Pollution Prevention Opportunity Assessment Approach, Training, and Technical Assistance for DOE Contractors

FY96 Report, ADS #ALHQ-334-1A-7

Federal Manufacturing & Technologies

Susan Pemberton

KCP-613-5933

Published March 1997

Approved for public release; distribution is unlimited.

RECEIVED
MAY 13 1997
OSTI

MASTER

Prepared Under Contract Number DE-ACO4-76-DP00613 for the
United States Department of Energy

AlliedSignal
AEROSPACE

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade names, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Printed in the United States of America.

This report has been reproduced from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, Tennessee 37831; prices available from (615) 576-8401, FTS 626-8401.

Available to the public from the National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Rd., Springfield, Virginia 22161.

A prime contractor with the United States
Department of Energy under Contract Number
DE-ACO4-76-DP00613.

AlliedSignal Inc.
Federal Manufacturing
& Technologies
P. O. Box 419159
Kansas City, Missouri
64141-6159

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

Approved for public release; distribution is unlimited.

**POLLUTION PREVENTION OPPORTUNITY ASSESSMENT
APPROACH, TRAINING, AND TECHNICAL ASSISTANCE
FOR DOE CONTRACTORS**

FY96 REPORT, ADS #ALHQ-334-1A-7

Susan Pemberton

Published March 1997

Susan Pemberton, Principal Investigator

Project Team:

Milt Bryant	Carole Stone
Mike Gerding	Scott Tubbesing
Michelle Maurer	Art VanHook
Harrison May	Don Watson
Charles McField	Ed Welborn
Bill Parker	Mark Wilson
Bill Schlosberg	

Sponsored by the United States Department of Energy, Office of Environmental Management, Office of Pollution Prevention, EM-77

HH
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Contents

<i>Section</i>	<i>Page</i>
Abstract	1
Summary	1
Discussion	3
Scope and Purpose	3
Activity	3
General Background.....	3
Environmental Restoration Training Module	5
PPOA Training and Technical Assistance.....	7
Implementation of DOE-Wide Database	15
Accomplishments	18
Future Work.....	19
References	20
Acronyms.....	21
Appendices	
A. PPOA-ER Course Outline	22
B. ER-P2 Hierarchy Exercise	25
C. PPOA-ER Model Worksheets	30

Illustrations

<i>Figure</i>		<i>Page</i>
1	PPOA Training Class Attendees by DOE Operations/Field Office	10
2	PPOA Training Class Attendees by Lead Cognizant Secretarial Office	10
3	PPOA Training Class Results - Routine PPOA Course.....	14
4	PPOA Training Class Results - ER-Specific PPOA Course	14

Abstract

One of the tools used in a successful pollution prevention program is a pollution prevention opportunity assessment (PPOA). PPOAs can be used to identify the nature and amounts of waste and energy usage from processes and projects within a site's operations, identify the opportunities that exist for pollution prevention and energy conservation, and then evaluate those opportunities for feasible implementation. The purpose of this project is to share the Kansas City Plant's (KCP's) PPOA methodology and experience with other DOE personnel and DOE contractors. This consisted of three major activities in FY96:

- 1. Completing the PPOA training module specific to Environmental Restoration activities,*
- 2. Providing PPOA training and technical assistance to interested DOE personnel and DOE contractors, and*
- 3. Implementing and maintaining the DOE-wide PPOA database.*

This report documents the FY96 efforts, lessons learned, and future plans for all of the PPOA-related activities.

Summary

The Department of Energy and its contractors are faced with environmental concerns and large waste management costs. Federal legislation and DOE Orders require sites to develop waste minimization/pollution prevention programs. In response to these requirements, the Kansas City Plant developed a pollution prevention tool called a pollution prevention opportunity assessment (PPOA). Pilot assessments resulted in the development of a graded approach to reduce the amount of effort required for activities that utilized less hazardous and/or low-volume waste streams. This methodology was modified to meet the needs of other DOE sites in FY94 and validated in FY95.

The project's objectives in FY96 were to complete the PPOA training module specific to Environmental Restoration activities, to provide PPOA training and technical assistance to interested DOE personnel and DOE contractors, and to implement and maintain the DOE-wide PPOA database.

KCP continued to deliver the performance-based PPOA training class utilizing Total Quality principles and participant involvement. A new training course was developed to emphasize the application of PPOAs to environmental restoration (ER) activities. The software was also updated to reflect the changes in terminology. Brochures and articles were mailed to past pollution prevention conference attendees as well as the PPOA contacts. Six classes were delivered to 91 people--four classes were routine PPOA classes and two were ER-specific PPOA classes. The total PPOA attendance to date (FY93-FY96) is 654.

The following progress was made in FY96 to implement the DOE-wide PPOA database: the DOE complex networking needs were defined; a DOE PPOA data request was distributed; an Internet homepage was established; 274 additional PPOA records were loaded, bringing the total number of PPOA records to 1158 from 13 different DOE sites; the database was released outside the KCP computer security wall; a URL address was assigned for Internet use; hotlinks were established to and from the DOE EPIC bulletin board; and the use and availability of the DOE-wide PPOA database were demonstrated at the DOE P2 Conference XII.

Discussion

Scope and Purpose

Pollution prevention opportunity assessments (PPOAs) can be used to identify the nature and amounts of waste and energy usage from processes and projects within a site's operations, identify the opportunities that exist for pollution prevention and energy conservation, and then evaluate those opportunities for feasible implementation. PPOAs also provide baseline data from which progress can be measured. Therefore, PPOAs can be the foundation for a comprehensive and effective pollution prevention program. The purpose of this project was to share the methodology and experiences of the five-year-old PPOA program at the Kansas City Plant (KCP) with other DOE personnel and DOE contractors. This consisted of three major activities in FY96:

1. Completing the PPOA training module specific to Environmental Restoration activities,
2. Providing PPOA training and technical assistance to interested DOE personnel and DOE contractors, and
3. Implementing and maintaining the DOE-wide PPOA database.

Activity

General Background

The Kansas City Plant has a well-developed, site-specific PPOA methodology. Lessons learned from pilot assessments in manufacturing, nonmanufacturing, and laboratory operations led to the development of model worksheets, a PPOA Guidance, performance-based training, and graded approach methodology. This project was initiated in FY93 to share this methodology and lessons learned with others in the DOE complex. The milestones in FY93 included the following:

1. Modification of KCP's Graded Approach methodology with the assistance of DOE/DP's laboratories and
2. Delivery of PPOA training and technical assistance to interested DOE personnel and DOE contractors.

KCP tailored the scope of its site-specific PPOA training module to meet the needs of other DOE sites and contractors. A two-day, performance-based training class was designed, piloted, and delivered to 66 DOE and DOE contractors. An annual project report was written and issued.

In FY94 the project milestones included the following:

1. Testing DOE's PPOA graded approach methodology,
2. Providing PPOA training and technical assistance to interested DOE personnel and DOE contractors,
3. Developing and conducting a PPOA advertising campaign throughout DOE,
4. Conducting a feasibility study to develop a DOE-wide PPOA information exchange mechanism, and
5. Organizing and coordinating information sharing among related EM-352 pollution prevention projects.

The validation of DOE's PPOA graded approach methodology was initiated in FY94 with the funding of PPOAs throughout the complex. The PPOA Graded Approach methodology developed for the DOE complex in FY93 was added to the DOE Defense Programs' Pollution Prevention Opportunity Assessment Guidance. KCP also continued to deliver the performance-based PPOA training. A logo was created for both PPOAs and for pollution prevention to promote the purpose of each. These logos were utilized in class materials, presentations, and brochures. Seventeen classes and two workshops were delivered to approximately 390 DOE personnel and DOE contractors. The Quality Function Deployment (QFD) tool was used to complete a feasibility study for the PPOA information exchange mechanism. A multisite team representing the DOE complex was used to identify customer needs and desires. A cost/benefit study was completed for each option identified in the QFD study and a recommendation made. Finally, the DOE EM Pollution Prevention Conference X, May 2-5, 1994, in Denver, Colorado, was used as a convenient location to gather the project leaders of DOE EM-334's pollution prevention projects. Information was exchanged and an agreement was made to share quarterly reports between principal investigators. An annual project report was written and issued (Reference 1).

