Contamination	0	2	3	2	**7**
Animal Testing	Disposal of Animal Waste	Environmental Contamination	0	3	2	4	**9**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Safety/Industrial Hygiene** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	2	**7**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	1	4	4	**10**
Chemical Storage	Use of Storage Space, Hazardous Waste Disposal	Environmental Contamination	1	3	3	3	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	3	**7**
Disposal of Old Calibration Gas	Hazardous Waste Disposal	Environmental Contamination	2	3	1	3	**9**

Table of Contents

Section 1 - Introduction to the GEMS Program

Introduction

Federal government agencies are required by Executive Order 13148, entitled "Greening the Government Through Leadership in Environmental Management," to develop and implement by December 31, 2005, environmental management systems at all appropriate* agency facilities. The text of Executive Order 13148 and a description of its sections are attached as Enclosure 1-1 and Enclosure 1-2, respectively.

> **Note: All VA Medical Centers are considered to be appropriate facilities. Multi-campus VA Healthcare Systems are considered to be a single appropriate facility. Other VHA facilities, such as Community Based Outpatient Clinics, are considered part of their affiliated VAMC for the purpose of developing an environment management system.*

This Guidebook is designed to help the Veterans Health Administration (VHA) facilities develop and implement an environmental management system. VHA is naming their environmental management system the Green Environmental Management System (GEMS). Properly implemented, a GEMS program can improve productivity and advance environmental protection and performance in a cost effective manner. It can elevate VHA environmental management practices to the "best in class" in ways that will be recognized by stakeholders inside and outside of VHA.

The most familiar form of an environmental management system is outlined in the 14001 Standard established by the International Organization for Standardization (ISO). This standard, entitled "Environmental Management System Standard," states that environmental management systems are "that part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy." Although there are other standards for environmental management systems, such as the Environmental Protection Agency's (EPA's) CEMP (Code of Environmental Management Principles), ISO 14001 is becoming widely adopted by the private sector throughout the United States and internationally. Many federal agencies are also considering the principles of ISO 14001 in the development of their environmental management systems. More detailed information on ISO 14001 and CEMP will appear later in this Introduction.

1.1 What is an Environmental Management System?

An environmental management system is a systematic approach to ensuring that a hospital's or a facility's environmental activities are well managed in all organizations. Because an environmental management system focuses on management practices, it can operate at facilities of widely varying size, complexity and missions, whether they are offices,

laboratories, facilities or agencies. An environmental management system can provide managers with a predictable structure for management, assessment and continual improvement of the effectiveness and efficiency of their environmental activities. An environmental management system approach builds in periodic review by top management and emphasizes continual improvement instead of crisis management.

The systematic nature of the environmental management system allows an agency to focus on management implementation and take a more inclusive and proactive view of environmental protection. By demonstrating improved environmental performance, an environmental management system can open the door to improved relations with regulators, stakeholders and the public. By itself, an environmental management system does not guarantee performance or compliance. Environmental management systems must be continually reviewed and improved to ensure compliance and to advance environmental and mission goals.

Each VA medical center needs to adapt its environmental management system to address its particular goals, activities, budgets, missions, conditions and stakeholders; "one size does not fit all." Developing an environmental management system rarely requires beginning from scratch. Many VHA facilities will find they have many of the environmental management system elements already in place. As facilities develop their environmental management systems, they will undoubtedly note that their management of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Environment of Care requirements follows a process very similar to that of an environmental management system. A formal environmental management system can help draw together the numerous program elements having environmental responsibilities that are typically found at VHA facilities. This will help produce a clearly defined environmental program and an integrated framework for environmental activities.

1.2 Code of Environmental Management Principles (CEMP)

The CEMP is a set of five broad environmental management principles developed by EPA to address all areas of environmental responsibility. CEMP provides federal agencies with a framework for developing environmental management systems at government facilities. The principles and supporting performance objectives are intended to serve as guideposts for organizations intending to implement environmental management programs or improve existing ones. The organization is expected to create operational programs and procedures to fulfill its commitment to the principles. EPA modeled the CEMP on common elements found in a number of environmental management system standards but with a stronger emphasis on sustainable development and regulatory compliance. The CEMP (published on October 16, 1996, 61 Federal Register 54062) was developed in coordination with other federal agencies, as required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements."

The five CEMP Principles are as follows:

1. *Management Commitment*: The agency makes a written top-management commitment to improve environmental performance by establishing policies that emphasize pollution prevention and the need to ensure compliance with environmental requirements.
2. *Compliance Assurance and Pollution Prevention*: The agency implements proactive programs that aggressively identify and address potential compliance problem areas and utilize pollution prevention approaches to correct deficiencies and improve environmental performance.
3. *Enabling Systems*: The agency develops and implements the necessary measures to enable personnel to perform their functions consistent with regulatory requirements, agency environmental policies and its overall mission.
4. *Performance and Accountability*: The agency develops measures to address employee environmental performance and ensures full accountability of environmental functions.
5. *Measurement and Improvement*: The agency develops and implements a program to assess progress toward meeting its environmental goals and uses the results to improve environmental performance.

1.3 ISO 14001 Environmental Management Systems – Specification with Guidance for Use

Increased interest in systematic management of environmental programs in the 1990s resulted in the development of international consensus standards related to environmental management systems. The ISO 14000 series has been developed under the auspices of the International Organization for Standardization (ISO).

The ISO 14000 series includes Standard 14001 for environmental management systems. The benefits of using the ISO 14001 standard as a model for environmental management systems include:

- Increased efficiency and reduced costs.
- Reduced liabilities.
- Enhanced compliance.
- Enhanced reputation and public image.

The ISO 14001 approach to environmental management systems establishes procedures, programs and operations that are designed to inspire environmental ethics in an organization. The ISO 14001 standard is based on the Plan-Do-Check-Act model; it is operational and process oriented, and addresses the following principles:

1. *Continual Improvement*. ISO 14001 establishes a framework that relies on process management and continual improvement of processes. Continual improvement ensures that processes do not stagnate - that they remain appropriate for continual use under the changing circumstances of operation. Continual improvement should remain a requirement of a facility's environmental management system even when the desired level of environmental performance is reached. New opportunities for improvement can be explored.

2. *Prevention of Pollution*. ISO 14001 encourages facilities to avoid the creation of pollution as a means of managing its environmental programs. Pollution prevention strategies range from source reduction to product substitution and recycling. The ultimate objective is to engineer pollution prevention features into products, design and operational processes in the beginning that will result in decreased production of pollutants and the attendant reduction in operating costs.

3. *Employee Involvement*. Maximizing the benefits accrued by an organization resulting from implementation of an environmental management system depends to a significant extent on employee involvement in the environmental management system process. To promote the foregoing, the ISO standard states that the key elements of the environmental management system must be implemented at "each relevant function and level of the organization." For example, the expectation of ISO 14001 is that individual employees have an in-depth understanding of their facility's operation as it relates to environmental requirements.

4. *Top Management Visibility and Leadership*. ISO 14001 states that upper level management visibility and leadership are essential elements of a facility's environmental management system. The reason that this is an important part of an environmental management system is that any attempt to change an organization's culture to embrace environmental stewardship without strong leadership from the top would likely end in failure. The high level of employee involvement that is required to successfully change organizational culture will not happen unless management itself becomes involved, committed and visible.

5. *Integration*. ISO 14001 states that the procedures, programs and operational controls that are applied to the myriad risks and exposures (e.g., health and safety, security) that an organization normally faces can be tailored as parts of one integrated system to include environmental management. The process prescribed by ISO 14001 lends itself to the creation of integrated programs to manage risks from different sources. This simplifies the management of all risks, provides built-in efficiencies and can potentially reduce costs. Behavioral change and improved operational techniques that deal with environmental risks can also promote behavioral change in areas such as health and safety.

An ISO 14001 environmental management system includes the following elements:

1. *Policy Statement* - Endorsed by top management. (Sample VA Medical Center policy, Green Environmental Management Systems (GEMS), is located in Section 5B.)

2. *Planning* - Identifying how operations impact the environment, setting goals and targets for reducing impacts, tracking legal and other requirements, and developing systems for environmental management.

3. *Implementation and Operation* - Assigning roles and responsibilities, training, communication, documentation and emergency preparedness.

4. *Checking and Corrective Action* - Establishing ways to monitor, identify and correct environmental problems.

5. *Management Review* - Focused toward continual improvement.

1.4 Summary

This Guidebook is designed to assist VHA facilities in developing and implementing a Green Environmental Management System (GEMS). By following the processes discussed in the guidebook, VHA facilities will be able to develop a GEMS that meets the requirements of EO 13148 and results in overall improvement in the management of operations. The pending VHA policy (Enclosure 1-3) that will direct facilities to develop and implement GEMS will be provided to facilities upon publication. All tools, samples and references to produce a fully compliant GEMS are contained in this Guidebook. Additional references with abstracts are provided in Section 6, Technical References, for use in developing facility specific GEMS.

Enclosures

1-1 Discussion of EO 13148.

1-2 EO 13148, Greening the Government Through Leadership in Environmental Management, dated April 21, 2000.

1-3 VHA Directive, Veterans Health Administration Environmental Policy *(Pending).*

1-4 VHA Directive 2001-036, Pollution Prevention (P2) Program, dated June 8, 2001.

1-5 FY ’02 Waste Minimization and Compliance Report.

Table of Contents
Section 2 - Concepts of the GEMS Program

Concepts of the GEMS Program

In order to effectively implement and benefit from the Green Environmental Management Systems (GEMS), it is important to have an understanding of the requirements, based on the ISO 14001 Standard. A quick review of the ISO 14001 Standard shows that it is structured to follow the Plan - Do - Check - Improve (Act) philosophy of the Total Quality Management movement, as follows:

PLAN

4.2 Policy

4.3 Planning

DO

4.4 Implementation and Operation

CHECK

4.5 Checking and Corrective Action

IMPROVE (ACT)

4.6 Management Review

2.1 Environmental Policy

The organization must have a GEMS policy statement to drive the system. This statement tends to be short, a one page or less document, and simply affirms the commitments. There is no expectation that specific details be noted in the policy. For example, the commitment to pollution prevention can simply be stated saying, "We are committed to the prevention of pollution." The policy must be clearly endorsed by top management and be available to the public and employees. Although the availability to the public can be rather passive (i.e., "it is here if they want it"), there is an expectation that the employee awareness is more proactive. Section 5B of this Guidebook provides a sample VA Medical Center policy.

2.2 Environmental Aspects

This element requires a procedure that not only identifies the aspects and impacts, but also provides for determination of significance and keeping the information up-to-date. A GEMS auditor does not prescribe what aspects should be significant or even how to determine significance. However, the organization is expected to develop a consistent and verifiable process to do so. See Section 3, Step 4, for further information.

Sample Environmental Aspects templates are available in Section 4 and should be completed for each Operating Unit. Significant environmental aspects and impacts should then be determined using the suggested format of Section 5, Document 5B1-1, "Procedure for

Determining Significant GEMS Environmental Aspects and Impacts" (see Section 2.11 for Operational Controls).

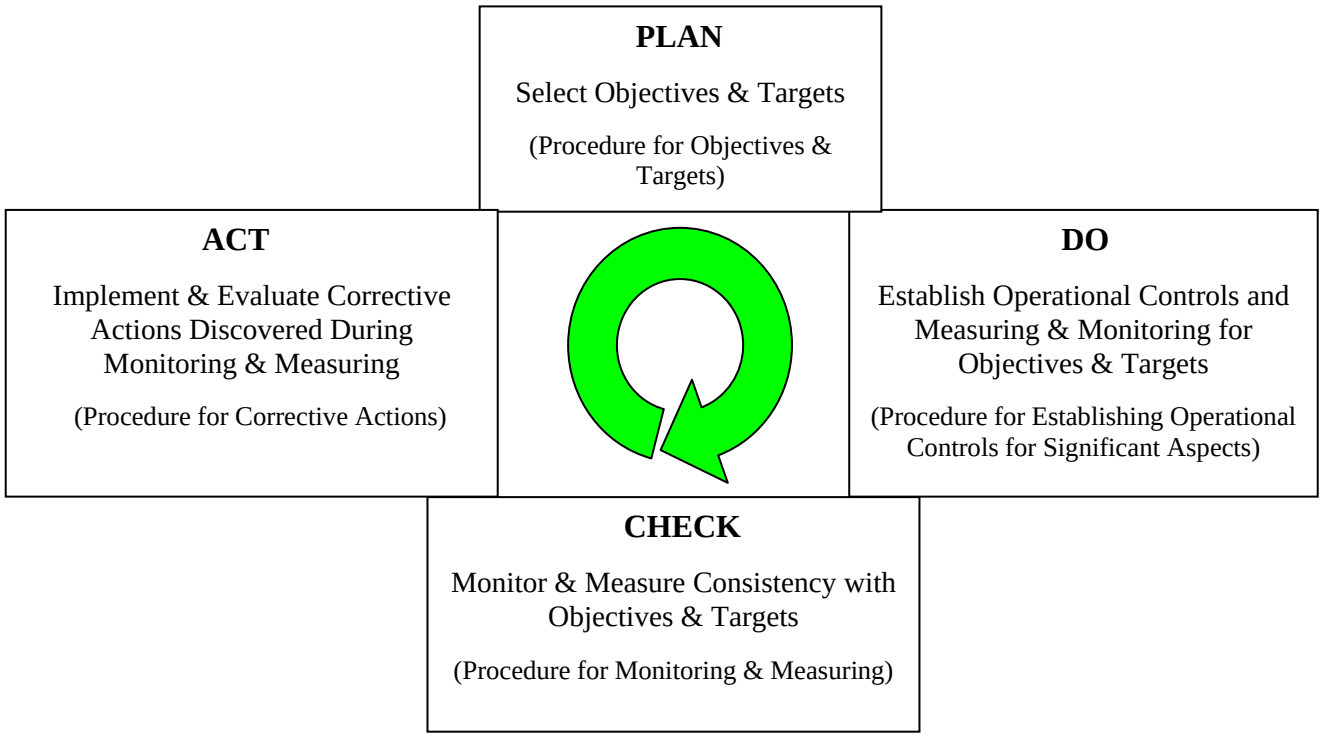
2.3 Legal and Other Requirements

This is a requirement for a procedure that explains how the organization obtains information regarding its legal and other requirements, and makes that information known to key functions. This is not the assessment or compliance audit requirement, but rather a more up front determination of requirements. See Section 3, Steps 4 and 8, for further information; and Section 5, Document 5B1-2, "GEMS Procedure for Legal and Other Requirements" for a written procedure.

