

---

---

---

---

---

---

**Pollution Prevention Plan  
for the  
Y-12 Analytical Chemistry Organization  
Off-Site Union Valley Facility**

---

---

---

---

---

---

**March 2010**

**Prepared for:**

**Babcock and Wilcox Technical Services Y-12, L.L.C.,  
and the  
National Nuclear Security Administration  
U.S. Department of Energy  
Oak Ridge, Tennessee**

**Prepared by:**

**Y-12 Staff, Analytical Chemistry Staff,  
Strata-G, LLC through White Oak Strategies Subcontract**

---

This Document is Printed on Recycled Paper Product

**Pollution Prevention Plan  
for the  
Y-12 Analytical Chemistry Organization  
Off-Site Union Valley Facility**

**March 2010**

**Prepared for:**

**Oak Ridge Y-12 National Security Complex  
Oak Ridge, Tennessee 37831  
managed by  
Babcock and Wilcox Technical Services Y-12, L.L.C.  
for the  
National Nuclear Security Administration  
U.S. Department of Energy  
Under Contract No. DE-AC05-00OR22800**

**Prepared by:  
Y-12 Staff, Analytical Chemistry Staff,  
Strata-G, LLC through White Oak Strategies Subcontract**

**COPYRIGHT NOTICE**

This document has been authored by a subcontractor of the U.S. Government under contract DE-AC05-00OR-22800. Accordingly, the U.S. Government retains a paid-up, nonexclusive, irrevocable, worldwide license to publish or reproduce the published form of this contribution, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, or allow others to do so, for the U.S. Government purposes.

**Disclaimer**

This work of authorship and those incorporated herein were prepared by Contractor as accounts of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Contractor, 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 name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency or Contractor thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency or Contractor thereof.

---

This Document is Printed on Recycled Paper Product

## Table of Contents

List of Tables .....	ii
List of Appendices .....	ii
List of Acronyms .....	iii
1.0 Scope and Objectives of Plan .....	1
2.0 Policy .....	2
2.1 Policy Statement .....	2
2.2 Statement of Management Commitment .....	2
3.0 Organization and Responsibilities, Description of Pollution Prevention Organization .....	3
4.0 Strategy and Objectives .....	4
4.1 Strategy .....	4
4.2 Program Objectives.....	4
5.0 Hazardous Waste Reduction Goals.....	5
5.1 Goals Rationale.....	5
5.2 Baseline Year, Rates, and SPUs .....	7
6.0 Schedule of Implementation Activities.....	8
7.0 Hazardous Waste Reduction Goals.....	11
7.1 Cost Accounting .....	11
7.2 Tracking of Hazardous Waste Generation and Disposition.....	11
7.3 Program Activity Tracking .....	12
8.0 Employee Involvement, Participation, and Training .....	13
8.1 Pollution Prevention Awareness .....	13
8.2 Incentive Awards and Recognition.....	14
8.3 Training.....	14
8.3.1 Training Goals .....	14
8.3.2 Employee Orientation and Refresher Training.....	14
8.3.3 Specialized Training Program .....	14
9.0 References.....	15

**List of Tables**

<b>Table</b>	<b>Title</b>	<b>Follows Page</b>
1	Hazardous Waste Generation Rates and Reduction Goals for Analytical Chemistry Off-Site Union Valley Facility.....	5
2	Hazardous Waste Reduction Goal Impediments and Rationale for Analytical Chemistry Off-Site Union Valley Facility.....	5