In FY95 the project milestones included the following:

1. Validating DOE's PPOA graded approach methodology,
2. Providing PPOA training and technical assistance to interested DOE personnel and DOE contractors,
3. Enhancing the methodology with energy analysis and tools for environmental restoration (ER) activities,
4. Implementing a DOE-wide PPOA database, and
5. Providing support to the DOE EM-334 in the completion of a report which indicated the future potential for pollution prevention and waste minimization in the DOE complex.

The DOE PPOA graded approach methodology was validated at the May 1995 DOE P2 Conference XI in Knoxville, Tennessee. The changes developed through this validation were added to a draft revision of the DOE Model PPOA Guidance. The PPOA training material was enhanced in FY95 with energy analysis and a section specific to ER activities. The software was also updated to reflect these changes. Of these changes, three new worksheets were added for energy analysis, and the Return-on-Investment (ROI) calculation used by DOE Headquarters was added to the economic option evaluation worksheet. In total, 12 classes were delivered to 200 people and over 160 hours of technical assistance were provided to over 20 DOE sites. A follow-up survey was conducted to measure the effectiveness of the training. The following progress was made in FY95 to implement the DOE-wide PPOA database: the software was selected and coded, the DOE's networking needs were identified through a survey, a data request was distributed to the DOE sites, and 884 PPOAs were loaded. Finally, DOE EM-334 expressed the need to provide an estimate of DOE's future waste reduction potential from the implementation of P2 opportunities. The KCP provided the input for the EM-30 routine waste streams and operations. The report was titled, *Potential Pollution Prevention and Waste Minimization for Department of Energy Operations* (Reference 2). An annual project report was written and issued (Reference 3).

Environmental Restoration Training Module

Background

The most common myth about PPOAs is that they cannot be used to evaluate nonroutine waste streams or project-oriented activities. Many DOE sites have ER missions which generate significant waste. ER missions include both remedial and decommissioning activities. The waste streams from these activities are often considered nonroutine and project-oriented. This is because decommissioning usually involves removing buildings and remediation usually requires treatment of soil and returning the land to its natural state. By modifying the point at which PPOAs are conducted or by changing one's point of view, PPOAs can be used to reduce waste from ER and other nonroutine activities.

A special concern of ER waste streams is that a large portion of the waste is already generated--"primary" waste. Since the activities involve cleaning up or tearing down existing wastes or structures, some claim that no pollution prevention can be accomplished. DOE contractors have already proven that P2 can be accomplished by extensive recycling of concrete and steel from decommissioning, as well as other projects which involve decontamination followed by reuse or recycling. The key is to prevent generation of "secondary" waste (waste generated in the course of performing ER activities) as much as possible (source reduction) and to also accept and embrace recycling and reuse as excellent and viable methods of P2 for ER waste streams.

Project-oriented and nonroutine waste-generating activities can be addressed by PPOAs in several ways. First, a macro-level view can be taken, looking for consistent general activities (part of a long series of routine processes) or as common waste streams. An example of a series of routine processes would be the decommissioning of many buildings over years of cleanup. This long-term perspective allows the consideration of equipment and initiatives that can be used on multiple projects, as well as development of lessons learned from one project to another. Other consistent ER activities can include the use and management of personal protective equipment (PPE). A PPOA on this waste stream could result in facility-wide PPE procedure changes that could have a large impact when implemented.

The second way to address ER projects is to implement the PPOA at the planning phase. This means reviewing the project scope and project plan in the same way an ongoing activity would be reviewed, although on paper. This can be done at a high level, such as a Record of Decision, or lower, such as specific work plans. The steps can be mapped, inputs and outputs identified, and brainstorming done on areas that will generate waste. All applicable and cost-effective ways of reducing waste can then be written into plans.

FY96 Environmental Restoration Training Module Schedule and Milestones

Develop exercises specific to ER PPOAs.	FY96-1Q
Critique of ER Training Module by other ER sites.	FY96-2Q
Advertise availability of PPOA-ER training.	FY96-3Q
Deliver PPOA training as requested.	FY96: 3Q-4Q
Document FY96 efforts and lessons learned.	FY96-4Q

The KCP teamed with representatives from Lockheed Martin Energy Systems - Oak Ridge and International Technology Corporation - Cincinnati to develop the PPOA class specific to environmental restoration. The P2/ER concepts section of the training course was taken from a report written by the representative from International Technology Corporation - Cincinnati. A draft training outline was first developed in March 1996. See Appendix A for the final PPOA-ER outline. Two exercises were created for the ER class: the first involved the dismantlement of a building and the second involved soil remediation. The dismantlement exercise was largely taken from a PPOA completed at the Fernald Site. An environmental hierarchy exercise specific to ER was also developed to help provide the culture change needed to implement P2 into ER. (See Appendix B.)

A meeting was held with International Technology Corporation - Nevada Test Site on June 25, 1996, to review the draft PPOA-ER materials. Representatives from the following locations were in attendance:

IT Corporation - Nevada
AlliedSignal Inc. - Kansas City Plant
Lockheed Martin Energy Systems - Oak Ridge
IT Corporation - Nevada
AlliedSignal Inc. - Kansas City Plant
IT Corporation - Nevada

Several sections of the training material were reordered and other changes were suggested as a result of this meeting. In addition, an ER/P2 videotape was discovered. IT Corporation was just completing a videotape specific to ER activities which highlighted P2 examples that had been implemented across the DOE complex. An agreement was reached for its use in the PPOA-ER class.

The DOE Pollution Prevention Conference XII was attended on July 7-9, 1996, in Chicago, Illinois. A brochure was distributed at the PPOA poster session which advertised the availability and schedule for the PPOA class designed for ER.

Another evaluation of the PPOA-ER training materials occurred at a pilot class at the Oak Ridge K-25 site on July 30-31, 1996. This class did not include the software training. Ten people attended the PPOA-ER course and provided feedback for its improvement. Overall, the response was positive. Most attendees felt that they had already been implementing P2 into their ER activities but had not been documenting the information or taking any P2 credit.

In August 1996, the worksheet software was modified to support the PPOA-ER class. (See Appendix C.) In addition, a PPOA-ER class was held at the Kansas City Plant with 8 people in attendance. Therefore, a total of 18 people attended the PPOA-ER training in FY96.

PPOA Training and Technical Assistance

Background

In FY93, the Kansas City Plant (KCP) developed a performance-based PPOA training course for the Department of Energy and its contractors. The approach for this course was modified from the site-specific KCP program to address pollution and waste concerns that existed across the DOE complex. The assessment process was streamlined and a new series of worksheets designed. The training was divided into twelve modules with a premium placed on instructor/student interaction through the use of examples and exercises. The course included modules on pollution prevention concepts, development of a pollution prevention program, the application of Total Quality to pollution prevention, two class exercises, the DOE graded approach methodology, the computer software database for recording PPOA information, and an opportunity for participants to share lessons learned. The training materials were evaluated and refined

over several pilot courses. Three classes were offered in FY93 with 66 participants. Feedback from the classes and support from the DOE indicated a strong demand for this type of training.

In FY94 two logos were designed to promote DOE as the leader in pollution prevention and universally applied to all DOE sites. "Partner with the Environment" was chosen to represent pollution prevention in general while "Creating Solutions, Not Pollution" was chosen to coordinate with PPOAs. These logos are proudly displayed on the front and back of the training notebook and classroom tote bag. In FY94, 297 additional DOE and DOE Contractors were trained.

In FY95, the training material was again enhanced to include energy analysis and a new section on the application to Environmental Restoration activities. Three new worksheets were developed and added to the PPOA computer software to support the energy usage/conservation opportunity documentation. A tool slide-out was developed to provide an aid for classroom attendees in the use of pollution prevention and PPOA tools. The PPOA database software was upgraded to enhance retrieval of PPOA data and worksheets and to incorporate Style III--radioactive waste categories detailed to the level of the DOE Annual Waste Generation and Waste Reduction Report. A follow-up survey was distributed to 228 past participants to determine if the training was helpful in initiating their program and if additional support was needed. In FY95, 200 additional DOE and DOE contractors attended the PPOA training class.