2.4 Objectives and Targets

There is no requirement for a procedure in this element, only that objectives and targets be documented. It does, however, require that certain items be considered in developing the objectives, such as legal requirements and prevention of pollution. The objectives and targets and these considerations may be documented in the minutes of the GEMS Committee meetings. See Section 3, Step 6, for further discussion. A sample Objectives and Targets procedure is available in Section 5, Document 5B1-3, "Establishing Objectives and Targets for the GEMS Program." This procedure will define an environmental objective, the associated operating units, target dates and methods. Form 5B1-3, "GEMS Objective and Target Form" and Form 5B1-4, "GEMS Responsibility Matrix," may be used to outline Objectives and Targets and organizational responsibilities.

PLAN - DO - CHECK - ACT
for Objectives and Targets



2.5 Plan for Achieving Targets and Objectives

This is the detailed plan explaining how the specific objectives and targets will be accomplished. This plan usually notes responsible personnel, milestones, dates and measurements of success. Noting monitoring and measurement parameters directly in the plan facilitates conforming to the Monitoring and Measurement requirements discussed below. A sample plan appears in Section 5B3.

2.6 Structure and Responsibility

The relevant management and accountability structure must be defined. This usually takes the form of an organizational chart. Also, the organization must denote the GEMS Coordinator who is responsible to oversee the GEMS and report to management on its operation. The GEMS Coordinator's job description will reflect this responsibility (see Section 3, Enclosure 3-1). GEMS organizational structure and responsibility should be well defined in the VAMC GEMS Policy, Section 5B.

2.7 Training Awareness and Competence

A procedure must address training in general knowledge of the GEMS (awareness) and competence for the work involving significant environmental issues. Specific requirements range from general facility-wide items, such as knowing the policy, to more function-specific training on aspects and emergency response. The VAMC may respond to this element with a training matrix, cross-referencing to training materials and records. See Section 3, Step 7. A GEMS Training Program Policy is available in Section 5, Document 5B1-5. A training program plan and attendance log is also provided. An additional program plan and needs assessment are available in Section 3, Enclosures 3-4 and 3-5. A PowerPoint Awareness Training Program is provided in Section 6, Enclosure 6 (on CD-ROM).

2.8 Communications

Procedures are required for both internal and external communications. Note that ISO 14001 requires procedures, but allows the organization to decide for itself the degree of openness and disclosure of information. Whatever the decision in terms of disclosure, that decision process must be recorded. A sample policy, "GEMS Communication to External and Internal Parties" is provided in Section 5, Document 5B1-6.

2.9 GEMS Documentation

The organization must document GEMS in either electronic or paper form such that it addresses the elements of the standard (ISO 14001) and provides direction to related documentation. Not all GEMS procedures need to be documented, as long as the system requirements can be verified (see Section 3, Step 5). A "GEMS Document and Record Control" sample policy is available in Section 5, Document 5B1-7.

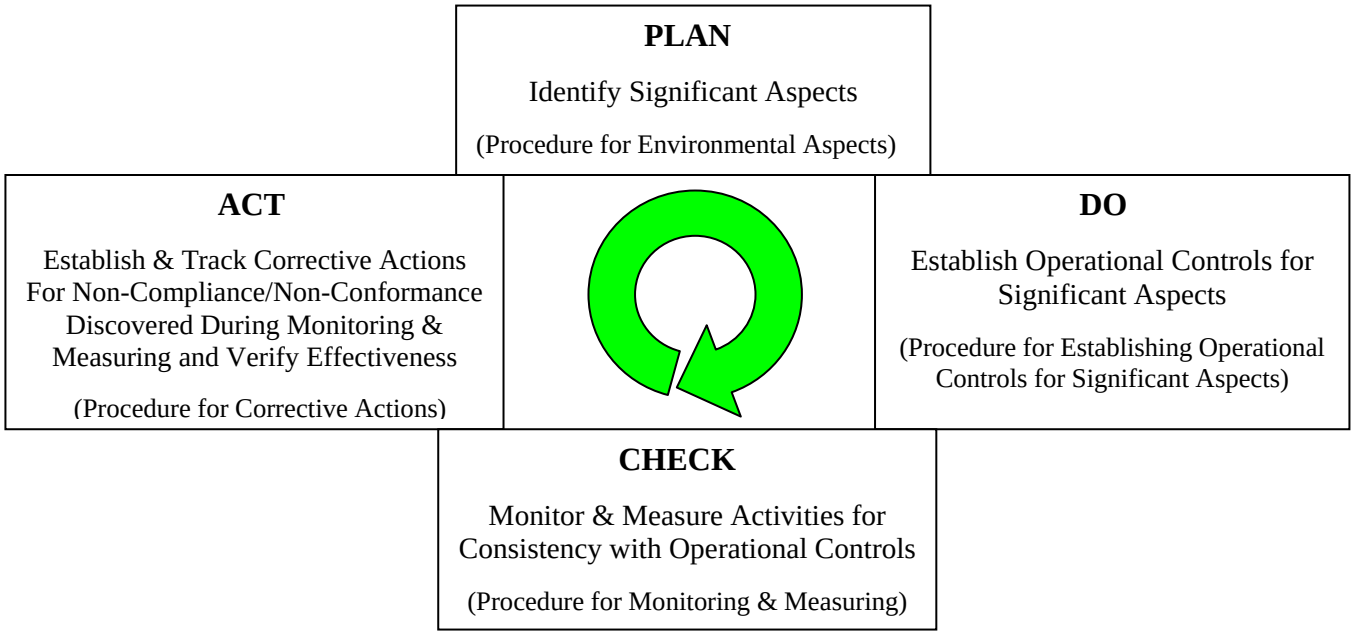
2.10 Document Control

Procedures are required to control documents, such as system procedures and work instructions; they also need to ensure that current versions are distributed and obsolete versions are removed from the system. See Section 3, Step 5. A document control worksheet is available in Section 5, Document 5B1-7.

2.11 Operational Control

A procedure on operational controls for significant aspects connects the GEMS with the organization as a whole. Here, the critical functions related to significant aspects and objectives and targets are identified, and procedures and work instructions are created to ensure the proper execution of activities. Requirements for communicating applicable system requirements to contractors are also addressed (see Section 3, Step 5). A written procedure for GEMS Operational Controls is available in Section 5, Document 5B1-8.

PLAN - DO - CHECK - ACT
for Operational Controls



2.12 Emergency Planning and Response

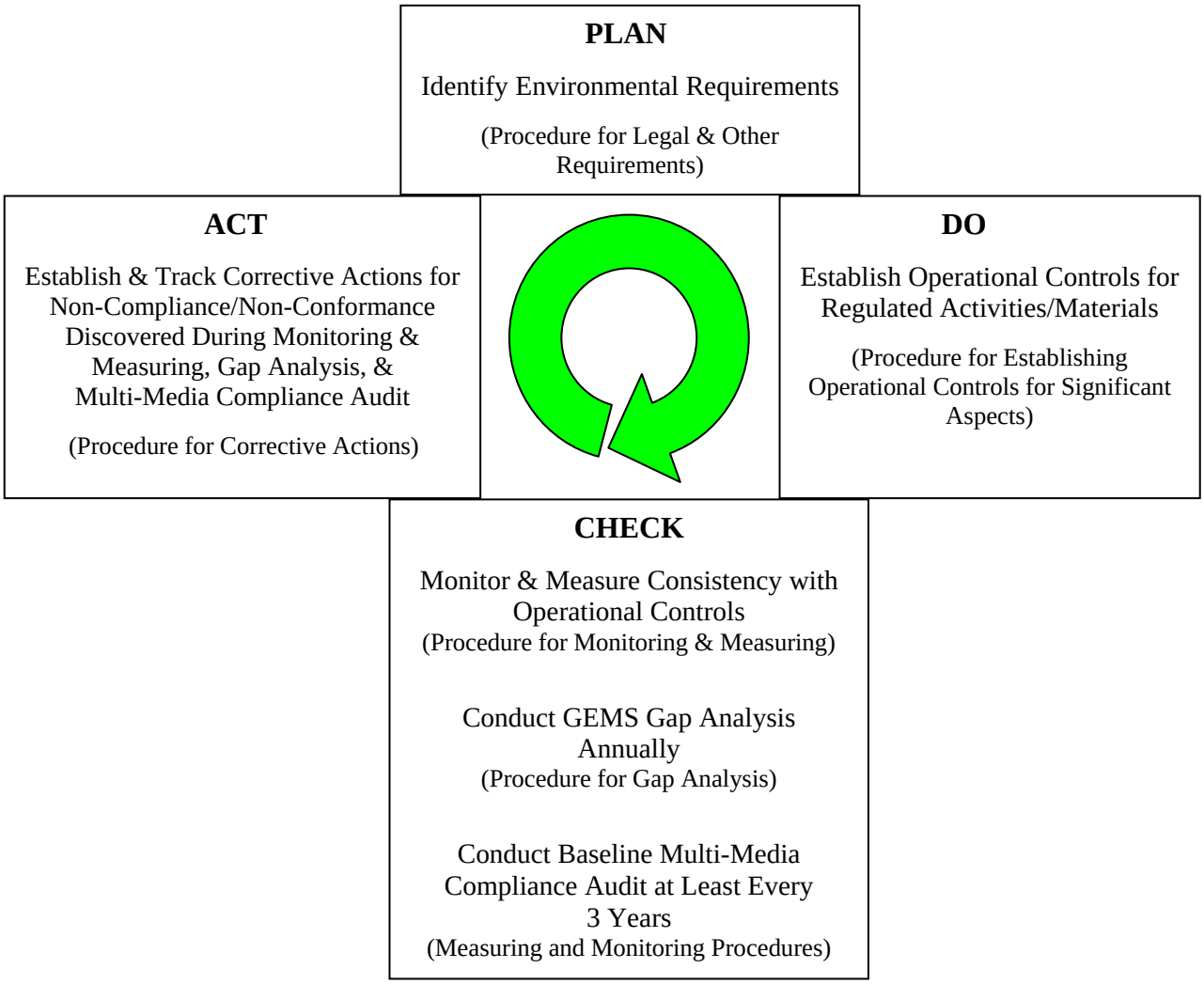
Although typically addressed through conventional emergency response plans, this element also requires that a procedure be developed for the process of identifying the potential emergencies, in addition to planning and mitigating them. A linkage to the aspect analysis, where impacts are assessed, is appropriate. Emergency incidents include those that may not be regulated, but may still cause significant impact as defined by the organization. The VAMC's Emergency Management Plan should address controlling and preventing

environmental consequences of emergency events (see Section 5, Document 5B1-9, "GEMS Emergency Planning and Response").

2.13 Monitoring and Measurement

Procedures are required to describe how the organization will monitor and measure key parameters of operations. These parameters relate to the significant aspects, objectives and targets and legal and regulatory compliance. In order to properly manage the system, measurements must be taken of the organization's performance to provide data for action. Responses to this element usually cross-reference to many other specific procedures and work instructions describing measurement and equipment calibration. Monitoring and measurement of the success of the compliance program is measured in this element. This requirement is commonly referred to as a compliance audit. Monitoring and measuring procedures are addressed in "GEMS Monitoring and Measuring Procedure," Section 5, Document 5B1-10, and "Biohazardous Waste Reduction Plan," Section 5, Document 5B3-1.

PLAN - DO - CHECK - ACT
for Compliance Assurance



2.14 Nonconformance, Corrective and Preventive Action

This element requires procedures for acting on nonconformances identified in the system, including corrective and preventive action. Nonconformances may be identified through audits, monitoring and measurement, and communications. The intent is to correct the system flaws. Typically, Corrective Action Report (CAR) forms are the norm, noting the nonconformance, the suggested fix and closure of the action when completed. Note that this requirement does not imply in any way that the party identifying the nonconformance must be the one to suggest the fix. Instead, it is expected that the system provide for the information to be routed to the most appropriate party to address the concern. A corrective action is not closed until verification of the effectiveness of the remedy. See Section 5, Document 5B1-11, "GEMS Non-Conformance and Corrective & Preventive Action," for a sample procedure.

2.15 Records

A procedure is required for record maintenance. Records are expected to exist to serve as verification of the system operating. For example, records include audit reports and training records. Unlike controlled documents, records are "once and done" documents, resulting from the execution of some process or procedure. Procedures in this element are required for the maintenance of records (see Section 3, Step 5).

2.16 Environmental Management System Gap Analysis

An internal audit procedure must be developed. This procedure will include methodologies, schedules and processes to conduct the audits. Interestingly, the GEMS audit will in essence audit the audit process itself! See Section 3, Step 3. A sample gap analysis policy and tool is available in Section 3, Enclosure 3-2, and Section 5, Document 5B1-12.

2.17 Management Review

This element requires that top management periodically review the GEMS to ensure it is operating as planned. If not, resources must be provided for corrective action. For areas where there are no problems, the expectation is that with time, management will provide for improvement programs. Usually there is no detailed procedure for this element; although records of agendas, attendance and agreed-upon action items are maintained as verification. A sample procedure for the review and sample report appear in Section 5, Document 5B1-13.