**List of Appendices**

<b>Appendix</b>	<b>Title</b>
A	Y-12 Pollution Prevention Policy

## List of Acronyms

ACO	Analytical Chemistry Organization
Advocate	Pollution Prevention Advocate
B&W Y-12	Babcock and Wilcox Technical Services Y-12, L.L.C.
CSS	Common Site Support
CWA	<i>Clean Water Act</i>
DOE	U.S. Department of Energy
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
FTSA	Flow-Through Scintillation Analysis
FY	fiscal year
GET	General Employee Training
HMIS	Hazardous Materials Inventory System
HPLC	High-Performance Liquid Chromatography
NNSA	National Nuclear Security Administration
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
P2IMS	Pollution Prevention Information Management System
PCB	Polychlorinated Biphenyls
PPC	Pollution Prevention Coordinator
PPOA	pollution prevention opportunity/operational assessment
Program	Pollution Prevention Program
RCRA	<i>Resource Conservation and Recovery Act</i>
SAP	Systems, Applications, and Products in Data Processing
SPE	Solid Phase Extraction
SPU	standard production unit
TDEC	Tennessee Department of Environment and Conservation
THWRA	<i>Tennessee Hazardous Waste Reduction Act</i>
UMC	Unneeded Materials and Chemicals
Union Valley Facility	Y-12 Analytical Chemistry Organization Off-Site Union Valley Facility
Y-12	Y-12 National Security Complex
Y-12 Program Plan	<i>Y-12 Pollution Prevention Program Plan</i>
YSO	Y-12 Site Office

## 1.0 Scope and Objectives of Plan

The Y-12 Analytical Chemistry Organization (ACO) Off-Site Union Valley Facility (Union Valley Facility) is managed by Babcock and Wilcox Technical Services Y-12, L.L.C. (B&W Y-12) through the Y-12 National Security Complex organization. Accordingly, the Y-12 Pollution Prevention Program (Program) encompasses the operations conducted at the Union Valley Facility. The Y-12 Program is designed to fully comply with state, federal, and U.S. Department of Energy (DOE) requirements concerning waste minimization/pollution prevention as documented in the *Y-12 Pollution Prevention Program Plan* (Y-12 Program Plan). The Program is formulated to reduce the generation and toxicity of all Y-12 wastes in all media, including those wastes generated by the Union Valley Facility operations. All regulatory and DOE requirements are met by the Y-12 Program Plan.

This Plan, in contrast, specifically addresses the requirements of the *Tennessee Hazardous Waste Reduction Act* (THWRA) for large quantity generators of hazardous waste. This plan documents the continuing expansion of the Y-12 Program, specifically the Y-12 ACO Union Valley Facility objectives and strategies for conserving resources and reducing the quantity and toxicity of wastes and other environmental releases. The plan specifies activities and methods that have been and continue to be planned and employed to reduce the quantity and toxicity of wastes generated at the site. This plan covers the requirements for pollution prevention but not treatment.

More detailed objectives are included in Section 4.2.

## **2.0 Policy**

### **2.1 *Policy Statement***

In 1986, Y-12 management issued a written policy that informed all Y-12 employees of the establishment of the Program and stated the waste minimization policy for Y-12. This policy statement includes all operations conducted at the Y-12 ACO Union Valley Facility as well as the general Y-12 site. This policy has since been slightly revised and integrated into the Environment, Safety, and Health Policy to meet the needs of Y-12. The revised, signed policy is appended in this plan as Appendix A. The National Nuclear Security Administration (NNSA) Y-12 Site Office (YSO) and DOE-Oak Ridge Operations (ORO) Office both support Y-12 and its policy and program activities. This policy supported by Y-12, YSO, and DOE-ORO management ensures the implementation of a comprehensive, effective Y-12 Program. The policy also requires compliance and implementation of all requirements, including all pertinent laws, regulations, Executive Orders, DOE Orders, and DOE guidance and requirements.

### **2.2 *Statement of Management Commitment***

The Y-12 President and Y-12 management are fully committed to minimizing the generation and toxicity of waste by giving preference to source reduction, material substitution, and environmentally sound recycling over treatment, control, and disposal or release of such wastes. When pollution prevention techniques cannot be applied to specific wastes, waste treatment techniques that are not included in pollution prevention will be favored over disposal. These techniques include treatment to reduce volume, toxicity, mobility, or a combination of these. Management continues to take appropriate action to provide adequate personnel, budget, training, and materials to ensure that the objectives of the Program are met.