FY96 PPOA Training and Technical Assistance Schedule and Milestones

Receive approval and funding for project.	FY96-1Q
Update DOE PPOA Contact List.	FY96-1Q
Advertise availability of PPOA training.	FY96-1Q
Update DOE Model PPOA Guidance.	FY96-2Q
Update Train-the-Trainer PPOA manual.	FY96-3Q
Revise current training program and class room materials to include energy analysis.	FY96-3Q
Deliver PPOA training as needed.	FY96:1Q-4Q
Provide PPOA technical assistance as requested.	FY96:1Q-4Q
Document training and assistance through an annual report and recommend future initiatives.	FY96-4Q

Advertising and Promotion

A four-fold brochure was developed for DOE-HQ to advertise the PPOA class to the Pollution Prevention Field Coordinators and for distribution at the annual DOE P2 Conference. The brochure described the major tools of the PPOA project: training, technical assistance, and the use of the DOE-wide PPOA database. The FY96 PPOA training schedule was also advertised on DOE's EPIC database, the Pollution Prevention Advisor, and the Kansas City Plant's Internet homepage.

Class Delivery

In FY96, 91 DOE and DOE contractors attended PPOA classes--73 attended the routine PPOA course while 18 attended the PPOA-ER course as noted below. A list of acronyms follows the text.

PPOA Training Class Attendance			
Date	Location	# Attended	Cumulative Total
1/9-11/96	Rocky Flats	24	24
2/27-29/96	KCP	12	36
4/30-5/2/96	KCP	5	41
7/17-18/96	LBNL	32	73
* 7/30-31/96	OR K-25	10	83
* 8/20-22/96	KCP	8	91

* (PPOA-ER Classes)

Figures 1 and 2 show the distribution of attendees by DOE Operations/Field Office and by lead Cognizant Secretarial Office (CSO), respectively.

Figure 1. PPOA Training Class Attendees by DOE Operations/Field Office

Figure 2. PPOA Training Class Attendees by Lead Cognizant Secretarial Office

Technical Assistance

Technical assistance has also been provided on PPOAs throughout the year. Assistance has included software support, guidance reviews, and information exchange to name a few. In addition, the Kansas City Plant coordinated the PPOA poster session at the DOE P2 Conference XII.

Technical assistance has been provided to the following sites:

<u>Site</u>	<u>Type of Assistance</u>
Oak Ridge	Draft Guidance Model Worksheets
Indiana Department of Environmental Management	P2 Examples and DOE Model PPOA Guidance
Nebraska Department of Environmental Quality	KCP Regulatory Worksheets
Oak Ridge	Priority Waste Stream List Questions and Application of Weighted Sums methodology
Los Alamos National Laboratory	PPOA Training Notebook, Train-the-Trainer, and Model DOE PPOA Guidance
Pantex	Updated PPOA Software
Lawrence Berkeley National Laboratory	Updated Software and Recycler Contact
Fernald Site	Updated Software
Oak Ridge	Carpenter and Fluorescent Lighting PPOAs 1994 and 1995 PPOA Project Reports
Savannah River Site	Past PPOA Attendee Lists and Updated Software
Rocky Flats	Fluorescent Bulb PPOA
Idaho National Engineering Laboratory	Database Fields
Savannah River Site	Lesson Plan and Training Materials
DOE EM-77	PPOA Attendee Search
Wastren	Updated PPOA Software and Use
SAIC	Example PPOA for EPIC

Hanford Site	PPOA Graphics, Software Update, and Cutting Fluid Contact
DOE EH-22	Course Outline, Notebook, and Model PPOA Guidance
IT Corporation	Model PPOA Guidance
University of Nebraska	Train-the-Trainer Notebook
Sandia National Laboratory	Train-the-Trainer Notebook
Lawrence Berkeley National Laboratory	Model PPOA Guidance
Oak Ridge National Laboratory	Model PPOA Guidance
DOE EM-77	Model PPOA Guidance
Idaho National Engineering Laboratory	Model PPOA Guidance
University of Louisville	PPOA Class Outline
Idaho National Engineering Laboratory	Example Technical PPOAs
DOE Oakland	PPOA-ER Class Outline and Brochure
Oak Ridge	Priority Ranking Questions and Guidance
Lawrence Livermore National Laboratory	Software Upgrade
Savannah River Site	Database Access
Oak Ridge	P2/ER Guidance
Pantex	Database Access
Western Area Power Administration	How to Perform Database Searches
DOE DP	PPOA-ER Class Notebooks

Lessons Learned

Class sizes were smaller at the Kansas City Plant due to cutbacks in travel budgets across the DOE complex. Therefore, fewer classes will be scheduled at the KCP and more will be planned off-site when the numbers are sufficient to warrant the travel.

Implementation of an ER section in the routine manual to show how PPOAs could be applicable to ER activities was insufficient. Feedback from class participants indicated that they needed ER examples to show how ER could apply. Therefore, two PPOA classes are now available--a routine class for continuous processes and activities and a class which is project oriented and specific to ER activities. Both are two and a half days in length.

Other Improvements

The return on investment formula was updated to the current DOE headquarters usage which includes the determination of post project termination costs on Worksheet 8. (See Appendix C.)

The DOE PPOA contact list was updated to include e-mail addresses. This list is presented in the resource section of the PPOA training notebook.

The Train-the-Trainer manual and PPOA software manual were updated to include the energy analysis material. Copies of the Train-the-Trainer were distributed to those who requested it and to new PPOA training staff. The Software Manual was added to the PPOA notebook.

Class Examination and Evaluation

After the PPOA training is complete, a class examination and evaluation are filled out by the class attendees. The results of these documents are analyzed to provide a measure of how well the course objectives were met. The course evaluation also provides a forum for the class attendees to make written comments about the strong and weak points of the training. These comments have been instrumental in making improvements to the training. Figures 3 and 4 summarize the results from the course examination and evaluation for both the routine and ER-specific training, respectively. Please note that the evaluation results and examination scores are averages for each class.

Figure 3. PPOA Training Class Results - Routine PPOA Course

Figure 4. PPOA Training Class Results - ER-Specific PPOA Course

DOE DP Model PPOA Guidance Update

A level III energy example and Design for Environment reference were added to the draft revision of the DOE Model PPOA Guidance. In addition, a new section was added on application to nonroutine activities. This included environmental restoration projects and new/modified facility design projects. Alternative methods were also discussed to emphasize the flexibility in using the model guidance. In November 1995 the suggested revision to the Model DOE PPOA Guidance was sent to DOE Defense Programs for review and release approval by DOE Defense Programs. Their review comments were incorporated into the document, and in February 1996 the guidance was published and distributed (Reference 4). In addition, 34 copies of the guidance were distributed to a list generated at the DOE P2 Conference XII.

Benchmarking

The Government Institute's class on "Pollution Prevention/Waste Minimization for Federal Facilities" was benchmarked on June 26-27, 1996. Several exercise techniques were noted as beneficial. However, the inclusion of DOE and radioactive waste coverage was found to be lacking.

Implementation of DOE-Wide PPOA Database

Background

Many sites within the Department of Energy have completed opportunity assessments. Others are just starting. DOE EM-77 recognized the need for these sites to share their information. Several benefits are achieved when information sharing is effective, such as (1) the elimination of redundant efforts, (2) the minimization of resources, and (3) the creation of valuable contacts. Therefore, EM-77 asked the Kansas City Plant to complete a feasibility study on a DOE-wide PPOA information exchange mechanism.

In FY94 this study was completed with a multisite team. Consensus within the team indicated that the minimum amount of PPOA information to be exchanged among DOE contractors was as follows. (This is referred to as "basic PPOA information.")

- PPOA Title
- PPOA ID Code
- Site
- Contact (Site Coordinator)
 - Phone Number / Fax Number
- Contact (Specific PPOA)
 - Phone Number / Fax Number
- Waste Type
- Process Type
- Brief PPOA Description
- Date
- Option Descriptions

Information sharing options were generated as a result of the QFD study and a cost/benefit analysis was completed for each. Based on the following criteria of option cost information, technical evaluation, Quality Function Deployment results, and speed of completion, a recommendation was made to DOE EM-77 to implement a central database of basic PPOA information using a dedicated PC followed by implementation using the Internet.