Enclosure

2-1 The Aspect Identification and Prioritization Process. *(Courtesy of Edward Pinero, Office of Federal Environmental Executive.)*

Table of Contents
Section 3 - Nine Steps to Establish a Successful GEMS

Nine Steps to Establish a Successful Green Environmental Management System (GEMS)

3.1 Introduction

1. The nine steps presented below in Veterans Health Administration (VHA) language represents a systematic approach to establishing a Green Environmental Management System (GEMS) at VHA facilities. Because healthcare organizations are replete with management systems, most of these steps will be very familiar to VHA management staff. Committee work, audits, action plans, and continual improvement activities fill the days of most healthcare managers. Only Steps 3 and 4 require activities that will be unfamiliar the first year, and Step 8 will likely be accomplished by contract. The concepts supporting these steps appear in Section 2.

2. Before describing the nine steps to establish a successful Green Environmental Management System (GEMS), a clarification of roles and responsibilities may be useful:

   Veterans Integrated Service Network (VISN) Director - The Network Director is responsible for the development, coordination, implementation and evaluation of a GEMS at each VHA facility.

   VISN Safety Manager/Industrial Hygienist - The VISN Safety Manager/Industrial Hygienist reviews and evaluates the GEMS at all VHA facilities within the Network.

   Medical Center Director - The Medical Center Director is responsible for the development and implementation of a GEMS program that addresses all VHA facilities under the control of the Medical Center. The Director must:

   - Appoint a GEMS Coordinator.
   - Establish a GEMS Committee.
   - Demonstrate commitment and provide resources and oversight necessary for an effective GEMS program.
   - Ensure that environmental responsibilities are contained in position descriptions and performance measures developed for supervisors, managers and other appropriate personnel.
   - Ensure that a system is in place to identify all costs associated with GEMS.

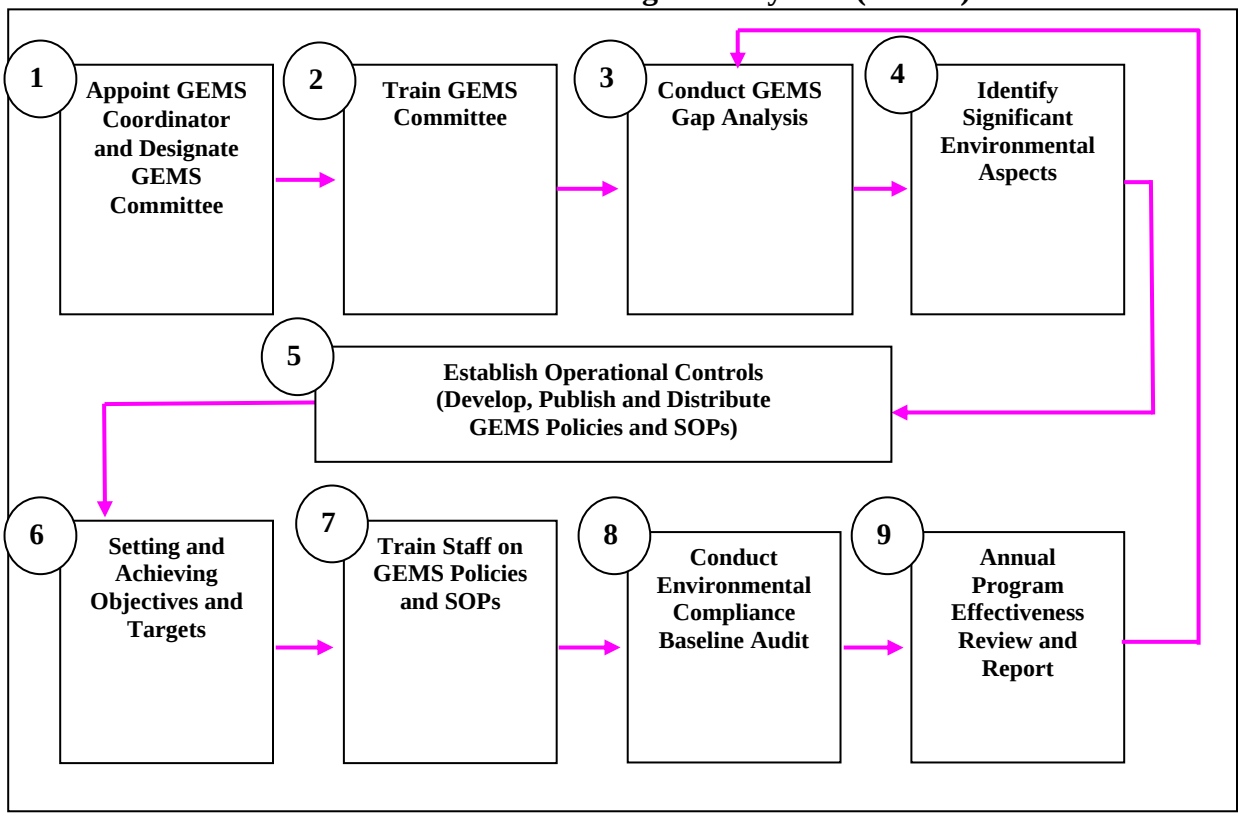
   Key Operations Managers - Key Operations Managers have broad control of systems and operations of the facility (i.e., Chief of Safety/Industrial Hygienist, Chief of Engineering, Chief of Acquisition and Materials Management, Chief of Environmental Management Services, Chief of Facilities Management Service, Chief of VA Police/Security, etc.).

GEMS Coordinator - The GEMS Coordinator is responsible for coordinating with the VA Medical Center (VAMC) staff, the community and regulatory agencies and ensuring that GEMS addresses all applicable regulations and standards. This position is typically assigned to the Chief Engineer, Facility Safety Officer, Industrial Hygienist or the Chief of Safety.

Operating Unit Managers - The Operating Unit Managers are responsible for participating in the GEMS, including planning, training and implementation.

3.2 Nine Steps to a Successful GEMS

Nine Steps to Establish a Successful Green Environmental Management System (GEMS)



Step 1 - Appoint GEMS Coordinator and Designate a GEMS Committee

The VA environmental policy should be reviewed as a guide in developing the GEMS program (see Section 5B).

GEMS Coordinator - A GEMS Coordinator will be appointed at each VAMC to ensure that the requirements of GEMS are established, implemented and periodically reviewed in accordance with ISO 14001. The GEMS Coordinator participates in most activities of the GEMS Committee, serving as technical consultant on ISO 14001 and environmental compliance. The VAMC will document this responsibility

in a job description of the GEMS Coordinator (see sample position description, Enclosure 3-1). The GEMS Coordinator is referred to as "Environmental Representative" in ISO 14001.

GEMS Committee - The GEMS Committee is a multi-disciplinary committee established to coordinate and oversee the GEMS.

a. ***GEMS Committee Membership*** - The membership of the GEMS Committee should be specified in the VAMC GEMS Policy and should include:

- Chairperson *(Senior management empowered to act on behalf of the facility.)*
- GEMS Coordinator
- Representatives from:
  - Nursing
  - Infection Control
  - Facilities Engineering
  - Environmental Management Service
  - Safety/Industrial Hygiene
  - Acquisition and Material Management *(Contracting and Logistics)*
  - Laboratory
  - Research
  - Pharmacy
- Support services as needed/requested from:
  - VA Fire Department
  - Area Emergency Manager *(if available)*
  - Critical Operating Unit Managers
  - Public Affairs Officer
  - Nuclear Medicine *(Radiation Safety Officer)*
  - Fiscal
  - Education

b. ***The GEMS Committee*** should report to, or have a very close liaison with, the facility Environment of Care Committee or Safety Committee.

c. ***Functions*** of the GEMS Committee include:

- Develop an action plan and timeline for establishment and implementation of the GEMS, with the goal of full implementation by December 2005.
- Identify significant environmental aspects.
- Approve GEMS Implementing Procedures (Section 5B1) and Operational Procedures (Section 5B2) that address significant aspects developed by the Operating Units, Services or GEMS Committee.
- Assign roles and responsibilities of Operating Unit Managers and Key Operators/Managers included in the GEMS.
- Oversee the development and maintenance of the GEMS.

- Ensure that all employees have received appropriate training as required by the GEMS.
- Establish and track the accomplishment of targets and objectives.
- Oversee an annual evaluation of the effectiveness of the GEMS, and report the results to the facility director for approval and/or action.

Step 2 – Train GEMS Committee

While all the facility and VISN staff with GEMS responsibilities needs training, the GEMS Committee will be trained first so they can develop, monitor and continually improve the GEMS. The GEMS Committee training will include GEMS Awareness Training. The competency training should also incorporate a GEMS implementation course that focuses on the follow-through of the gap analysis process. A sample GEMS Awareness Training Program PowerPoint presentation is provided on the CD-ROM (Section 6, Enclosure 6-6); it can be modified as appropriate to meet the needs of a particular facility. A sample training policy for GEMS appears in Section 5B1.

Step 3 – Conduct GEMS Gap Analysis

Note that this review is of the *management system* for conformance with the GEMS standards. It is *not a regulatory compliance audit*; that will come later. For instance, in a GEMS review, if an unlabeled hazardous waste container is discovered, the auditor will determine what variance of GEMS element(s) led to that condition. It may be that the container labeling Standard Operating Procedure (SOP) was not followed or was not appropriately written, or the training program was not implemented as planned. Any of these findings will become gaps to close in the corrective action plan. In a regulatory compliance audit, this same unlabeled hazardous waste container will simply be an item on the list of deficiencies (reference Section 2, Paragraph 2.16).

A review of the current environmental management system should be conducted initially to determine any gaps in the program in relation to recognized environmental standards and criteria. The GEMS review can be conducted by a trained GEMS auditor from outside the facility, such as VISN staff or EPA staff conducting an Environmental Management Review, or a contract ISO 14001 auditor. An internal audit team with training may also conduct a review. The GEMS Gap Analysis Tool to conduct these reviews appears as Enclosure 3-2 to this Section.

The purpose of the GEMS review is to produce a gap analysis to help the facility understand what it is already doing in terms of the requirements for GEMS, and to identify ways to build on existing programs and activities. VHA facilities will find that they are already performing many of the GEMS activities, and they must only "fill in the gaps" between what they are already doing and what needs to be done to establish their site-specific GEMS. The primary purpose of GEMS is to bind together existing programs and activities so that efficiency, effectiveness, performance and cost-effectiveness for the entire facility can be improved. Building on existing programs becomes even more important when facilities are faced with

diminishing resources and being asked to "do more with less" (see GEMS Gap Analysis Program Review, Section 5B1, Document 5B1-12).

The GEMS Committee will establish procedures to evaluate the effectiveness of the developing environmental program using criteria consistent with the ISO 14001 model (reference Enclosure 3-2, GEMS Gap Analysis Tool).

Once GEMS is implemented, many facilities are likely to realize a high return on their GEMS investment through an improved "risk profile" that reduces the costs associated with regulatory compliance, health and safety, incident response and cleanup of contaminated sites. Improved public opinion and employee satisfaction can also be achieved. A gap analysis is designed to answer the following questions:

- How well are the organization and its environmental programs performing?
- What standards of environmental performance does the organization hope to achieve?
- What are the gaps between objectives and performance?
- What existing programs and activities can serve as the best foundation for improved environmental performance?

After the initial gap analysis, it should be repeated periodically to guide the GEMS Committee toward full implementation. After GEMS is fully implemented, periodic gap analyses keep GEMS on track and serves to document its status.

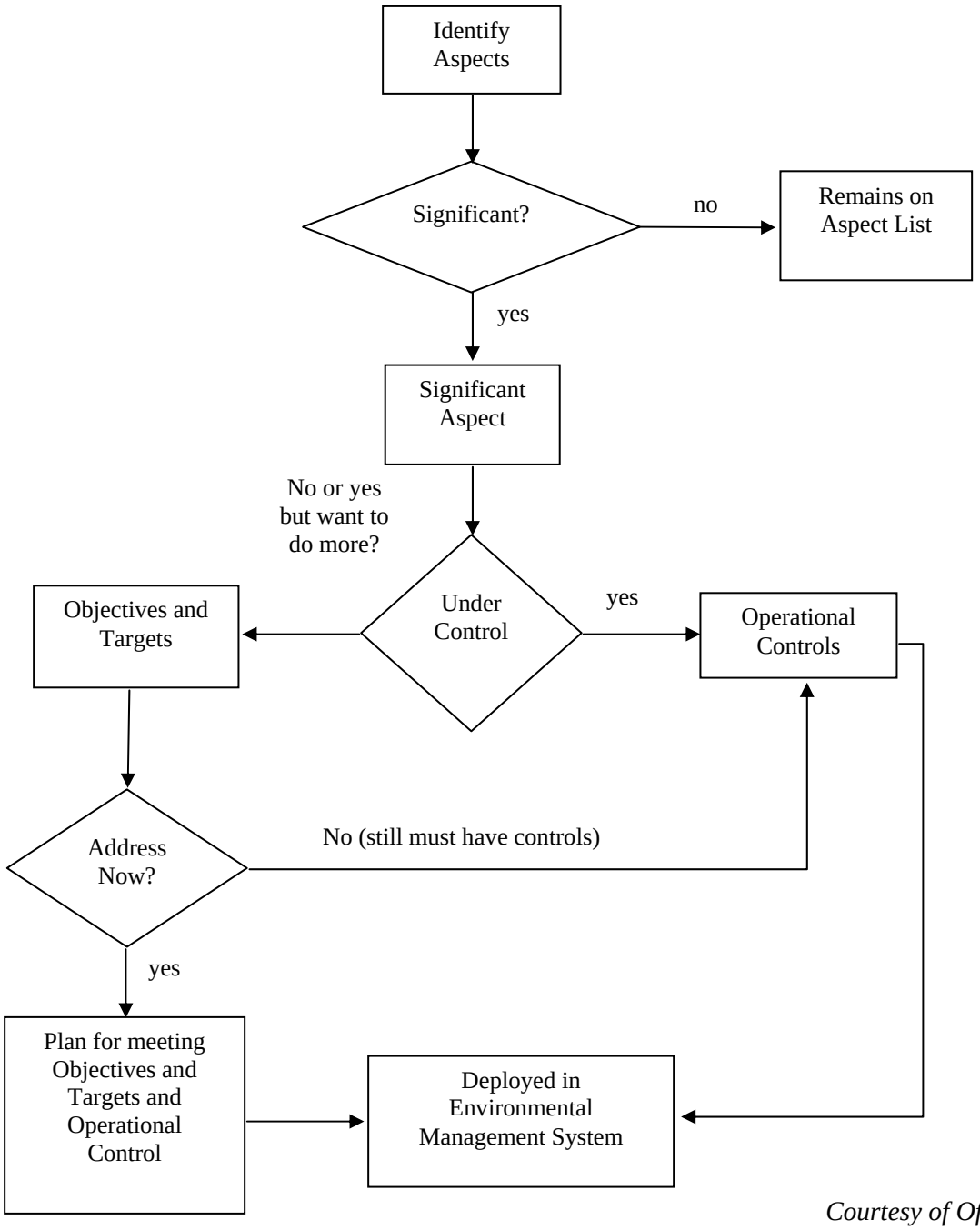
Step 4 – Identify Significant Environmental Aspects

Overview of the process:

There is a procedure describing how significant environmental aspects are identified in order to determine where the organization can focus its attention to accomplish the most with the least effort and resources (see Section 5, Document 5B1-1). This involves a process starting with identifying legal and other requirements (see Section 5, Document 5B1-2) applicable to the activities of each Operating Unit; then Operating Units identify and score the impacts they have on the environment. The GEMS Committee reviews the results of the scoring by the Operating Units and verifies that it is consistent with significant aspects procedures. The Committee then identifies significant aspects and asks the Operating Units to submit operational controls (such as procedures) for all significant aspects. The GEMS Committee then reviews all the operational controls for each significant aspect to ensure there is agreement and consistency within each program and across Operating Units (Step 5). This process, as well as the gap analysis (Step 3), will determine if the current SOPs reflect the actual practices. Finally, gaps between written procedures and actual practice will be addressed as action items for updates to the SOPs or changes in actual procedures, possibly requiring retraining (Step 7).