### **3.0 Organization and Responsibilities, Description of Pollution Prevention Organization**

Y-12 management and technical staff, in support of the NNSA YSO and the DOE-ORO Office, administer and implement the Y-12 Program, including providing support and generating employee awareness. The Pollution Prevention Coordinator (PPC) has been appointed by Y-12 management to manage the Program. The Program's purpose is to unite pollution prevention activities into one program and to integrate these activities into all Y-12 operations including those conducted at the Y-12 ACO Union Valley Facility, as well as to support technology development programs aimed at minimizing multimedia waste generation.

The Y-12 Program is responsible for requesting funding for the overall Y-12 program and complex-wide activities, while the waste-generating line organizations, such as ACO, are responsible for requesting organization-specific implementation funding. The Y-12 Program ultimately reports to the Y-12 President and General Manager. DOE has an established organization to support pollution prevention programs at DOE facilities. Specifically, the YSO functions as the programmatic oversight for the Program with the PPC managing the associated program activities and funding. DOE-Headquarters Office of Health, Safety, and Security (HSS), Office of Nuclear Safety and Environment provide independent oversight of the Program and are responsible for DOE pollution prevention policy development, guidance, and reporting activities. The Y-12 Off-Site Union Valley Facility is managed by ACO and is directly matrixed to the Y-12 Program as an operating line organization.

The Program organizational structure is designed to maximize the collection, dissemination, and flow of pollution prevention information and to provide waste-generating line organizations with managerial responsibility and authority for the development, design, construction, and implementation of pollution prevention projects. The Y-12 Program is responsible for requesting funding for the overall Y-12 program and Y-12-wide activities, while the waste-generating line organizations are responsible for requesting organization-specific implementation funding.

The responsibilities of specific Y-12 personnel are delineated in the Y-12 procedure numbered Y77-311 entitled *Y-12 Pollution Prevention Program Implementation Instruction*.

Additionally, the Y-12 Pollution Prevention Program has a Pollution Prevention Advocate (Advocate) from each Y-12 organization that is assigned to represent and support organization managers and serve as the pollution prevention technology transfer point within their organization. This responsibility includes providing information about the wastes generated within their organization for reporting purposes, ensuring that new projects or changes to existing facilities have considered pollution prevention in design and construction, and submitting ideas or problems for pollution prevention efforts originating within their organization to the Y-12 Program.

Finally, all Union Valley Facility employees generate waste and are, therefore, waste generators. Y-12 ACO Union Valley Facility waste generators are responsible for properly managing their waste according to their training and procedural requirements to minimize the generation of waste from spills or inadvertent mixing of different waste streams. Therefore, the integration of pollution prevention into the waste generator's activities is vital to the success of the Y-12 Program.

## **4.0 Strategy and Objectives**

### **4.1 Strategy**

The Y-12 Program continues to support the implementation of systems to provide accurate and current waste stream-specific information including at the ACO Union Valley Facility. This information provides baseline information to support the identification of the true source of waste generation, the implementation of specific pollution prevention techniques and technologies, and the quantitative monitoring of the progress of these activities. The Program continues to develop methods for collecting information, evaluating sustainable options, and identifying cost-effective pollution prevention techniques. The essential features of the strategy are to maintain an organization that comprises management and staff representatives who continue to develop and administer the Program; continue to identify materials, wastes, discharges, and emissions to be targeted for reduction; continue to develop methods for tracking performance and progress of the Program; and continue to foster and encourage the development of pollution prevention technologies, the awareness of environmental problems, and a sustainable philosophy that includes pollution prevention.

### **4.2 Program Objectives**

The overall objectives of the Program and, therefore, for the Y-12 ACO Union Valley Facility are to:

- Foster a Y-12-wide philosophy to implement sustainable measures, conserve resources, reduce the costs of production operations, and create a minimum of waste and pollution in achieving Y-12-strategic objectives through developing and implementing techniques, technologies, and programs that minimize waste and pollution generation.
- Promote environmentally-preferable purchasing and the use of nonhazardous materials in Y-12 operations to minimize the potential risks to human health and the environment.
- Reduce or eliminate the generation of waste materials through input substitution, product reformulation, process modification, improved housekeeping, closed-loop recycling, and external recycling to achieve minimal adverse effects on the air, water, and land when technically and economically feasible and cost effective.
- Comply with federal and state regulations and DOE requirements for pollution prevention.