FY96 Implementation of DOE-Wide PPOA Database Schedule and Milestones

Receive approval and funding for project	FY96-1Q
Distribute database users guide.	FY96-1Q
Request, collect, and load additional PPOAs.	FY96-2Q
Survey users for improvements and implement significant suggestions.	FY96-3Q
Maintain PPOA database and respond to user requests for data.	FY96:1Q-4Q
Document FY96 activities in an annual report and make future recommendations.	FY96-4Q

Two hundred seventy-four additional off-site PPOA records were loaded into the database in FY96, providing a total number of 1158 PPOA records. Reminder telephone calls were made to sites with PPOAs that had not sent their data. See the listing below for the number and origin of PPOA records in the DOE-wide database at the end of FY96.

DOE Site	PPOAs in Database
Argonne National Laboratory - East	11
Brookhaven National Laboratory	1
Fernald Environmental Management Project	6
Hanford Site	124
Idaho National Engineering Laboratory	33
Kansas City Plant	841
Nevada Test Site	3
Oak Ridge	42
PETC	1

Rocky Flats Environmental Technology Site	3
Sandia National Laboratories	10
Savannah River Site	79
West Valley Demonstration Project	4
TOTAL	1158

Technical, legal, and security approvals were authorized for external release (outside the computer security protection system at the Kansas City Plant) of the DOE-wide PPOA database. A homepage and Internet address were established for the database and Internet access was tested (locally and out of state).

The availability and use of the DOE-wide PPOA database by Internet access was demonstrated at the DOE P2 Conference XII's PPOA poster session in July 1996. Hotlinks were established to and from the DOE EPIC bulletin board for integration and sharing of P2 information. The URL address for the DOE-wide PPOA database is

<http://ppoa.os.kcp.com> or 199.89.130.30

A database verification was conducted from an internal FileMaker Pro database to the external Ingress database for Internet access. Several search comparisons showed some errors in the Ingress programming. The results were provided to the programmer so that adjustments could result in improvements to the external system.

The following searches were performed with the database.

<u>Site</u>	<u>Database Search Provided</u>
DOE EM-77	Contaminated Soil PPOAs
Oak Ridge	Low Level Waste PPOAs
Rocky Flats	Painting, Leaded Glass, Batteries, Solvent Substitution, and Photolithography PPOAs
IT Corporation	ER PPOAs
Idaho National Engineering Laboratory	Plutonium and Nuclear Waste Production PPOAs

Accomplishments

The following accomplishments have been realized as a result of this project in FY96:

- Ninety-one DOE and DOE contractors received PPOA training--18 attended the ER-specific class and 73 attended the routine class.
- The PPOA training materials were revised based on lessons learned from FY95.
- A new set of PPOA training materials was developed for application to ER activities. The worksheets and worksheet software were updated to include the new terminology needed for the ER course.
- The DOE Model PPOA Guidance was updated to include energy analysis and application to nonroutine activities.
- The Return-on-Investment (ROI) calculation was updated to reflect what is being used by DOE Headquarters.
- The list of DOE PPOA contacts was updated to include e-mail addresses.
- The Software and Train-the-Trainer manuals were updated to include energy analysis.
- More than 40 hours of technical assistance were provided to over 22 DOE sites during FY96.
- The PPOA course was advertised through the Pollution Prevention Advisor, the DOE EPIC bulletin board, the KCP Internet homepage, and internally developed brochures. The brochures were distributed at the DOE EM P2 Conference XII in Chicago, Illinois.
- The DOE-wide PPOA database access from the Internet was completed with a total of 1158 PPOA records stored from 13 DOE sites. In addition, the database was released outside the KCP computer security wall, a link was established with the DOE EPIC bulletin board, and the use and availability of the DOE-wide PPOA database were demonstrated at the DOE P2 Conference XII.

Future Work

The last deliverable for each project activity included the development of FY96 follow-on plans. They are as follows:

- Develop a Model PPOA Guidance specific to Environmental Restoration activities.
- Continue to provide routine and ER-specific PPOA training and technical assistance to interested DOE and DOE contractor personnel.
- Develop additional P2/ER training materials for ER project managers and field staff to ensure the culture change necessary to implement P2 into the ER project level.
- Develop a PPOA training overview videotape to distribute to smaller sites within the DOE complex.
- Maintain the DOE-wide PPOA database and update the information periodically. Develop and distribute a users survey to determine user friendliness and areas for improvement. Establish and record the number of hits that the database receives.

References

¹Susan E. Pemberton, *Pollution Prevention Opportunity Assessment Approach, Training, and Technical Assistance for DOE Contractors - FY94 Report*. Federal Manufacturing & Technologies: KCP-613-5545, January 1995. (Available from NTIS).

²Griffin, Ischay, Kennicott, Pemberton, and Tull, *Potential Pollution Prevention and Waste Minimization for Department of Energy Operations*, Lockheed Idaho Technologies Company, INEL-95/0293, October 1995.

³Susan E. Pemberton, *Pollution Prevention Opportunity Assessment Approach, Training, and Technical Assistance for DOE Contractors - FY95 Report*. Federal Manufacturing & Technologies: KCP-613-5735, February 1996. (Available from NTIS).

⁴*U.S. Department of Energy Model PPOA Guidance*, prepared under the direction of U.S. Department of Energy, Office of Defense Programs, February 1996, DOE/DP-0136.

Acronyms

AD - Department of Energy's Administration Program
ANL - Argonne National Laboratory
ADS - Activity Data Sheet
ASI/KO - AlliedSignal Inc./Kirtland Operations
BDM - BDM Oklahoma Inc.
CSO - Cognizant Secretarial Office
CSU - Colorado State University
DOE DP - Department of Energy's Defense Programs
DOE EE - Department of Energy's Energy Efficiency and Renewable Energy Program
DOE EM - Department of Energy's Environmental Management Program
DOE ER - Department of Energy's Energy Research Program
DOE FE - Department of Energy's Fossil Energy Program
DOE HQ - Department of Energy's Headquarters
EADC/IAC - Energy Analysis and Diagnostics Center/Industrial Assessment Center
ECO - Energy Conservation Opportunity
EML/NY - Environmental Measurements Lab / New York
EPIC - Department of Energy's Pollution Prevention Information Clearinghouse
ER - Environmental Restoration
FY93 - Fiscal Year 1993
FY94 - Fiscal Year 1994
FY95 - Fiscal Year 1995
FY96 - Fiscal Year 1996
KCP - Kansas City Plant
LANL - Los Alamos National Lab
LBNL - Lawrence Berkeley National Laboratory
LLNL - Lawrence Livermore National Laboratory
NE - Department of Energy's Nuclear Energy Program
NP - Department of Energy's New Production Reactor Program
NTS - Nevada Test Site
P2 - Pollution Prevention
PPOA - Pollution Prevention Opportunity Assessment
PWA - Process Waste Assessment
QFD - Quality Function Deployment
RW - Department of Energy's Civilian Radioactive Waste Management Program
SNL/CA - Sandia National Laboratories/California
SNL/NM - Sandia National Laboratories/New Mexico
TRADE - Training Resources and Data Exchange
WRITAR - Waste Reduction Institute for Training and Applications Research
WINCO - Westinghouse Idaho Nuclear Company
WSRC - Westinghouse Savannah River Company

Appendix A
PPOA-ER Course Outline

**Pollution Prevention Opportunity Assessment Training
for Environmental Restoration Programs**

Course Outline

1

Day #1

Approximate Time

Registration

7:30 am

Coffee, Juice and Rolls will be provided.