The GEMS aspect templates will be completed by Operating Units, and the Operating Units will forward them to the GEMS Committee. The GEMS Committee will evaluate the reports from the Operating Units to identify significant environmental aspects. A list of Operating Units, along with sample environmental aspects templates, appear in Section 4 of this Guidebook. These are examples only and should be edited to reflect the specific Operating Units, environmental aspects and impacts at each medical center.

Figure 3-1: Process to Evaluate Environmental Aspects



Courtesy of Office of Federal Environmental Executive.

Figure 3-2: Some Useful Definitions

Environmental Aspect - Element of the Operating Unit's activities and services that can interact with the environment. An environmental aspect signifies the potential for an environmental impact. Environmental impacts and aspects include both positive and negative events, such as recycling paper and leaking drums.

Environmental Impact - Any change to the environment or to the health or safety of people, whether adverse or beneficial, wholly or partially resulting from the operating unit's activities or services.

Environmental Objective - Site-specific goal that the medical center sets for itself to achieve. Objectives are selected from the significant aspects and are consistent with the environmental policy. Example: Waste reduction.

Environmental Target - The measurable elements of the environmental plan, including a measure of the objective (such as 10% reduction of waste) and a timeframe for achievement (such as by the end of the fiscal year).

Significant Environmental Aspect - An environmental aspect that has or can have a significant environmental impact.

Significant Environmental Impact - A significant actual or potential change to the environment, wholly or partially resulting from the organization's activities or services.

Operating Unit Activity - A recurring activity or series of activities that is performed by the Operating Unit in the accomplishment of its mission, including emergency management.

See Section 2 for an in-depth discussion of these concepts.

Figure 3-3: Recommended Steps for Identifying Significant Aspects

1. The GEMS Committee will distribute the appropriate sample environmental aspects template from Section 4, along with instructions for completion and scoring guidelines (Section 4.2), to each Operating Unit in the facility. The Operating Units will identify the environmental aspects impacted by their operations and activities, and return the completed template to the GEMS Committee. The sample below is from an Engineering Operating Unit.

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency of Activity	VAMC Control	TOTAL SCORE
Outdoor Vehicle and Equipment Washing.	Chemicals In Runoff Water.	Runoff Enters the Storm Water System.	2	2	2	4	10
Parts Washing: -Washer Fluid -Washer Filter	Disposal of Washer Fluids. Disposal of Filter.	Disposal of Hazardous/ Regulated Waste in Municipal Landfill.	3	0	4	4	11
Fertilizer Applications.	Use and Disposal of Fertilizers.	Unnecessary Use and Improper Disposal.	1	0	1	2	4
Snow Removal and De-icing.	Application of De-icing Materials to Icy Roads and Walkways.	Runoff Enters the Storm Water System.	3	0	2	2	7

2. The GEMS Committee will evaluate the templates of all the Operating Units and identify <u>significant</u> environmental aspects. A form like the one below will be useful to document the decisions.

Operating Unit	Aspect	Aspect Evaluation Score	Significant Aspect Yes	No
ICU	Medical Waste	14	X	
ICU	Isopropyl Alcohol Use	6		X
Engineering	Fuel Storage	16	X	

See Section 5, Document 5B1-1, for a sample written procedure and Section 4 for sample templates and scoring and ranking documents.

Step 5 – Establishing Operational Controls (Develop, Publish and Distribute GEMS Policies and SOPs)

The GEMS Committee will develop the Medical Center Memorandum (see Section 5B) covering GEMS policy, and the implementing procedures (see Section 5B1), and reference or attach the supporting policies and standard operating procedures (SOPs) for significant aspects (see Section 5B2). (Note that most of the GEMS implementing procedures [Section 5B1] are discussed in one or more of the Nine Steps.)

The GEMS Committee will ask the Operating Units to develop the SOPs to maintain operational control of the significant aspects identified by the GEMS Committee in Step 4. The GEMS Committee will review all SOPs of significant aspects to ensure that they are consistent with the GEMS policies and procedures. The GEMS Committee will oversee the elimination of any discrepancies between the GEMS policies and procedures by coordinating the revision of these documents or changing behavior. **If there are existing Operating Unit SOPs that do not score out as involving significant aspects, the Committee will determine that those procedures will not be managed within the GEMS. For those aspects scored significant where no operational controls exist, the Committee will task the Operating Units to prepare it.**

The GEMS Committee shall establish procedures for communication of GEMS policies (see Section 5B1) throughout the organization. The GEMS Committee will also establish procedures to review feedback from the Operating Units. Operating Unit managers should regularly report the results of implementation to the GEMS Committee in accordance with the monitoring and measuring procedure (see Section 5B1, Document 5B1-10). Reports should include:

- Overall status of the GEMS implementation.
- Compliance with Environmental Regulations.
- Corrective and Preventive Action Plans (Section 5B1, Document 5B1-11).

The following format may be used for documenting the review and updating of the SOPs:

Operating Unit	Activity	Significant Aspect	SOP Title and Number	Date of Review	Date of Last Update
Infection Control	Environmental Rounds	Medical Waste Disposal			
Environmental Mgmt. Service	Environmental	Medical Waste Disposal			
EMS	Collection and Disposal of Medical Waste	Medical Waste Disposal			

Step 6 – Setting and Achieving Objectives and Targets

From the list of significant aspects, the GEMS Committee selects a few for demonstrating continual improvement. Continual improvement is determined by success in achieving the objectives (a site-specific environmental goal, such as reducing hazardous waste) and measurable targets (such as 10 percent reduction) by the target date (end of FY). A plan for how to achieve the objectives and targets may include new or revised operational controls, such as new procedures or the purchase of new equipment or materials. The targets, objectives and plan for achieving them should appear in the GEMS Committee meeting minutes. Results of periodic monitoring of the progress toward achieving the targets and objectives will be reported in the GEMS Committee meeting minutes. The report of the Annual Program Effectiveness Review that appears in the GEMS Committee meeting minutes at the end of each year (Step 9) includes an evaluation of achievement of the targets and objectives.

Objectives and targets should be meaningful and achievable. Occasionally, the GEMS Committee may find that a target that was set cannot be achieved. As soon as that is confirmed, the GEMS Committee should adjust the target or select a new one to achieve. The goal is not perfection but rather continual improvement.

Two to five targets and objectives supporting the continual improvement of GEMS should be developed by the GEMS Committee and reported to the facility Environment of Care Council or Safety Committee where they will serve to monitor some aspects of the Environment of Care (EOC) program as required by JCAHO EOC Standards. VHA medical centers are accustomed to measuring and monitoring the hazardous materials management program and reporting monthly, quarterly and annually to the facility EOC or Safety

Committee. The GEMS targets and goals element will fit nicely into the existing monitoring system, which can be expanded to cover not just hazardous materials management, but the entire GEMS program. See a sample written plan for Setting and Achieving Target and Objectives in Section 5B3.

The annual Waste Minimization and Compliance Reports submitted by each facility to Environmental Programs Service (181C) provides the opportunity for tracking and trending some features of its environmental performance. These reports should provide some ideas for environmental objectives and targets at the facility level. To view the FY '02 Waste Minimization and Compliance Report summarizing the national data, see Enclosure 1-5 in Section 1.

Step 7 – Train Staff on GEMS Policies and SOPs

The recommended training for all facility and VISN staff is outlined in Enclosure 3-3, VHA Environmental Training Program Plan, and Enclosure 3-4, GEMS Training Needs Assessment.

Training resources are identified in Section 5, Document 5B1-5, VHA Environmental Training Program Plan, and include training programs that are being developed nationally by VHA and will be announced as they become available. Other sources are Environmental Protection Agency (EPA) Regional Offices, state environmental agencies and contractors. Many of the training programs identified in the Enclosures are already being used at medical centers for specific requirements such as those for underground storage tank (UST) monitoring for operators, which is usually given by the manufacturer of the USTs.

JCAHO Environment of Care Standards, Occupational Safety and Health Administration (OSHA), EPA regulations, and VHA Handbook 7701.1 address the requirements for documenting training. Generally they require the training records to include date of training, name and qualification of trainer, topics covered, names and social security numbers of attendees. Some media-specific regulations of the federal EPA or state environmental agencies have further requirements for training documentation, which should be confirmed during the compliance audit.

The facility should develop a training program tailored to its particular needs. The training program should provide sufficient education to the employees to ensure that the GEMS is operating at the highest level. Training should include emphasis on the following:

- The importance of conformance to the policy.
- Recognition of significant aspects identified by the GEMS Committee.
- Individual roles and responsibilities regarding GEMS implementation and operation.
- Consequences of nonconformance.
- Environmental Awareness Training of Employees, including New Employee Orientation.
- Annual reporting requirements.

Training status should be monitored, and refresher courses should be available periodically.

The Green Environmental Management Systems Brochure (included as a binder cover pocket insert to this Guidebook and also as Enclosure 3-5) was designed to supplement the facility-training program. It should be reproduced and given to all managers, so that the information can be shared with all staff at monthly section/department meetings. As an additional tool, GEMS should be added as an element in New Employee Orientation, and the GEMS brochure reproduced and distributed to all incoming staff at that time. A sample GEMS Awareness Training Program is in Section 6, Enclosure 6-6 (on CD-ROM).

Step 8 – Conduct Environmental Compliance Baseline Audit

Once the GEMS is designed and reviewed for gaps, medical center memoranda and SOPs written, and training has been conducted, it is time to conduct a thorough multimedia regulatory compliance audit addressing federal, state and local environmental regulations. The purpose of this audit is to determine the compliance status of the facility and address any non-compliance issues. The auditor will produce a report of non-compliance items (violations), which the GEMS Committee will address with a corrective action plan for immediate compliance and a tracking mechanism to report progress. The audit may instigate the identification of additional significant aspects that require SOPs and targets or monitoring by the GEMS Committee.

Compliance audits are usually conducted by external experts, which can include contractors and experts from other federal agencies, but can be done by internal experts.

Scope: The regulatory compliance audit should cover all environmental regulations impacting the medical center and include those promulgated by the federal EPA, state environmental agencies and local regulatory entities.

Audit Tools: The Environmental Compliance Guidebook, Book 6B in the VHA Safety Guidebook Series, published in 2003, is a multimedia guide to federal EPA regulations affecting VHA medical centers. Some compliance assistance materials are available from federal and state regulatory agencies.

(See Concepts, Section 2, paragraph 2.13; and Section 5, Document 5B1-10, Monitoring and Measuring Compliance).