I. Welcoming Remarks

8:00 am

- a) Administrvia
- b) Training Team Introductions & Training Purpose

II. Introduction to the Total Quality Approach

- a) Description of the Total Quality (TQ) Problem Solving Model
- b) The Total Quality Approach and Continuous Improvement
- c) Critical Success Factors

III. Pollution Prevention Program and Structure

- a) Major Elements of a Successful P2 Program
- b) Organization of a P2 Network
- c) Strategies of Goal Setting
- d) Theory and Steps to Determining P2 Priorities
- e) P2 Drivers and How They Relate to PPOAs

IV. Pollution Prevention Concepts for Environmental Restoration

- a) Definition of Pollution Prevention (P2) and Environmental Restoration (ER)
- b) Application of P2 to ER
- c) Environmental Hierarchy Definition & Examples
- d) ER/P2 Hierarchy Exercise
- e) P2 Benefits, DOE HQ Initiatives, & P2/ER Examples
- f) P2 Tools

V. Pollution Prevention Opportunity Assessment, (*Assessment Portion*)

- a) Pollution Prevention Opportunity Assessment (PPOA) Elements
- b) Nonroutine PPOA Application and ER Case Study
- c) PPOA Benefits
- d) Elements of PPOA Team Formation
- e) Description of the Steps to Complete an Activity Description
- f) Requirements of PPOA Flow Diagrams, Material Balances, Energy Usage and Costs

Lunch (On Your Own)

11:30 am

**V. Pollution Prevention Opportunity Assessment
(Option Generation Portion)**

12:30 pm

- a) Identification of Option Generation Methods
- b) Description of Option Screening Techniques
- c) Economic Evaluation of Options
- d) Description of the Weighted Sums Prioritization Technique
- e) Final Report: Elements, Purpose, and Checklist

Adjourn Day 1

4:30 pm

**Pollution Prevention Opportunity Assessment Training
for Environmental Restoration Programs**

Course Outline

2

Day #2

Welcome Back - Preview Day and Review Objectives **7:30 am**
Coffee, Juice and Rolls will be provided.

VI. Performance-Based Team Exercise, Part 1 **8:00 am**
a) Introduction of Team Exercise
b) Teams Perform Assessment Portion of PPOA
c) Review Assessment Results

VI. Performance-Based Team Exercise, Part 2 **10:00 am**
a) Teams Complete Option Generation and Evaluation Portion of PPOA
b) Review Option Generation and Evaluation Results

Lunch (On Your Own) **noon**

VII. Graded Approach for PPOAs **1:00 pm**
a) Benefits of a Graded Approach Methodology
b) Minimum Requirements and PPOA Levels

VIII. Course Examination and Evaluation

IX. Lessons Learned/Information Sharing (P2 and PPOA)
a) Participants are Encouraged to Share Information about their Sites
b) List of ER PPOAs Available in DOE Database
c) Technical Assistance

X. Review Course/Participants Expectations

Adjourn Day 2 **4:00 pm**

Day #3

XI. Brief Overview of Breakout Sessions

Group 1		Group 2	
Computer Room	8:00am-10:00am	?	8:00am-10:00am
?	10:00am-Noon	Computer Room	10:00am-Noon

Appendix B
ER-P2 Hierarchy Exercise

ER/P2 EXERCISE

Exercise

When is an ER activity considered pollution prevention?

P2-15

Environmental Management Hierarchy Examples

Which Environmental Management Hierarchy option best describes each of the following?

Choices: Source Reduction (SR)
 Recycling / Reuse (RR)
 Treatment / Controls (TC)
 Disposal (DI)

1. A hazardous cleaner used for decontamination of radioactive surfaces is substituted with a non-hazardous one. _____
2. Free-release requirements are changed leading to a 25% reduction in primary waste removal. _____
3. An activated carbon filter is installed in a wastewater treatment system. _____
4. Liquid low-level radioactive waste is mixed with concrete prior to disposal. _____
5. Low-level contaminated concrete is pulverized resulting in releaseable material for use in a bedding for a new road. _____
6. Low-level waste is placed in containers and disposed at the Nevada Test Site. _____
7. Waste management changes a treatment process which results in a 50% reduction in the secondary hazardous waste stream. _____
8. A POTW permit on end-of-pipe pH levels is adjusted causing less sulfuric acid to be used. _____
9. The temperature and pressure of a high-pressure hot water cleaner were raised to reduce chemical usage. _____
10. Purchase specifications are rewritten to require the vendor to take back all packaging materials for their reuse. _____
11. A new procedure is implemented requiring all unnecessary packaging to be removed prior to entry into a rad-contaminated zone. _____

Environmental Management Hierarchy Examples

Which Environmental Management Hierarchy option best describes each of the following?

Choices: Source Reduction (SR)
 Recycling / Reuse (RR)
 Treatment / Controls (TC)
 Disposal (DI)

12. A new decontamination technique is implemented which increases the amount of primary waste which can be reused and/or recycled. _____
13. Spent solvent from a decontamination process was distilled and reused. _____
14. The specification for fleet antifreeze is changed to extend the usage-life (based on mileage not time) before replacement. _____
15. A decommissioning team segregates the metal being removed for purposes of reuse or recycling. _____
16. A new piece of equipment is bought to treat decon wastewaters that are currently being stored and shipped for disposal. This will significantly decrease secondary waste generation and energy required for transportation. _____
17. An insitu treatment for soil is selected which avoids removal, shipment, and storage of the primary waste. _____
18. Negotiations with regulators on clean-up standards reduces the volume of waste requiring remediation. _____
19. A review of historical records provides adequate process knowledge to decrease the number of samples and analyses required for site characterization. _____
20. Primary waste is compacted and dewatered to decrease storage containers, optimize storage space, and optimize transportation energy/fuel. _____

ORDER OF MOST-EFFECTIVE ENVIRONMENTAL MANAGEMENT FOR ER

P2-16

Appendix C
PPOA-ER Model Worksheets

Level III

Pollution Prevention Opportunity Assessment

Issue Date: _____
Revision No.: _____
Revision Date: _____

PPOA Team

PPOA ID Code:

PPOA Title:

Team Members	Job Classifications	Phone No.	Fax No.	E-mail Address
* _____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
* Team Leader	_____	_____	_____	_____

Additional Resources	Contact Name	Phone No.	Fax No.	E-mail Address
Site PPOA Coordinator				
Waste Management				
Industrial Hygiene				
Environmental Compliance				
Safety				
Fire Protection				
Health Physics				
Cost Estimator				
Engineering				
Maintenance (Utilities)				
Maintenance (Equipment)				
Analytical Services				
Scheduling				
Site P2 Manager				
Other				

Pollution Prevention Opportunity Assessment

PPOA Team

Help

This worksheet provides the scope and identification of the pollution prevention opportunity assessment (PPOA) team. For the PPOA to be successful, employees involved with the activity being assessed should be members of the team. The assessment team needs a leader, members, and additional resources, as required.

The team leader should have technical knowledge of the area's operations and the personnel involved. The leader shall assemble the team to perform the assessment. Team members may include pollution prevention coordinators, environmental waste engineers, design engineers, project engineers, project managers, health physics, environmental compliance, waste management specialists, and other field or project staff. Additional resources may be called in to provide information not available within the team. The size of the team may be large for complicated activities, but should be kept to a minimum to maintain focus.

To move from field to field, either use mouse and click on desired field, or use TAB key.

1. **Original Issue Date:** Automatically entered upon selecting NEW RECORD.
2. **Revision No.:** List the revision number for this worksheet. {Original issue = 0.}
3. **Revision Date:** Automatically updated any time a change is made to a record.
4. **PPOA Title:** List the PPOA title selected by the team.
5. **PPOA ID Code(s):** List the PPOA ID Code(s) selected by the team.
6. **Name, Job Classification, Phone No., Fax No., and E-Mail Address:** To facilitate team meetings and for future reference, this information should be completed when the PPOA team is formed.

Pollution Prevention Opportunity Assessment

Revision No.: _____

Revision Date: _____

Activity Description

PPOA ID Code:

PPOA Title:

Activity Location:

Site: _____

Area: _____ **Building:** _____ **Depart.:** _____

Floor: _____ **Room:** _____

Activity Description:

Description of Major Product(s) of Activity or Purpose:

Major Activity Type: _____

Specific Activity Type: _____

Major Waste Type: _____

Specific Waste Type: _____

Pollution Prevention Opportunity Assessment

Activity Description

Help

Worksheet 2 provides a brief description of the activity. An activity is any existing or planned project or process which uses energy and/or generates waste or pollution to the air, water, and/or land. The main elements of the activity description are the location, input materials, energy usage, equipment, summary of operations performed, controls, operator training, major products, and the waste streams affected.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **PPOA Title:** List the PPOA title given on Worksheet 1.
4. **PPOA ID Code(s):** List the PPOA ID Code(s) given on Worksheet 1.
5. **Activity Location:** List the best descriptor of the activity location. It may be a department, building, room, etc..
6. **Activity Description:** The description should detail important attributes of the activity. Project's purpose, waste streams involved (primary and secondary), cleanup technology, project monitoring, secondary materials, training (qualification or certification), and energy sources may be included.
7. **Description of Major Product(s) of Activity or Purpose:** Describe the major products which result from this activity or the reason it is being performed.
8. **Major Activity Type, Specific Activity Type, Major Waste Type, and Specific Waste Type:** These fields will provide useful searching capability in the DOE-Wide PPOA database. Choose the best descriptor for these fields. A list of the available activity and waste stream lists are shown as pop-up lists.

Pollution Prevention Opportunity Assessment

Revision No.: _____

Revision Date: _____

Level III

Flow Diagram

Page: 1

PPOA ID Code: _____

PPOA Title: _____

Inputs: _____

Material Name /
Control No.

Activity:

Outputs:

Decontaminated / Reclamation
Hazardous
Nonhazardous
Recycled
Reused
Other

DR1	Solid	
DR2	Liquid	
DR3	Air	

HZ1	Solid	
HZ2	Liquid	
HZ3	Air	

OT1	Solid	
OT2	Liquid	
OT3	Air	

NH1	Solid	
NH2	Liquid	
NH3	Air	

RU1	Solid	
RU2	Liquid	
RU3	Air	

RC1	Solid	
RC2	Liquid	
RC3	Air	

Pollution Prevention Opportunity Assessment

Level III**Flow Diagram****Help**

Worksheet 3 provides a flow diagram for the PPOA. The flow diagram should represent all PPOA ID Code(s) associated with the activity, all input materials, and outputs (products/wastes). The flow diagram should track materials from the time they enter the boundary of the activity until they leave. This diagram represents a very simplistic flow model; a more detailed diagram may be required to identify all waste streams, especially for complex, multi-step processes.

To move from field to field, either use mouse and click on desired field, or use TAB key.

1. **Revision No.:** List the revision number for this worksheet. {Original issue = 0.}
2. **Revision Date:** Automatically updated any time a change is made to a record.
3. **PPOA Title:** List the PPOA title given on Worksheet 1.
4. **PPOA ID Code(s):** List the PPOA ID Code(s) given on Worksheet 1.
5. **Flow Diagram:** List the input materials on the lines provided. Fill in the Activity Name box. Then highlight those outputs that are applicable to the activity (e.g. Recycled, Hazardous, etc). Then categorize those outputs into solid, liquid, or air emission streams by highlighting the corresponding output stream. A Stream ID Code is provided for each category of waste.
6. **Outputs:** The Stream ID Code provides a uniform coding scheme for the release information requested on Worksheet 4. A brief waste description may be recorded in the box to the right of the Stream ID Code.

Stream ID Codes

Designator	Code
Decontaminated / Reclamation	DR
Hazardous	HZ
Nonhazardous	NH
Recycled	RC
Reused	RU
Other	OT

Solid Stream = 1, Liquid Stream = 2, Air Stream = 3

Worksheet 3A
Style 3

Level III

Pollution Prevention Opportunity Assessment

Revision No.:

Revision Date: _____

Page: 1 A

Flow Diagram

PPOA ID Code:

PPOA Title:

**Material Name /
Control No.**

Inputs:

Level III**Flow Diagram**

Worksheet 3 provides a flow diagram for the PPOA. The flow diagram should represent all PPOA ID Code(s) associated with the activity, all input materials, and outputs (products/wastes). The flow diagram should track materials from the time they enter the boundary of the activity until they leave. This diagram represents a very simplistic flow model; a more detailed diagram may be required to identify all waste streams, especially for complex, multi-step activities.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **PPOA Title or PPOA ID Code(s):** List the PPOA Title or PPOA ID Code(s) given on Worksheet 1.
4. **Flow Diagram:** List the input materials on the lines provided. Fill in the Activity Name box. Then highlight those outputs that are applicable to the activity (e.g. Product, Hazardous, etc.). Then categorize those outputs into solid, liquid, or air emission streams by highlighting the corresponding output stream. A Stream ID Code is provided for each category of waste.
5. **Outputs:** The Stream ID Code provides a uniform coding scheme for the release information requested on Worksheet 4. A brief waste description may be recorded in the box to the right of the Stream ID Code.

DOE Definitions

Hazardous Waste - Waste, which because of its quantity, concentration, or physical, chemical or infectious nature may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous waste can be further defined as:

RCRA-regulated - solid waste not specifically excluded from regulation under 40 CFR 261.4, or delisted by petition, that is either a listed hazardous waste (40 CFR 261.30 - 261.33) or exhibits the characteristics of a hazardous waste (40 CFR 261.20 - 261.24).

Non RCRA-regulated - any other hazardous waste not specifically regulated under TSCA or RCRA, which may be regulated by the state or local authorities, such as used oil.

TSCA Waste - Individual chemical wastes (both liquid and solid), such as polychlorinated biphenyls.

Pollution Prevention Opportunity Assessment

Revision No.: _____

Revision Date: _____

Level III

Flow Diagram

Page: 1 B

PPOA ID Code:

PPOA Title:

OR1	Solid
OR2	Liquid
OR3	Air

LL1	Solid
LL2	Liquid
LL3	Air

Outputs:

Other, RAD
Low Level
Low Level, Mixed
TRU, Mixed
Transuranic, (TRU)
High Level
Recycling
Reuse

LM1	Solid
LM2	Liquid
LM3	Air

TM1	Solid
TM2	Liquid
TM3	Air

RC1	Solid
RC2	Liquid
RC3	Air

TU1	Solid
TU2	Liquid
TU3	Air

RU1	Solid
RU2	Liquid
RU3	Air

HL1	Solid
HL2	Liquid
HL3	Air

Pollution Prevention Opportunity Assessment

Level III

Flow Diagram

Help

Worksheet 3 provides a flow diagram for the PPOA. The flow diagram should represent all PPOA ID Code(s) associated with the activity, all input materials, and outputs (products/wastes). The flow diagram should track materials from the time they enter the boundary of the activity until they leave. This diagram represents a very simplistic flow model; a more detailed diagram may be required to identify all waste streams, especially for complex, multi-step activities.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **PPOA Title or PPOA ID Code(s):** List the PPOA Title or PPOA ID Code(s) given on Worksheet 1.
4. **Flow Diagram:** List the input materials on the lines provided. Fill in the Activity Name box. Then highlight those outputs that are applicable to the activity (e.g. Product, Hazardous, etc.). Then categorize those outputs into solid, liquid, or air emission streams by highlighting the corresponding output stream. A Stream ID Code is provided for each category of waste.
5. **Outputs:** The Stream ID Code provides a uniform coding scheme for the release information requested on Worksheet 4. A brief waste description may be recorded in the box to the right of the Stream ID Code.

DOE Definitions:

High Level Waste: - Irradiated reactor fuel, liquid wastes resulting from operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and solids into which such liquid wastes have been converted. (10 CFR 60.2)

Transuranic Waste: - Waste that is contaminated with alpha-emitting radionuclides with (1) an atomic number greater than 92 (heavier than uranium); (2) half-lives greater than 20 years; and (3) concentrations greater than 100 nanocuries per gram of waste.

Transuranic Mixed Waste: - Waste which contains both transuranic waste and hazardous components, as defined by the Atomic Energy Act and RCRA, respectively.

Low Level Waste: - Radioactive Waste not classified as high level waste, transuranic waste, spent nuclear fuel, or by-product material [specified as uranium or thorium tailings and waste in accordance with DOE Order 5820.2A].

Worksheet 4

Level III

Pollution Prevention Opportunity Assessment

Material Balance Summary

Revision No.:

Revision Date: _____

Page of

Time Frame

From:

To:

PPOA Title or PPOA ID Code(s): _____

[illegible]

Worksheet 4

A material balance is a summation of the total quantity of input material to an activity and the releases to the environment, another activity, or made into product. The purpose of Worksheet 4 is to tabulate this information and total the inputs and outputs for all streams.