Step 9 – Annual Program Effectiveness Review and Report

The final step in developing your GEMS is the Annual Program Effectiveness Review, which must cover at least these four elements:

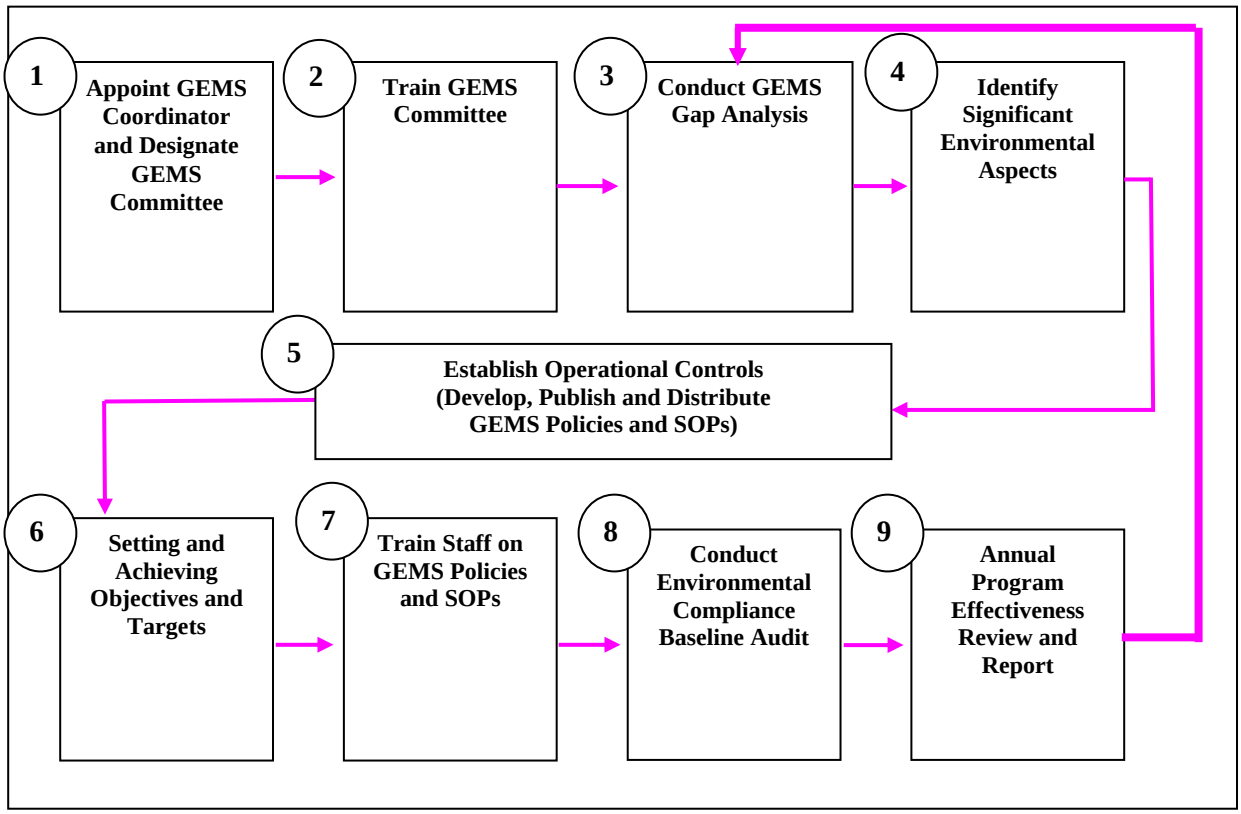
- Status Report on the regulatory compliance program, specifically the completion of previous corrective or preventive actions resulting from any compliance audits or inspections.
- Status Report on GEMS implementation, specifically the completion of preventative and corrective actions resulting from the GEMS gap analysis.

- Review of the accomplishments of the Targets and Objectives. This answers the questions "Were the objectives and targets met? If not, why not? What corrective actions were established?"
- Committee recommends adoption of new targets and objectives for the upcoming year and proposes changes in the GEMS and/or improvements in the compliance program based on findings of the GEMS gap analysis and compliance audit.

To maintain continual improvement, suitability and effectiveness of your environmental management system, the Director is tasked to review and evaluate the environmental management system at defined intervals. The GEMS Committee should carry out this preliminary review with policy and program assessment and recommended changes to objectives and targets. It will determine the suitability of the environmental management system in relation to changing conditions and information. The GEMS Committee will present their review, conclusions and recommendations to the Medical Center Director for review, comment and approval. (See Section 5, Document 5B1-13, GEMS Procedure for Annual Program Effectiveness Review and Report, for a sample procedure and sample committee report.)

Congratulations on completing the Nine Steps of implementing GEMS! Now note that the process of GEMS is cyclical and continual improvement requires revisiting Steps 3-9 of GEMS on a regular basis.

Nine Steps to Establish a Successful Green Environmental Management System (GEMS)



The GEMS implementing procedures will specify the frequency of re-visiting each of these steps.

Enclosures

3-1 Sample Position Description for GEMS Coordinator.

3-2 GEMS Gap Analysis Tool.

3-3 VHA Environmental Training Program Plan.

3-4 GEMS Training Needs Assessment.

3-5 Green Environmental Management Systems Brochure.

Table of Contents
Section 4 - Operating Unit
Environmental Aspects Templates

Operating Unit Environmental Aspects Templates

4.1 Introduction

Sample Operating Unit Templates have been developed as guides for the various Operating Units to identify their particular environmental aspects. These samples have been developed in a table format for easy customization and use. They are not intended to be comprehensive or cover all the aspects at a particular location. Certain items in the samples may be specific to a VA Medical Center (VAMC) while others may not.

Operating Unit managers should involve their staff members in completing the templates. This will foster environmental awareness and ensure a more effective GEMS.

The Operating Unit templates may need revision as more information becomes available to managers. As the templates evolve, feedback and coordination with the Green Environmental Management Systems (GEMS) Committee will ensure consistency in the GEMS Program.

On the sample templates in this Section, significant environmental aspects are identified in order to determine where the organization can focus its attention to accomplish the most with the least effort and resources. This starts with Operating Units identifying the impact(s) their activities have on the environment, followed by the GEMS Committee determining which of those impacts are significant aspects requiring operational controls.

The analysis of impacts will incorporate the following factors:

- The extent to which the aspect is regulated by law, regulation, Executive Order or other requirement and how well the VAMC is complying with those regulations.
- The degree of risk to any exposed human population or exposed ecosystems.
- The frequency of the activity.
- The extent to which the aspect is under the control of the medical center.

The totals of the scores will determine which environmental aspects are significant and therefore required to have operational controls. The GEMS Committee may select a cut off in the total scores to identify significant aspects. The Committee may also review each aspect and set up other criteria for selecting significant aspects, which must be reflected in their written procedures.

Each year environmental targets and objectives are established for a few of the significant aspects. This becomes the focus for continual improvement of the environmental program.

4.2 Instructions for Completing Templates

Operating Unit templates are divided into eight columns. The forms are designed to first look at the routine processes within an Operating Unit (Column 1, Activity or Service); identify those processes that have an environmental impact; evaluate each aspect to determine if it has

or can produce a positive and/or negative effect (impact) on the environment. Once this is completed for an Operating Unit, each aspect is ranked for Compliance, Risk, Frequency and Control (see Figure 4-1, below for definitions and scoring). The Medical Center GEMS Committee will then look at each Operating Unit's significant aspects as discussed in Section 3, Nine Steps.

Enclosure 4-1, Sample GEMS Aspects Rating Template, demonstrates how the rating for the Blood Bank/Phlebotomy Laboratory was determined.

Figure 4-1

Explanation of Aspects and Impacts Template Scoring

Compliance	
The extent to which the aspect is regulated by law, regulation, Executive Order or other requirement	**Score Assigned**
The aspect is not regulated or is in full compliance	0
Compliance activity has been initiated	1
Compliance activity has been scheduled	2
There is an awareness of non-compliance status, considering compliance options	3
The aspect is out of compliance and has taken no compliance activity to date	4

Risk	
The degree of risk to any exposed human populations or exposed ecosystems	**Score Assigned**
Minor risk to human population and/or ecosystems	0
Moderate risk to sensitive human populations and/or ecosystems	1
Moderate risk to general human populations and/or ecosystems	2
High risk to sensitive human populations and/or ecosystems	3
High risk to the general human population and/or ecosystems	4

Frequency	
Frequency that this activity occurs	**Score Assigned**
< Once per calendar year	0
Bi-annually or less	1
Monthly	2
Weekly	3
Daily or more	4

Control	
The extent to which the aspect is under control of the Operating Unit	**Score Assigned**
Operating Unit has no control or influence	0
Operating Unit has some influence or control	1
Operating Unit has influence parity with other entities with some level	2

of control	
Operating Unit has significant influence	3
Operating Unit has total control over this aspect	4

This section contains sample forms showing how operating units list each impact, identify the aspects, and rank their effect on the facility. A sample GEMS Committee Ranking is included showing how the aspects rank as a whole. Also included is a blank form for facility use.

Enclosures

4-1 Sample Template with Explanation of Scoring Rationale.

4-2 Blank GEMS Aspects Template.

4-3 Operating Unit Templates.

4-4 GEMS Committee Ranking of Environmental Aspects.

Table of Contents
Section 5 - Sample GEMS Documents

5B2-9 Management of Universal Hazardous Wastes

5B2-10 Mercury Pollution Prevention Program

5B2-11 Mercury Reduction Program

5B2-12 Notification of Environmental Incidents (Spills/Releases/Discharges)

5B2-13 Oil Spill Prevention Control and Countermeasure Plan

5B2-14 Pollution Prevention Plan

5B2-15 Pollution Prevention and Waste Minimization Plan

5B2-16 Precautions in Handling Carcinogenic Chemicals and/or Cytoxic Agents

5B2-17 Reclamation of Salvageable Material

5B2-18 Reporting of Environmental Incidents

5B2-19 Silver Recovery Program

5B2-20 Storm Water Prevention Plan

5B2-21 Underground Storage Tanks (USTs)

5B2-22 Waste Characterization Sampling and Analytical Work Plan

5B2-23 Waste Minimization Program

Tab B3 - Objectives, Targets and Plans for Meeting Objectives and Targets

5B3-1 Sample GEMS Committee Report of Annual Effectiveness Review

5B3-2 Sample Blank GEMS Objectives and Targets Form

Sample GEMS Documents

The effective management of GEMS requires extensive documentation. Fortunately, most VHA facilities will already have many of the required documents. The GEMS Committee must review the existing documents and identify any required modifications and/or additions needed. While updating the GEMS documents is an ongoing function of the GEMS Committee, getting the required documents in place will likely take up the first year of the GEMS program.

The design of the GEMS documentation program should be considered first, in order to create a logical scheme that is understandable to all. For this purpose, one document organization scheme is proposed in this Section (Figure 5-1); however, other schemes may be just as appropriate.

Following is a listing of the categories of documents along with descriptions of their content. Samples to illustrate the concepts, as well as serve as guidelines for evaluating existing documents or creating new ones, are included in Tabs A through B3.

Tab A. As VA and VHA environmental policies become available, facility GEMS policies should be updated to reflect the same commitment, language and targets.

Tab B. A medical center memorandum covering GEMS policy must be developed and signed by the facility director. It can be a short document, as is this example (Tab B), with several GEMS procedures as attachments (Tab B1), or it can include the procedures within a larger GEMS Medical Center Memorandum. VA Medical Center (VAMC) written policy should:

- Include a mission statement for development and implementation of VAMC policy that meets EO 13148 and eliminates, minimizes and mitigates adverse environmental impacts.
- Comply with federal, state and local environmental laws and regulations.
- Evaluate VAMC operations to address the reduction of environmental vulnerabilities.
- Integrate pollution prevention, waste minimization, resource conservation and environmental compliance into VAMC planning and decision making.
- Require training of VA staff to accomplish assigned environmental responsibilities.
- Designate the VAMC Director as the responsible person for the successful implementation of a GEMS program.
- Assign responsibility to GEMS Coordinator and GEMS Committee to identify significant aspects, set targets and objectives and approve action plans and program goals.
- Require annual review with recommendations be sent to VAMC Director for approval.

Tab B1. There are 13 written procedures required in ISO 14001. These procedures describe the steps required to implement and maintain an effective GEMS. The sample procedures in this Section are provided to assist in developing a facility-specific implementation plan; however, they will not work as written for all facilities. They should be revised to reflect the needs, the culture and the activities at each facility. Procedures should be detailed enough to guide the users to perform consistently. When writing these procedures, refer to Section 2 (Concepts) and Section 3 (Nine Steps) of this Guidebook.

Tab B2. Sample operational procedures are provided as examples of operational controls of significant aspects. Operational procedures do not need to repeat the regulatory requirements or GEMS policies, but rather they must state how facility staff will conduct their activities in order to meet the regulations, policies and objectives. For a hospital-wide objective, such as biohazardous waste reduction, operational procedures must cover activities of all staff who generate, handle and dispose of the waste. Therefore, there would be a need to have operational procedure on waste reduction for Infection Control, Environmental Management Service (Housekeeping), Safety/IH, Engineering, Contracting and clinical Operating Units.

Tab B3. Every year the GEMS Committee completes an annual report summarizing the year's accomplishments. This report will also identify objectives and targets for the upcoming year. The selection of new objectives and targets will be noted in the GEMS Committee minutes and will be approved by the Director. A written plan for achieving the selected objectives and targets should be included in or attached to the annual report. This Section contains a sample annual report, along with the suggested forms for identifying new objectives and targets and the written plan format.

Table of Contents
Section 6 - Technical Resources

Technical Resources

This Section contains a list of the resources we have compiled, along with a summary paragraph of each resource describing its contents to better help you select the best source of information. The list is not all-inclusive but reflects the efforts of the Professional Advisory Group (PAG) in providing the best information they have found to date. (*Note: Reference data and web site information was current at the time of publication of this Guidebook.)* Publications listed under Resources can be found on the accompanying CD-ROM only.

This Guidebook, as well as the entire Occupational Safety, Fire Protection and Industrial Hygiene Guidebook series is available on the CEOSH web site:

vaww.ceosh.med.va.gov

Additional copies of this Guidebook may be obtained by contacting the CEOSH Administrative Library at 314-543-6700.

6.1 Resources

a. Publications.

1) **EPA Pamphlet 744-R-00-011**, October 2000, Integrated Environmental Management Systems Implementation Guide (Enclosure 6-1). Developed by the Office of Pollution Prevention and Toxics, this brochure is intended to help businesses integrate environmental concerns into their daily activities so they can reduce cross media impacts, use energy and other resources efficiently, better manage the risk associated with using hazardous chemicals, practice product and process responsibility, and integrate environmental and worker safety and health requirements.

2) **EPA Pamphlet 315-B-97-001**, March 1977, Implementation Guide for the Code of Environmental Management Principles for Federal Agencies (CEMP) (Enclosure 6-2). Developed by the Environmental Protection Agency (EPA) in response to Executive Order 12856, CEMP is a collection of five broad principles and underlying performance objectives that provide a basis for federal agencies to move toward responsible environmental management. Adherence to the five principles will help ensure environmental performance that is proactive, flexible, cost-effective, integrated and sustainable. The CEMP is not a regulation; it is a voluntary component of a program established to encourage federal agencies to enhance their environmental performance through the creative use of management tools. As such, the goal is to move agencies “beyond compliance” and the traditional short-term focus on regulatory requirements to a broader, more inclusive view of the inter-related nature of their environmental activities.