1. **Revision No.:** List the revision number of the PPOA.
2. **Revision Date:** List the most recent revision date for the PPOA worksheet.
3. **PPOA Title/PPOA ID Code(s):** List the PPOA Title or ID Code(s) given on Worksheet 1.
4. **Page ____ of ____:** Indicate the page number for this worksheet and the number of pages for this worksheet.
5. **From/To:** Report the dates (month and year) for the time period covered. An annual period is suggested for purposes of averaging and documenting performance toward facility goals.
- 42 6. **Material Description:** List the material name and stock number (optional) or the output product if different than originating material.
7. **Units ____:** Enter the unit of measure for the input/output summary. A consistent unit of measurement is suggested. If requirements dictate mixing units, designate the units for a particular column under the Stream ID Code heading.
8. **Total Input:** For the material described in the far left column enter the weight of material used in the operation during the time frame specified.
9. **Total Output:** For the material specified in the Material Description column enter the weight of the output. This is the sum of all waste streams and any product generated. For activities where chemical reactions take place, input materials are consumed or changed to different compounds, a separate entry in the Material Description column is required to adequately define the output. In these cases, the input and output quantities will not balance for the listed material in that row.
10. **Output Quantity:** Use these columns to break down the total output into output categories. Refer to Worksheet 3 for the appropriate Stream ID Code for the output type. Enter the Stream ID Code at the top of the column (e.g., HZ1 for a hazardous solid waste stream), then enter the

discharge amount for the material described in the Material Description column that relates to that Stream ID Code. Continue across the worksheet for all Stream ID Code(s) utilized in Worksheet 3.

11. **Totals/Subtotals:** Sum the Total Input, Total Output, and Output columns. Record the sum at the bottom row of the last worksheet. Subtotals are recorded at the bottom row for other pages of the worksheet. The Total Input column should equal the Total Output column unless there is system accumulation. The Total Output column should also be the sum of all the Stream ID Code output streams.

Stream ID Codes:

Designator	Style 1	Style 3
Decontaminated/Reclamation	DR	DR
Hazardous	HZ	
Nonhazardous	NH	NH
Other	OT	OT
Hazardous, RCRA		HR
Hazardous, Non-RCRA		HN
Toxic, TSCA		TS
High Level		HL
Transuranic, TRU		TU
TRU, Mixed		TM
Low Level		LL
Low Level, Mixed		LM
Other, Radioactive		OR
Recycled	RC	RC
Reused	RU	RU

Solid Stream = 1, Liquid Stream = 2, Air Stream = 3

Style refers to the version of Worksheet 3 used.

Pollution Prevention Opportunity Assessment

Energy Usage Summary

Revision No.: _____

Revision Date: _____

Page: 1

Time Frame

From: _____

To: _____

PPOA ID Code: _____

PPOA Title: _____

Usage Level by Activity Equipment								
Equipment	Estimated Efficiency	Energy Resource	Energy Resource	Energy Resource	Energy Resource	Energy Resource	Energy Resource	Energy Resource
		Type:	Type:	Type:	Type:	Type:	Type:	Type:
		U/M:	U/M:	U/M:	U/M:	U/M:	U/M:	U/M:
Energy Usages - Page Totals:								

**Energy Usages -
Found Set Totals:**

Pollution Prevention Opportunity Assessment

Energy Usage Summary

Help

The energy summary is a tabulation of the total quantity of energy utilized by the activity and related equipment. The purpose of Worksheet 4E is to identify energy resource usage types and document the usage level by equipment.

1. **Revision No.:** List the revision number of the PPOA.
2. **Revision Date:** List the most recent revision date for the PPOA worksheet.
3. **PPOA Title/PPOA ID Code(s):** List the PPOA Title or ID Code(s) given on Worksheet 1.
4. **Page ____ of ____:** Indicate the page number for this worksheet and the number of pages for this worksheet.
5. **From/To:** Report the dates (month and year) for the time period covered. An annual period is suggested for purposes of averaging and documenting performance toward facility goals.
6. **Equipment:** List the equipment name in the column heading under "Equipment". In the remainder of the row, for the energy resource specified in the Energy Resource column, enter the amount of the resource that is attributable to the listed piece of equipment.
7. **Estimated Efficiency:** For the listed Equipment described in the far left column enter the estimated efficiency in percentage, if known, or by indicating, high, medium or low.
8. **Energy Resource:** List some of the major energy resources and types. Additional spaces are provided for more activity specific needs. The "Type" blank should be filled in with the specific energy usage type. Examples of some energy resources and some specific types are as follows: (Use the nomenclature - "standard" when unable to determine the specific type.)

Energy Resource: Electricity

Types - coal generated, gas generated, hydroelectric, nuclear (fission), or geothermal (steam)

Energy Resource: Fossil Fuels

Types - gasoline, butane, propane, coal, fuel oils, diesel fuel, or natural gas

Energy Resource: Water

Types - electricity, natural gas, propane, or coal

Energy Resources: Gas

Types - butane, propane, generated methane, or natural gas

Pollution Prevention Opportunity Assessment

Revision No.: _____

Revision Date: _____

Page: 1

Level III

Material Cost

PPOA ID Code: _____

PPOA Title: _____

INPUT MATERIAL COSTS

Material Name	Control No.	Cost /	Total Cost

OUTPUT PROJECT COSTS

Page Subtotal: _____

Output Stream Catagory	Output Stream Name	Output Stream Quantity UNITS:	Average Cost /	Total Cost
HZ1	Hazard Solid			
HZ2	Hazard Liquid			
HZ3	Hazard Air			
NH1	Nonhazard Solid			
NH2	Nonhazard Liquid			
NH3	Nonhazard Air			
OT1	Other Solid			
OT2	Other Liquid			
OT3	Other Air			
RC1	Recycle Solid			
RC2	Recycle Liquid			
RC3	Recycle Air			

Page Subtotal: _____

Page Total - Input Material
and Output/Disposal Cost:

Pollution Prevention Opportunity Assessment

Level III**Material Cost**

Help

Worksheet 5 details the cost of the PPOA input materials (use the quantities from Worksheet 4) and the cost of disposal for these materials. The material cost may be obtained from Purchasing or Stores. The cost of disposal may be obtained from Waste Management or Accounting. Annual Cost is calculated from the amount of material placed in the process or from the amount of disposed material, multiplied by the cost per unit.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **Page_____of_____:** Indicate the number of this page and the total number of pages for this worksheet.
4. **PPOA Title or PPOA ID Code(s):** List the PPOA Title or PPOA ID Code(s) given on Worksheet 1.
5. **Input Material Costs:** List the material, stock number (if applicable), cost per unit (\$/lb., \$/gal, etc.), and the annual cost for this activity.
6. **Output Project Costs:** List the material or output stream, waste stream category, (e.g., hazardous liquid), stock number if applicable, the cost per unit (\$/lb., \$/gal, etc.) , and annual cost.
7. **Totals / Subtotals:** Record the sum of the annual costs for the materials or waste streams listed. There will be a total for both the input material cost and waste disposal cost.

Pollution Prevention Opportunity Assessment

Revision No.: _____

Revision Date: _____

Page: 1 A

Level III

Material Cost

PPOA ID Code: _____

PPOA Title: _____

INPUT MATERIAL COST

Material Name	Control No.	Cost /	Total Cost

OUTPUT / DISPOSAL MATERIAL COST

Page Subtotal: _____

Output Stream Category	Output Stream Name	Output Stream Quantity UNITS:	Average Cost /	Total Cost
NH1	Non-Hazard Solid			
NH2	Non-Hazard Liquid			
NH3	Non-Hazard Air			
HN1	Hazardous - non RCRA Solid			
HN2	Hazardous - non RCRA Liquid			
HN3	Hazardous - non RCRA Air			
HR1	Hazardous - RCRA Solid			
HR2	Hazardous - RCRA Liquid			
HR3	Hazardous - RCRA Air			
TS1	Toxic, TSCA Solid			
TS2	Toxic, TSCA Liquid			
TS3	Toxic, TSCA Air			
OT1	Other Solid			
OT2	Other Liquid			
OT3	Other Air			
RC1	Recycle Solid			
RC2	Recycle Liquid			
RC3	Recycle Air			
RU1	Reuse Solid			
RU2	Reuse Liquid			
RU3	Reuse Air			

Page Subtotal: _____

Page Total - Input Material
and Output/Disposal Cost: _____Found Set Total - Input Material and
Output/Disposal Material Cost: _____

Pollution Prevention Opportunity Assessment

Level III

Material Cost

Help

Worksheet 5 details the cost of the PPOA input materials (use the quantities from Worksheet 4) and the cost of disposal for these materials. The material cost may be obtained from Purchasing or Stores. The cost of disposal may be obtained from Waste Management or Accounting. Annual Cost is calculated from the amount of material placed in the process or from the amount of disposed material, multiplied by the cost per unit.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **Page ____ of ____:** Indicate the number of this page and the total number of pages for this worksheet.
4. **PPOA Title or PPOA ID Code(s):** List the PPOA Title or PPOA ID Code(s) given on Worksheet 1.
5. **Input Material Cost:** List the material, stock number (if applicable), cost per unit (\$/lb., \$/gal, etc.), and the annual cost for this activity.
6. **Waste Disposal Cost:** List the material or waste stream, waste stream category, (e.g., hazardous liquid), stock number if applicable, the cost per unit (\$/lb., \$/gal, etc.) , and annual cost.
7. **Totals / Subtotals:** Record the sum of the annual costs for the materials or waste streams listed. There will be a total for both the input material cost and waste disposal cost.

Pollution Prevention Opportunity Assessment

Level III

Material Cost

Help

Worksheet 5 details the cost of the PPOA input materials (use the quantities from Worksheet 4) and the cost of disposal for these materials. The material cost may be obtained from Purchasing or Stores. The cost of disposal may be obtained from Waste Management or Accounting. Annual Cost is calculated from the amount of material placed in the process or from the amount of disposed material, multiplied by the cost per unit.

1. **Revision No.:** List the revision number for this worksheet.
2. **Revision Date:** List the most recent revision date for this worksheet.
3. **Page ____ of ____:** Indicate the number of this page and the total number of pages for this worksheet.
4. **PPOA Title or PPOA ID Code(s):** List the PPOA Title or PPOA ID Code(s) given on Worksheet 1.
5. **Input Material Cost:** List the material, stock number (if applicable), cost per unit (\$/lb., \$/gal, etc.), and the annual cost for this activity.
6. **Waste Disposal Cost:** List the material or waste stream, waste stream category, (e.g., hazardous liquid), stock number if applicable, the cost per unit (\$/lb., \$/gal, etc.) , and annual cost.
7. **Totals / Subtotals:** Record the sum of the annual costs for the materials or waste streams listed. There will be a total for both the input material cost and waste disposal cost.

Level III

Pollution Prevention Opportunity Assessment

Energy Cost

Revision No.: _____

Revision Date: _____

Page: 1

PPOA ID Code:

PPOA Title:

Input Cost:

Energy Resource	Energy Resource Type	U/M	Energy Usage Totals	Cost per Unit	Annual Cost
Energy Costs - Page Totals:					

Found Set Total - Energy Costs:

Pollution Prevention Opportunity Assessment Energy Cost Help

Worksheet 5E details the cost of the PPOA energy resources (use the quantities from Worksheet 4E) for equipment identified as utilizing energy resources by the PPOA activity. The "Cost per Unit" may be obtained from the location's plant/facility organization or from the utility companies supplying the energy resource. The "Annual Cost" is calculated by multiplying the "Energy Usage Total" by the "Cost per Unit".

To move from field to field, either use mouse and click desired field, or use TAB key.

- 1. Revision No.:** List the revision number for this worksheet. {Original issue = 0.}
- 2. Revision Date:** Automatically updated any time a change is made to a record.
- 3. PPOA Title:** List the PPOA title selected by the team.
- 4. PPOA ID Code(s):** List the PPOA ID Code(s) selected by the team.
- 5. Energy Resource:** List some of the major energy resources and types. Additional spaces are provided for more activity specific needs. The "Type" blank should be filled in with the specific energy usage type. Examples of some energy resources and some specific types are as follows: (Use the nomenclature - "standard" when unable to determine the specific type.)
 - Energy Resource: Electricity**
Types - coal generated, gas generated, hydroelectric, nuclear (fission), or geothermal (steam)
 - Energy Resource: Fossil Fuels**
Types - gasoline, butane, propane, coal, fuel oils, diesel fuel, or natural gas
 - Energy Resource: Water**
Types - electricity, natural gas, propane, or coal
 - Energy Resources: Gas**
Types - butane, propane, generated methane, or natural gas
- 6. U/M:** The unit of measure used by the location's plant/facility organization or by the energy resource utility company.
- 7. Cost per Unit:** The cost per unit of measure as quoted by the location's plant/facility organization or by the utility company(ies).
- 8. Annual Cost:** The result of multiplying the "Energy Usage Total" column by the "Cost per Unit".

Activity Lists

MAJOR ACTIVITY TYPE

Environmental Restoration
Laboratory
Maintenance
Manufacturing
Nuclear Facility Operations
Office
Service
Waste Management

SPECIFIC ACTIVITY TYPE

Abatement
Activation
Baking
Burn-In
Cafeteria
Calibration
Caulking
Cleaning
Coating
Concrete Scabbling
Construction
Curing
Cushioning
Deactivation
Decommissioning
Decontamination
Demineralization
Demolition
Depotting
Dismantlement
Disposal
Disposition
Drilling
Encapsulation
Energy Generation
Excavations

SPECIFIC ACTIVITY TYPE (con't)

Field Analysis
Fire Protection
Heat Treating
Inspection
Joining
Labeling
Laboratory, Biological
Laboratory, Chemical
Laboratory, Electronics
Laboratory, Environmental
Laboratory, Mechanics
Laboratory, Medical
Laboratory, Metallurgy
Laboratory, Organic
Laboratory, Physics
Laboratory, Radiological
Laundry Operations
Machining
Maintenance, Building
Maintenance, Equipment
Maintenance, Grounds
Maintenance, Utilities
Maintenance, Vehicle
Medical
Metrology
Mixing
Molding
Monitoring
Nuclear, Accelerator
Nuclear, Beam Alignment
Nuclear, Critical Experiments
Nuclear, Hot Cell Operations
Nuclear, Material Processing
Nuclear, Neutron Diffraction
Nuclear, Neutron Scattering
Nuclear, Reactor Operations

SPECIFIC ACTIVITY TYPE (con't)

Nuclear, Shielding Operations
Nuclear, Target Production/Maintenance
Packaging
Painting
Photographic Services
Plating & Surface Finishing
Printing
Purchasing
Radiological Surveys
Recovery
Recycling
Relamping
Remediation
Removal
Repair
Robotics
Salvage
Sampling & Characterization
Sand Blasting
Security
Segmenting
Shipping
Shut Down
Soil Washing
Soldering
Spill Cleanup
Staking
Surveillance & Maintenance
Transportation
Treating Leather
Waste Management, Disposal
Waste Management, Handling
Waste Management, Storage
Waste Management, Treatment
Welding

Waste Stream Lists

MAJOR WASTE TYPE

Hazardous Waste
High Level Waste
Low Level Mixed Waste
Low Level Waste
Sanitary Waste
Transuranic Mixed Waste
Transuranic Waste

SPECIFIC WASTE TYPE

Abrasive
Acid
Aerosol Cans
Air Emissions
Antifreeze
Aqueous
Asbestos
Asphalt
Batteries
Cafeteria Refuse
Cardboard
Caustic
Chemicals
Circuit Boards
Cleaning Supplies
Compressed Gas Cylinders
Concrete
Construction Debris
Containers
Core Samples
Cyanide
Drilling Fluids & Muds
Equipment
Explosives
Fertilizer
Filters
Fluorescent Lamps
Glass
Glove Bags
Grease
Inorganic Solid
Lab Packs
Laundry

SPECIFIC WASTE TYPE (con't)

Lead
Leather
Medical, Infectious
Mercury
Metal Debris
Metal, Precious
Office Trash
Oil
Oxidizers
Packaging Materials
Paint
Paper
Personal Protective Equipment
Petroleum
Plastic
Plutonium
Polychlorinated Biphenyls, PCBs
Polymers
Rubber
Sanitary Sewer
Sludge
Soil
Solid Waste
Solvents
Textiles
Toner Cartridges
Trees, Limbs & Brush
Uranium
Wastewater
Wood