3) **US Army Environmental Management System Implementers Guide**, Version 1.0, dated May 2003 (Enclosure 6-3). This guide provides Army personnel an easy-to-use, step-by-step tool for implementing the Army's environmental management system. It provides the information needed to establish and implement an installation's environmental management system, while allowing the flexibility to address differing installations' missions and operational readiness requirements.

4) **IL 049-02-11**, Office of Acquisition and Materiel Management Information Letter, Subject: Executive Order 13148, Greening the Government Through Leadership in Environmental Management, dated July 5, 2002 (Enclosure 6-4). This IL provides guidance to acquisition and procurement professionals regarding Executive Order 13148, which requires federal agencies to integrate environmental accountability into day-to-day decision-making and long-term planning processes.

5) **Federal Register 54061**, Volume 61, No. 201, dated October 16, 1996, Notices, Environmental Protection Agency Code of Environmental Principles (Enclosure 6-5). This is the public announcement of the issuance of the Code of Environmental Management Principles developed by EPA in consultation with other federal agencies as mandated by EO 12856, Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements, August 3, 1993.

b. *Tools.*

1) Green Environmental Management Systems (GEMS) PowerPoint Presentation developed by the Center for Engineering & Occupational Safety and Health (CEOSH), Department of Veterans Affairs (Enclosure 6-6). This presentation can be used by Medical Centers to provide training to staff on environmental management roles, responsibilities, procedures and compliance.

2) Sample Affirmative Procurement Program (APP) Facility-Level Audit Questions (Enclosure 6-7). A tool to assist procurement personnel in meeting the Facility Affirmative Procurement Program.

3) Office of the Federal Environmental Executive to Agency Environmental Executives, Subject: EMS Self-Declaration Protocol, dated January 27, 2004 (Enclosure 6-8).

4) Checklist for Environmental Aspects (Enclosure 6-9). A tool to assist managers in identifying environmental aspects within their area of responsibility.

6.2 Web Sites

a. Environmental Management Systems Guides.

http://www.epa.gov/ne/assistance/univ/index.html - DRAFT College and University Environmental Management System Implementation Guide, US EPA, October, 2001. EPA Region 1 created this guide to help colleges and universities design and implement an environmental management system in a streamlined, cost-

effective manner. This document provides an overview of the Guide content and organization, and a road map for getting started, including form templates. Since some federal agencies have functions similar to educational institutions, this guide could be useful.

http://www.dep.state.pa.us/dep/deputate/pollprev/Iso14001/12elemnr1.pdf - Guidance developed by EPA National Enforcement Investigation Center to assist in developing enforcement documents requiring environmental management systems. It gives an outline of many of the elements that should be considered when developing an action directed at requiring an environmental management system. The structure is somewhat different than that of an ISO 14001 type, although the same concepts are incorporated. It is specifically designed to assist facilities that have had compliance problems to develop a systematic approach to compliance obligations.

http://www.epa.gov/dfe/pubs/iems/iems_template/template-cover.pdf - EPA Pamphlet 744-R-00-012, dated 2001, Integrated Environmental Management Systems, Company Manual Template for Small Businesses. This contains examples and samples of documents and procedures that may be adapted by or to a particular company and its environmental management system. It will not be a substitute for development of a specific environmental management system or replace the implementation process, but it can help to facilitate the development process and enhance the documentation. Caution is advised as this document may invite over-simplification through cut-and-paste. While cut-and-paste can be useful as a tool, it should not be substituted for facility specific evaluation and system development.

http://www.nsf-isr.org/ - Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, MI, January 2001. Although developed for smaller organizations, this guide is an excellent primer in environmental management systems and can be of use to organizations of any size. It provides a step-by-step approach to implementing environmental management systems at smaller organizations and includes worksheets and examples to assist the implementer. Contains an extensive appendix of sample documents and procedures. There is a strong focus on organizational and management techniques for successful implementation. (Also available at EPA web site http://www.epa.gov/ems).

b. Environmental Management Systems Standards.

ISO 14001, 14004 - Available in some libraries for reference, but they are copyrighted by ANSI. ISO 14001 is the Environmental Management System standards, and ISO 14004 is the implementation guidance. Standards are available for purchase from:

- American National Standards Institute - http://www.ansi.org
- American Society for Quality - http://qualitypress.asq.org/perl/catalog.cgi?category=Standards

- NSF International Strategic Registrations - http://www.techstreet.com/info/iso.html

- http://www.epa.gov/p2/programs/voluntary.htm - EPA Standards Network Fact Sheets, ISO 14000 International Environmental Management Standards and the Role of Voluntary Standards.

c. Site Specific Documentation Examples.

http://www.cityofseattle.net - Seattle, Washington's Environmental Management Program web site provides background information regarding the City's approach to their environmental management system. It consists of three parts: Part A outlines the planning process and describes the management system for meeting the environmental policy; Part B details the environmental policies and performance indicators; and Part C identifies the specific work elements by department planned for the next two years to implement this management program. Also on this site is a benchmarking report developed from telephone interviews and reviews of documentation from 23 municipal organizations. Finally, this site contains a bibliography of environmental management resources.

http://www.ci.scottsdale.az.us/ecosystem - Scottsdale, Arizona's Environmental Management System web site provides background information regarding the City's environmental management system, as well as general information and other applicable web sites.

http://pen.ci.santa-monica.ca.us/environment/policy/ - Santa Monica, California's Sustainable City Program web site provides information on the City's approach to a sustainable community. The program has been evolving since 1994; site includes environmental policies, information on environmental programs to implement those policies and indicators.

http://www.getf.org/projects/muni.cfm - The Global Environmental and Training Foundation (GETF) provides training to the public sector by supplying organizations with the information and tools they need to practice proactive environmental management and to utilize this approach to identify and successfully manage their environmental responsibilities and prevent new environmental security risks. The Environmental Management System Pilot Program for Local Government Entities is a detailed report on a pilot project that the EPA Office of Wastewater Management sponsored in 1997-99 to implement environment management systems at nine public agencies across the country. The final report discusses the process, benefits and costs to the participants in a fair amount of detail. Also there are case studies that describe each facility's experiences, including benefits, resource commitments (labor, dollars, cost of consultants if used) and the barriers encountered along the way.

http://www.dep.state.pa.us/dep/deputate/pollprev/Iso14001/emsrcemp.pdf - An Environmental Management Systems Review of the National Park Service, EPA Publication 300-R-00-006, Office of Enforcement and Compliance Assurance,

August, 2000. Using the CEMP, a gap analysis was conducted of the NPS management systems supporting their environmental program.

http://www.dep.state.pa.us/dep/deputate/pollprev/iso14001/Ford_Manual/fordmanual.htm - DOD EMS/ISO 14001 Pilot Study Sites and Points of Contact, Ford Motor Company's ISO 14001 Environmental Management Systems Template. MS Word documents downloadable as Section 3 of the Environment Management System Workbook, December 1999.

http://www.epa.gov/ems - US Environmental Protection Agency's main environmental management systems web site provides information and resources related to environmental management systems for businesses, associations, the public and state and federal agencies. Examples are EPA's internal environmental management policy, 2001 Action Plan for incorporating environmental management systems into the agency's programs and the revised EPA position statement (2002).

d. Self Assessment/Environmental Audit Tools.

http://www.epa.gov/compliance/resources/publications/incentives/ems/emstoolsmas.pdf. - Environmental Management System Tools: A Reference Guide, EPA Publication 300-B-02-012. EPA Federal Facilities Enforcement Office, June 2001. Discusses use of CEMP and, for agencies that have adopted ISO 14001, use of the Oregon Green Permits Program Guide ISO-based approach to conduct an environmental management self-assessment.

Generic Protocol for Conducting Environmental Audits at Federal Facilities, 3rd Edition, Federal Interagency Workgroup, 1998. Includes three sections: a very detailed but now dated compliance auditing protocol, a section on auditing environmental management systems within a media program, and a section on auditing facility-wide environmental management systems. Available for purchase from the Government Printing Office.

http://www.gemi.org - Exploring Pathways to a Sustainable Enterprise: SD Planner, Global Environmental Management Initiative (GEMI), 2002. Their web site states "this detailed and comprehensive self-assessment tool is designed to help companies evaluate, plan for and integrate sustainable development into business processes. The tool addresses all three aspects of development: environmental impact, economic development and social equity as well as activities that can be undertaken toward achieving those goals. Can assist companies in identifying the critical sustainable development issues that are important to business activities."

http://www.c2e2.org/index.htm - The Campus Consortium for Environmental Excellence is a not-for-profit corporation formed by several New England colleges and universities. To help these colleges and universities move their environmental management systems forward, the C2E2 has developed a self-assessment tool (http://esf.uvm.edu/c2e2) designed to help a campus identify the strengths and weaknesses of its current environmental management system.

http://www.epa.gov/ormisbo1/pubs.htm - The Small Business Source Book on Environmental Auditing, US EPA, May 2000. This is a comprehensive resource guide that may be useful for organizations of all sizes. It describes publicly available sources of information and training on environmental auditing.

e. Enforcement.

http://www.state.ma.us/dep/enf/enforce.htm - Massachusetts Department of Environmental Protection (MADEP). New guidance from MADEP that provides some slightly different insight than the NEIC document.

f. General.

https://www.denix.osd.mil/denix/Public/Library/EMS/ems.html - The Department of Defense's (DoD's) DENIX web site provides environmental management systems news, policy and guidance within DoD activities worldwide. Information included on the site includes case studies, presentations and self-assessment tools.

http://www.p2pays.org/iso/ - North Carolina's Department of Natural Resources Environmental Management Systems site provides case studies and design tools to use when implementing an environmental management system and answers frequently asked questions.

http://p2library.nfesc.navy.mil/ems/introduction.html - Navy Environmental Management Systems Library. The primary purpose of the Joint Service P2 Library is to provide a source of information sharing throughout DoD. The Library is designed as a clearinghouse for Joint Service environmental management systems resources, including addressing issues and fostering information sharing, success stories and lessons learned.

http://p2ric.org/TopicHubs/toc.cfm?hub=9&subsec=7&nav=7 - The Pollution Prevention Regional Information Center's web site is intended as a quick guide to environmental management systems, as well as a compilation of pertinent on-line resources. The site offers general background information, including a lengthy collection of documents on the overall impact of environmental management systems.

http://www.peercenter.net/emsinplace/ and
http://www.peercenter.net/howtoimplement/sampledoc.cfm - EPA's PEER Center acts as a clearinghouse of GEMS information. This includes a database of environmental management systems implemented in the US. This database is searchable by state, fenceline and government entity. The Center also has sample documentation on various aspects of environmental management systems from primarily local governments.

http://www.eli.org/isopilots.htm - The National Database on Environmental Management Systems (NDEMS) is a collaborative effort between the EPA, the University of North Carolina, the Environmental Law Institute and several states to compile data to determine how the environmental and economic performance

of a range of corporate, military and municipal facilities is affected by the implementation of environmental management systems.

http://tis.eh.doe.gov/oepa/ - This US Department of Energy (DOE) site provides guidance documents created by DOE addressing environmental management systems at federal facilities.

http://www.iwrc.org/programs/ems.cfm - The Iowa Waste Reduction EMS Service Center provides small businesses with assistance regarding environmental actions. The site contains environmental information specific to meat processors, soybean growers, pork producers, automotive suppliers, food processors and die casters.

http://www.epa.gov/sbo/labguide.htm - Environmental Management Guide for Small Laboratories, US EPA, July 1998. Prepared to assist those responsible for administering or improving environmental management programs at small laboratories, this includes a detailed section outlining requirements of federal environmental regulatory programs that affect laboratories. It includes brief section on P2 opportunities and an introduction to the concept of environmental management systems. Not a comprehensive environmental management systems guide.

http://www.epa.gov/compliance/resources/publications/incentives/ems/emsprimer.pdf . - Environmental Management Systems Primer for Federal Facilities. Office of Environmental Policy and Assistance, US Department of Energy, and Federal Facilities Enforcement Office, US EPA, 1998. The goal of this guide is to help federal managers understand environmental management systems and how one can help them improve environmental management at their facilities. It is not intended to be a technical or detailed manual on implementation. Rather this Primer outlines the elements of an environmental management system, offers tips on how to make the case for an environmental management system to upper management, explains how it will benefit an organization and places it in the context of regulations, compliance issues, pollution prevention and other government programs.

http://www.ofee.gov - Office of the Federal Environmental Executive. The OFEE's mission is to promote sustainable environmental stewardship throughout the federal government by encouraging sustainable practices; identifying and sharing success stories, best practices and other tools to make sustainable practices easier to adopt and maintain; providing training, awareness and outreach; assisting in coordinating and advancing sustainability policies across agencies; publicly advocating and supporting sustainable practices and policies; and measuring and reporting on agencies' progress. Web site contains environmental information, publications and links to additional environmental information.

http://www.dep.state.pa.us/dep/deputate/pollprev/iso14001/iso14000.htm. - ISO 14001 in Pennsylvania. Web site covering environmental happenings within Pennsylvania. Repository for a variety of useful documents from around the country, including EPA documents no longer available on the EPA web site. Includes case studies and interesting articles.

http://www.epa.gov/performancetrack/ - National Environmental Performance Track Program Description and Application Package. NEPT is EPA's national program to promote environmental management and provide recognition for superior environmental performance by facilities using an environmental management system.

http://www.napawash.org - Third Party Auditing of Environmental Management Systems: US Registration Practices for ISO 14001, National Academy of Public Administration (NAPA), May 2001. An in-depth study done for the EPA about the ISO 14001 registration process and how it functions.

http://www.eli.org/isopilots.htm - National Database on Environmental Management Systems (NDEMS). Created by the University of North Carolina at Chapel Hill (UNC) and the Environmental Law Institute (ELI), supported by US EPA, and with cooperation of the Multi-State Working Group on Environmental Management Systems (MSWG), the project is compiling data on the process and nature of environmental management system implementation, the costs and benefits realized and the economic benefits. The project seeks to determine how the environmental and economic performance of a range of corporate, military and municipal facilities is affected by the implementation of environmental management systems.

http://www.eli.org/isopilots.htm - Drivers, Designs and Consequences of Environmental Management Systems: A Research Compendium, March 12, 2001. This is a series of research papers on various issues related to environmental management systems implementation and associated public policy issues prepared by University of North Carolina and the Environmental Law Institute in conjunction with the National Database on Environmental Management Systems (NDEMS).

http://www.globalreporting.org - The Global Reporting Initiative is a multi-stakeholder process and independent institution whose mission is to develop and disseminate globally applicable guidelines for reporting on the economic, environmental and social performance (initially for corporations and eventually for any business, governmental or non-governmental organization). It is a partnership between the Coalition for Environmentally Responsible Economies (CERES) and the United Nations Environmental Program (UNEP) and seeks to make sustainability reporting routine and credible in terms of comparability, rigor and verifiability.

http://www.naturalstep.org - The Natural Step is a non-profit advisory and think-tank organization that helps businesses and government agencies integrate sustainability into core strategy and operations.

http://www.rprogress.org - Redefining Progress (USA) is "a nonprofit public policy organization that creates policies and tools to … protect common social and natural assets and to foster social and economic sustainability." It has a program for calculating a personal ecological footprint, as well as links to national footprints. Its Community Indicators Project links existing and emerging projects

and facilitates the development of community indicator initiatives nationwide through a series of tools, resources and technical support.

http://www.lewis.army.mil/envcaretakers - Fort Lewis, Washington, is the first federal agency to achieve certification of its forestlands. Its forestry practices were evaluated as related to environmental, industrial and social criteria.

g. Environmentally Preferable Cleaning Products. This is a revised list of green cleaning/janitorial project web sites compiled by Dianne Thiel, Federal Facilities Coordinator (8P-P3T), US EPA Region 8.

http://www.informinc.org/cleanforhealth.php - INFORM, Inc is a nonprofit group that did a very informative report on changing to green janitorial products. Has a large list of green cleaning products that have been reviewed by existing state or local government green cleaning programs. Contains vendor information.

http://www.pnl.gov/esp/greenguide/custodialproducts - DOE Pacific Northwest National Laboratory, Richland, WA case study of their switch to green janitorial products. They use one company's cleaning products (at a very large site). Sandra Cannon, Pacific Northwest National Laboratory, Environmentally Preferable Purchasing Technical Assistance for the U.S. Department of Energy, (509) 529-1535

http://www.epa.gov/Region8/conservation_recycling/yellowstone.html - Yellowstone/Grand Teton National Parks faced special challenges in switching to green janitorial products. Contains an interesting step-by-step case study, toxicity and environmental information on common chemicals in cleaning products, and discusses why chemicals in cleaning products are a concern. Contains the City of Santa Monica's bid specifications for janitorial products.

http://www.newdream.org/procure/products/clean.html - Center for a New American Dream is a nonprofit group working with state and local governments on green janitorial products; participating governments have agreed to use the Green Seal Standard 37 for Institutional and Industrial Cleaners.

http://www.ci.santa-monica.ca.us/environment/policy/purchasing/policies.htm - Janitorial Products Purchasing Criteria, Santa Monica, California, was one of the first to develop an environmentally preferable janitorial products purchasing program. Custodial cleaning products were identified as the first category of toxic products to be addressed under the program following a TUR assessment of City operations. The goals of the cleaning product program are:

- To safeguard City custodial workers' health by minimizing workplace exposure to hazardous materials.
- To minimize the environmental impacts incurred due to the manufacture, use and disposal of custodial products used to clean City facilities.
- To increase workplace morale by allowing custodians to participate in decisions about their work.
- To achieve a cost savings while maintaining or improving the level of service.
- To decrease liability for workers compensation claims.

- To decrease custodial staff sick days due to exposure to toxic materials.

This program included a pilot-testing phase to evaluate the effectiveness of various less toxic or non-toxic alternative custodial products. City custodians were enlisted to test the products and provide feedback. The results of the pilot contributed to the development of purchasing specifications for the evaluation of bids from custodial product vendors. The specifications include environmental and public health criteria as well as performance and cost criteria.

http://www.greenseal.org - Go to product standards and look for Standard 37 on Institutional and Industrial Cleaners, and Standard 34 on Degreasing Agents.

http://www.state.ma.us/osd/enviro/products/cleaning.htm - State of Massachusetts used Standard 37 for a statewide procurement.

http://www.epa.gov/opptintr/epp/ - EPA's Environment + Price = Performance (EPP) web site has information on green cleaning efforts around the country.

OSHA's Blood Borne Pathogen Regulation and Approved Disinfectants: When implementing your green cleaning project, OSHA requires (29 CFR 1910.1030) you to use an EPA registered tuberculocidal disinfectant (List B) or HIV 1/Hepatitis B disinfectant (List D) for cleaning up blood borne pathogens (i.e., bodily fluids or materials that have been in contact with liquid bodily fluids). Most green cleaning products, even the disinfectants, aren't registered by EPA's pesticide program as List B or List D disinfectants. This means that if the University switches to green cleaning products, the janitorial staff still needs to have access to an EPA registered tuberculocidal disinfectant for this special need. One product on EPA's list whose active ingredient was listed as citric acid. That would be a green product, if the inert ingredients were green. However, most of the tuberculocidal disinfectants use chlorine bleach or similar serious germ killers and would not be classified as environmentally preferable. The trick in a green cleaning program is to limit the use of these products to the OSHA blood borne pathogen situations. You could look for the registered product that has the lowest bleach solution, as one approach.

EPA Disinfectant Web Site. http://www.epa.gov/oppad001/chemregindex.htm - These strong disinfectants, used in hospital settings, do not need to be used all the time, just for cleaning up blood or other bodily fluids. For disinfectant needs other than in blood and bodily fluids covered by OSHA's regulations, a regular environmentally preferable disinfectant can be used. The first set of numbers of the EPA registration number refers to the registrant's identification number and the second set of numbers represents the product identification number. A distributor's product may use a different name, but must have the first two sets of EPA Reg # of the primary registrant, plus a third set of numbers that represents the Distributor/Relabeler Identification number, for example EPA Reg #001234-000012-000567. An establishment number (EPA Est #) is the place where the pesticide, formulation or device is produced and it is indicated by a set of codes which consist of the registrant's number followed by the State where the product is made and facility number.

h. Chemical Cleaners and Disinfectants. from Medical Industry Roundtable (MIRT) Workshop: Clean Effectively and Reduce Chemical Hazards at Health Care Facilities

1) Selection and Use of Disinfectants:

http://www.mntap.umn.edu/health/disinfection.htm - Disinfection Best Management Practices - Using best management practices for disinfecting will help ensure that you are cleaning appropriately to kill the bugs - the microbes - you need to kill. A side benefit is that you use only the amount of disinfectant necessary to do the job. Ultimately, best management practices protect patients, employees and the environment.

http://www.ehs.ucdavis.edu/sftynet/sn-51.cfm - University of California Davis - Selecting Chemical Disinfectants - The disinfectant table lists the disinfectants most commonly used in laboratories, some commercially available products, general use parameters, important characteristics, potential applications, and general types of organisms they are effective against. This list should be used as a general guide for selection in meeting your particular requirements.

http://www.apic.org/pdf/gddisinf.pdf - APIC Guideline For Selection and Use of Disinfectants. The Association for Professionals in Infection Control and Epidemiology (APIC) assists health-care professionals in their decisions in the judicious selection and proper use of specific disinfectants.

2) Alternative Cleaning Products:

http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi - Sustainable Hospitals Project Alternative Cleaning Products - Provides technical support to the healthcare industry for selecting products and work practices that reduce occupational and environmental hazards, maintain quality patient care and contain costs.

http://www.ciwmb.ca.gov/wpie/healthcare - California Integrated Waste Management Board -Waste Prevention Information Exchange Health Care Waste: (Microfiber Mops; Replacing Ethylene Oxide and Glutaraldehyde) - Comprehensive list of publications, fact sheets and web links to information on healthcare waste.

http://www.zerowaste.org/ugca.htm - Zero Waste Alliance Unified Green Cleaning Alliance - Promotes credible and reliable criteria to distinguish cleaning product formulations that perform and are preferable with respect to human and environmental health. We refer to those products as sustainable or "eco-effective."

http://www.newdream.org/procure/products/clean.html - Center for New American Dream Green Cleaners Product List - The Center for a New American Dream helps Americans consume responsibly to protect the environment, enhance quality of life and promote social justice. The Center works with individuals, institutions, communities and businesses to conserve

natural resources and promote positive changes in the way goods are produced and consumed**.**

3) Miscellaneous:

http://www.greenseal.org/standards.htm - Green Seal is a labeling standard for industrial and institutional cleaning products. The standard helps users and purchasers of cleaning chemicals select products that clean effectively while minimizing negative health and environmental effects.

http://eerc.ra.utk.edu/ccpct/pdfs/EnvPrefCleaners-wholedoc.pdf - Green Seal Standard and Environmental Evaluation for General-Purpose Bathroom and Glass Cleaners Used for Industrial and Institutional Purposes - This report was prepared by the University of Tennessee Center for Clean Products and Clean Technologies for Green Seal to evaluate three classes of industrial and institutional cleaners: general-purpose cleaners, bathroom cleaners, and glass cleaners. Green Seal focused on these three cleaners because they are frequently used with annual sales of $2.38 billion.

www.epa.gov/pesticides/factsheets/antimic.htm - US EPA Information on Antimicrobial Pesticide Products - More than 8000 antimicrobial products are currently registered with the US Environmental Protection Agency (EPA) and sold in the marketplace. Nearly 50% of antimicrobial products are registered to control infectious microorganisms in hospitals and other healthcare environments. However, public health antimicrobial products tend to be low-volume products, and thus constitute less than 5% of the estimated total market for antimicrobial products.

4) The following resources were contributed by Philip Dickey, Washington Toxics Coalition:

http://www.wrppn.org/Janitorial/jp4.cfm - Janitorial Products Pollution Prevention Project - Risks of janitorial products and ingredients, recommended alternatives (Sponsored by US EPA, Cal/EPA Department of Toxic Substance Control, Santa Clara County Pollution Prevention Program, City of Los Angeles, City of Richmond, City of Santa Barbara, Local Government Commission).

http://www.informinc.org/cleanforhealth.php - Excellent Report on Cleaning Products from INFORM - *Cleaning for Health: Products and Practices for a Safer Indoor Environment,* Alicia Culver, Marian Feinberg, David Klebenov, Judy Muskinow, Lara Sutherland (86 pp. $30; $15 for government/nonprofit; contact below for bulk rate) ISBN 0-918780-79-9 (August 2002).

http://www.epa.gov/opptintr/dfe/ - The Design for the Environment (DfE) Program is one of EPA's premier partnership programs, working with individual industry sectors to compare and improve performance, human health, environmental risks, costs of existing and alternative products, processes and practices. DfE partnership projects promote integrating cleaner, cheaper and smarter solutions into everyday business practices.

EPA also supports using "benign by design" principles in the design, manufacture, and use of chemicals and chemical processes—a concept known as "green chemistry." EPA's Green Chemistry Program promotes the research, development, and implementation of innovative chemical technologies that prevent pollution in both a scientifically sound and cost-effective manner. In addition, EPA's emerging Green Engineering Program strives to help academia introduce a "green" philosophy into undergraduate chemical engineering curricula. The DfE Program works with these and other related programs.

http://www.watoxics.org/pages/root.aspx - Scientific Report on APE Surfactants - *Troubling Bubbles: The Case for Replacing Alkylphenol Ethoxylate Surfactants,* Philip Dickey, Washington Toxics Coalition, 1997. This 88-page report documents the scientific evidence that APEs are poor environmental performers. Includes a summary of research on biodegradability, endocrine disruption and toxicity, as well as recommendations for replacing APEs with alternative surfactants. Contains a list of 477 products found to contain one or more APEs. (Prices: $5.00 individuals and non-profits; $10.00 government agencies; $25.00 businesses.) Available by mail at Washington Toxics Coalition web site.

5) Other Links, Organizations and Associations:

http://atsdr1.atsdr.cdc.gov/toxfaq.html - Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs - This is a series of summaries about hazardous substances developed by the ATSDR Division of Toxicology. Information for this series is excerpted from the ATSDR Toxicological Profiles and Public Health Statements. Each fact sheet serves as a quick and easy to understand guide. Answers are provided to the most frequently asked questions (FAQs) about exposure to hazardous substances found around hazardous waste sites and the effects of exposure on human health.

http://www.epa.gov/tri/chemical/appendixc1999pdr.pdf - OSHA Basis of Carcinogen Listing of Individual Chemicals - This table shows the specific bases for which the individual chemical was designated as a known or suspect carcinogen.

http://www.osha.gov/SLTC/etools/hospital/mainpage.html - Hospital E-Tool - US Department of Labor, Occupational Safety and Health Administration (OSHA) - The OSH Act of 1970 strives to "assure safe and healthful working conditions" for today's workers and mandates that employers provide a safe work environment for employees. There are many occupational health and safety hazards throughout the hospital. This E-Tool focuses on some of the hazards and controls found in the hospital setting, and describes standard requirements as well as recommended safe work practices for employee safety and health.

http://www.lni.wa.gov/Safety/Rules/default.htm - Workplace Safety and Health Rules (WISHA), Washington State Department of Labor and Industries -

Here are the WISHA Safety and Health rules for Washington State employers. There may be other local, state and federal safety and health rules that apply to your business.

http://www.noharm.org - Health Care Without Harm is an international coalition of hospitals and healthcare systems, medical professionals, community groups, health-affected constituencies, labor unions, environmental and environmental health organizations and religious groups. Its mission is to transform the healthcare industry worldwide, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment.

http://www.state.ma.us/ota/otapubs.htm#eppnet - Heath Care Environmentally Preferable Purchasing (EPP) Network Information Exchange Bulletin - Massachusetts Executive Office of Environmental Affairs Office of Technical Assistance, October 1999 - March 2001. This bi-monthly newsletter provides updates on health care environmental purchasing innovations from across the country.

www.h2e-online.org/ - Hospitals for a Healthy Environment **(**H2E) is a voluntary program designed to help healthcare facilities enhance work place safety, reduce waste and waste disposal costs and become better environmental stewards and neighbors.

www.ewg.org/pub/home/reports/greening/greenpr.html - Greening Hospitals Report - A first of its kind environmental survey of 50 major U.S. hospitals uncovered widespread failure on the part of medical facilities to take steps to halt contamination of milk, meats and fish by dioxins and mercury pollutants that cause a wide range of health impacts.

i. Greening the VA.

www1.va.gov/oamm/recycle/ - The Department of Veterans Affairs, Office of Acquisition and Materiel Management's (VA OA&MM) Environmental Affairs - Greening VA web site. VA is committed to the health of the environment and promotes pollution prevention, energy efficiency, acquisition of environmentally preferable products and services, and the "Three R's" of waste prevention and management: Reducing, Reusing, Recycling. The VA intranet URL is vaww1.va.gov/oamm/recycle/.

Enclosures

6-1 EPA Pamphlet 744-R-00-011, Integrated Environmental Management Systems Implementation Guide.

6-2 EPA Pamphlet 315-B-97-001, Implementation Guide for the Code of Environmental Management Principles for Federal Agencies (CEMP).

6-3 US Army Environmental Management System Implementers Guide, Version 1.0.

Table of Contents
Section 7 - Environmental Safety Automated Facility Evaluation (E-SAFE)

Environmental Safety Automated Facility Evaluation (E-SAFE)

7.1 Introduction

Environmental Safety Automated Facility Evaluation (E-SAFE) is a new evaluation software program developed at Center for Engineering & Occupational Safety and Health (CEOSH). It is the Green Environmental Management Systems (GEMS) addition to the Safety Automated Facility Evaluation (SAFE) Program, which for several years has been used for conducting the Annual Workplace Evaluations (AWE) at Medical Centers, required by the Occupational Safety and Health Administration (OSHA) regulations.

The management system of GEMS is periodically evaluated to identify conformance with the ISO 14001 Environmental Management Standard and gaps between the Standard and the facility practice.

This gap analysis serves as a snapshot-in-time review of the degree to which the GEMS has been developed and implemented. It is an essential component of an environmental management system, which is required by EO 13148. The E-SAFE criteria statements that follow will be used to evaluate the facility GEMS. The citations in parentheses refer the reader to relevant sections in the ISO 14001 Standard and in this Guidebook.

Evaluations of the GEMS can be conducted by staff from within or from outside of the facility. Evaluation by persons external to the operations of the facility GEMS is considered to be the more objective approach. Regardless, the person doing the evaluation must have completed an ISO 14001 accredited Internal or Lead Auditor course. An annual evaluation is recommended and may be conducted all at once or completed over several months to a year. Reports of the gap analysis should be submitted to the GEMS Committee for review and corrective action. The corrective actions should be tracked to completion (with effectiveness verified) and noted in the GEMS Committee minutes.

Note: The following Criteria Statements were updated January 10, 2005; therefore, they will vary from the printed version of the Guidebook.

7.2 Criteria Statements

1. ***Category 1 - Environmental Policy*** (ISO 14001-2004, Section 4.2; VA Directive 0057, paragraph 2.k; VHA GEMS Guidebook, Sections 2.1 and 5B (Sample MCM).

   a. **Policy.** Is there a published environmental policy in place that supports pollution prevention, regulatory compliance and continual environmental improvement?

   b. **Policy.** Is the policy communicated to the employees and available to the public?

2. ***Category 2 - Planning***

a. **Environmental Aspects and Impacts.** (ISO 14001-2004, Section 4.3.1; VA Directive 0057, paragraph 2e; VHA GEMS Guidebook, Sections 2.2, 3.2 (Step 4) and 4.2 and Documents 5B1-1, 5B1-2 and 5B1-3).

1) **Aspects and Impacts.** Has the facility established a written procedure to identify the environmental aspects and impacts of its activities, products and services?

2) **Aspects and Impacts.** Have significant environmental aspects been determined and considered in setting environmental objectives and targets?

b. **Legal Requirements.** (ISO 14001-2004, Section 4.3.2; VHA GEMS Guidebook, Sections 2.3 (Step 4) and Document 5B1-2).

Legal. Is there a written procedure to identify, access and evaluate federal, state and local legal requirements?

c. **Objectives and Targets.** (ISO 14001-2004, Section 4.3.3; VHA GEMS Guidebook, Sections 2.4, 2.5 and 3.2 (Step 6) and Documents 5B1-3, 5B1-4, 5B2 and 5B3).

1) **Setting Objectives and Targets.** Is there a written procedure to achieve objectives and targets. Identify and document environmental objects and targets for each relevant function and level? Consider legal requirements and significant aspects and other operational requirements. Identify the means and acceptable time frames for accomplishment. Designate responsibility at each relevant function and level.

3. ***Category 3 - Implementation and Operation***

a. **Accountability (Structure and Responsibility).** (ISO 14001-2004, Section 4.4.1; VA Directive 0057, paragraph 2.b, and 2.c; EO 13148, Section 404(b); VHA GEMS Guidebook, Sections 2.6, 3.2 (Step 1) and Document 5B1-4).

1) **Accountability.** Has top management provided adequate resources? Has top management appointed a GEMS Committee to oversee, track and report GEMS status and performance?

2) **Accountability.** Have roles, responsibilities and authorities been defined, documented and communicated to facility staff to ensure effective environmental management?

b. **Training.** (ISO 14001-2004, Section 4.4.2; VA Directive 0057, paragraph 2.j; VHA GEMS Guidebook, Sections 2.7 and 3.2 (Steps 2 and 7) and Document 5B1-5, Enclosure 6-6).

1) **Training.** Has GEMS awareness been conducted for all employees?

2) **Training.** Does New Employee Orientation include GEMS awareness training?

3) **Training.** Has the organization identified training needs for those workers who may create a significant impact on the environment?

4) **Training.** Are employees aware of environmental aspects/impacts associated with their work activities?

5) **Training.** Does the worksite specific GEMS training include significant environmental impacts, emergency response procedures and environmental consequences of nonconformance with standard operating procedures?

c. **Communications.** (ISO 14001-2004, Section 4.4.3; VHA GEMS Guidebook, Section 2.8 and Document 5B1-6).

1) **Communications.** Is there a written procedure for internal communication between the various levels/functions of the facility, the GEMS Coordinator and the GEMS Committee?

2) **Communications.** Is there a written procedure in place to coordinate and document inquiries from external public, private and regulatory organizations?

d. **GEMS Documentation and Record Keeping.** (ISO 14001-2004, Section 4.4.4 and 4.4.5; VA Directive 0057, paragraph 2.f; VHA GEMS Guidebook, Sections 2.9, 2.10, 2.15 and 3.2 (Step 5) and Documents 5B1-5 and 5B1-7).

1) **GEMS Documentation.** Is there a written procedure to ensure all GEMS policies and procedures are fully integrated and consistent with all other VAMC policies and procedures?

2) **Record Keeping.** The written GEMS document control procedure specifies:

1. approval of documents for adequacy prior to issue
2. review and update as necessary and re-approval of documents
3. ensuring that changes and all the current revision status of documents are identified
4. ensuring that relevant versions of applicable documents are available at points of use
5. ensuring that documents remain legible and readily identifiable
6. ensuring that documents of external origin, determined by the VAMC to be necessary for the planning and operation of the GEMS, are identified and their distribution controlled and
7. preventing the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

3) **Record Keeping.** Is there a written procedure to identify, maintain and dispose of environmental, training audit records?

4) **Record Keeping.** Are environmental records identifiable, legible, readily retrievable and traceable to activity, product and service?

e. **Operational Control.** (ISO 14001-2004, Section 4.4.6; VA Directive 0057, paragraph 2.f; VHA GEMS Guidebook, Sections 2.11 and 3.2 (Step 5) and Documents 5B1-7 and 5B1-8; Construction Safety Guidebook, Chapter 1).

1) **Operational Control.** Are the VAMC environmental operations aligned with significant environmental aspects and objectives?

2) **Operational Control.** Are procedures in place to communicate the GEMS requirements to suppliers and contractors?

f. **Emergency Response.** (ISO 14001-2004, Section 4.4.7; VHA GEMS Guidebook, Section 2.12 and Document 5B1-9; VHA Emergency Management Guidebook).

Emergency Response. Is there an emergency preparedness and response procedure to recognize and mitigate potential environmental impacts?

4. ***Category 4 - Checking and Corrective Action***.

a. **Monitoring and Measurement.** (ISO 14001-2004, Section 4.5.1and 4.5.2.1; VHA GEMS Guidebook, Sections 2.13 and 3.2 (Steps 8 and 9) and Document 5B1-10).

1) **Monitoring and Measurement.** Is there a written monitoring and measuring procedure for operations and activities related to significant environmental aspects?

2) **Monitoring and Measurement.** Does the monitoring and measuring procedure include requirements for calibration and recording of information to track performance, operational controls and conformance objectives and targets?

3) **Monitoring and Measurement.** Has a periodic (every 3 years) and/or baseline environmental compliance audit been conducted?

b. **Corrective and Preventive Action.** (ISO 14001-2004, Section 4.5.3; VHA GEMS Guidebook, Sections 2.14 and Documents 5B1-4 and 5B1-11).

1) **Action Plans.** Is there a written procedure covering the definition of roles and responsibilities for investigating and determining a cause of nonconformance?

2) **Action Plans.** Does the preventive and corrective action procedure include action needed to mitigate impact and necessary preventive action?

3) **Action Plans.** Do corrective and preventive action plans address the causes of the deficiency?

4) **Action Plans.** Is the effectiveness of corrective and preventive actions verified before considered completed?

c. **Gap Analysis.** (ISO 14001-2004, Section 4.5.5; VA Directive 0057, paragraph 2.c; VHA GEMS Guidebook, Sections 2.16 and 3.2 (Step 3 and Documents 5B1-11 and 5B1-12).

1) **Gap Analysis.** Does the program have procedures for conducting annual gap analyses of GEMS?

2) **Gap Analysis.** Is the scope based on the environmental importance of the activity and the results of the previous GEMS gap analysis?

3) **Gap Analysis.** Are the results of the GEMS gap analysis reviewed by the GEMS Committee and the recommendations forwarded to top management for review?

4) **Action Plans.** Are resources assigned to corrective and preventive actions in order to complete them in a reasonable timeframe?

5) **Action Plans.** Are corrective and preventive actions tracked to completion in the GEMS committee?

5. ***Category 5 - Management Review***.

a.) **Annual Review.** (ISO 14001-2004, Section 4.6; VHA GEMS Guidebook, Sections 2.17 and 3.2 (Step 9) and Document 5B1-13).

1) **Annual Review.** Is the management review conducted and documented on an annual basis and reported in the GEMS Committee?

2) **Annual Review.** Does the GEMS Committee use the gap analysis results to address the need for changes to policy, objectives and other GEMS elements?

3) **Annual Review.** Is there evidence that the facility director (top management) participates in the annual review (for instance, by signing annual review report)?

7.3 Questions to Ask During E-SAFE

1. Does the management review include questions for employees, such as:
   a. Are you adequately involved in the development of the Standard Operating Procedures (SOPs)?
   b. Do you have responsibilities under GEMS?
   c. Do you know the potential environmental consequences of not following GEMS procedures?
   d. Do you believe that you have had satisfactory training to conform to GEMS procedures?
   e. Do you have the ability to communicate ideas/suggestions to upper management on how to improve VAMC environmental performance?
2. Does the management review include questions for top managers, such as:
   a. What was your role in the GEMS policy?
   b. How do you determine the appropriate human resources, financial resources, specialized skills and technological resources needed to implement and control GEMS?
   c. How do you determine GEMS' continued suitability, adequacy and effectiveness?

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Supply, Processing and Distribution** **Date:**

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Chemical Usage	Ethylene Oxide Sterilization	Air Contamination	0	4	3	3	**10**
Chemical Usage	Cidex Sterilization	Environmental Contamination	0	3	2	3	**8**
Chemical Usage	Steris Sterilization	Environmental Contamination	0	2	2	3	**7**
Chemical Usage	Bleach	Environmental Contamination	1	1	4	2	**8**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	1	3	**6**
Operation of Sterilization Machinery	Energy Consumption, Noise, Heat	Natural Resource Expense	1	1	4	1	**7**
Report Generation	Use of Paper	Natural Resource Expense	1	1	2	3	**7**

Green Environmental Management Systems (GEMS) Aspects Template

OPERATING UNIT: **Specialty Care Clinics** **Date:**_____

Activity or Service	Aspect	Impact	Compliance	Risk	Frequency Of Activity	VAMC Control	TOTAL SCORE
Operation of Equipment	Energy Consumption	Use of Natural Resources	1	1	3	1	**6**
Chemical Usage	Employee/Patient Exposure, Waste Disposal	Health Effects, Environmental Contamination	1	2	4	4	**11**
Chemical Storage	Potential for Spills	Environmental Contamination	1	1	4	4	**10**
Report Generation	Use of Paper	Use of Natural Resources	0	0	4	4	**8**
Drug Preparation and Administration	Improper Disposal	Environmental Contamination	0	1	4	4	**9**
Generation of Regulated Medical Waste	Exposure to Biological Contaminants	Disease Transmission, Environmental Contamination	1	3	4	4	**12**
Changing Linen	Handling of Contaminated Laundry	Employee/Patient Exposure	1	1	4	3	**9**
Cleaning and Disinfecting Surfaces and Equipment	Handling of Detergent Disinfectants	Employee/Patient Exposure	0	2	4	2	**8**
Maintenance of Equipment	Generation of Batteries	Environmental Contamination	1	1	2	2	**6**

Veterans Health Administration
Environmental Policy