Additionally, Environmental Management System (EMS)-driven objectives and targets are established each year for Y-12 as a whole and for each Y-12 organization.

## 5.0 Hazardous Waste Reduction Goals

### 5.1 Goals Rationale

While compiling data needed for completing hazardous waste reporting requirements for calendar year 1998, ACO originally examined its allocation of wastes within its Union Valley Facility hazardous waste streams. Per the THWRA, the Y-12 ACO Union Valley Facility established quantitative performance goals for each hazardous waste stream generated as listed in Table 1. These goals are consistent with the qualitative goals of the Y-12 Program and have been revised periodically. These revisions are based on the results of implemented projects recommended in pollution prevention opportunity/operational assessments (PPOAs) and on changes in operations. The baseline year for these goals, the rationale for establishing the waste stream-specific goals, and the impediments to the goals are also summarized in this section. Chapter 6.0 provides additional information on impediments. If additional regulatory goals are established in the future, the goals will be evaluated and adjusted as applicable to ensure compliance.

Numeric goals have been established by Y-12 and the Y-12 ACO Union Valley Facility for hazardous wastes as defined under the *Resource Conservation and Recovery Act (RCRA)* and covered by the THWRA. These goals and impediments to reaching the goals are listed in Tables 1 and 2. The calculation methodology and details associated with these goals are outlined in the remainder of this section.

The goals listed in Table 1 are basically a waste stream-specific percentage-based reduction goal by weight. Once a waste stream is generated at the Union Valley Facility, the first 2 years of waste generation data will be examined, and a baseline and base year designation will be established. The initial goal or target year will be 4 years after the first year of generation and will be updated periodically. For instance, if 2009 is the first year of generation, then 2013 will be designated as the goal year and updated periodically. This goal methodology has been applied to all current and future Y-12 ACO Union Valley Facility hazardous waste streams.

The Y-12 ACO Union Valley Facility rationale for the waste stream-specific percent-based reduction goals assigned to each waste stream is based on ACO's completed Level I PPOA, completed and scheduled pollution prevention projects and activities, and past experience in reducing hazardous waste from similar operations. Impediments to pollution prevention are listed in Table 2.

The goal ratios shown in Table 1 are based on a standard production unit (SPU) that has been established for each waste stream. The waste stream-specific SPUs have been obtained from facility records.

As shown in the following equation, when required, the actual ratio for a given year is calculated by dividing the total amount generated during that year by the SPU and then multiplying this value by a range factor to adjust this value to within the Tennessee Department of Environment and Conservation (TDEC) guideline.

**Table 1.**  
**Hazardous Waste Generation Rates and Reduction Goals for**  
**Analytical Chemistry Off-Site Union Valley Facility**  
 (Page 1 of 1)

Hazardous Waste Name	WS No.	Baseline Year	Baseline SPU	SPU Units	Baseline Ratio	Target Year	CY-96 Generation (kg)	CY-97 Generation (kg)	CY-98 Generation (kg)	CY-99 Generation (kg)	CY-00 Generation (kg)	CY-01 Generation (kg)	CY-02 Generation (kg)	CY-03 Generation (kg)	CY-04 Generation (kg)	CY-05 Generation (kg)	CY-06 Generation (kg)	CY-07 Generation (kg)	CY-08 Generation (kg)	CY-09 Generation (kg)
Miscellaneous Organic Ignitable Waste	2	1998	45,762	No. of Analyses	0.425	2012	N/A	N/A	194.5	0.0	496.0	224.0	121.0	64.0	13.0	0.0	88.0	21.0	0.0	101.0
Miscellaneous Acids, Corrosive Waste	3	1997	34,913	No. of Analyses	28.733	2010	8,719.0	10,031.4	10,575.8	8,120.2	9,343.7	7,276.5	5,923.2	7,364.0	9,741.0	5,939.4	5,619.6	5,812.3	5,030.2	5,017.8
PCB Acids	24	1998	45,762	No. of Analyses	1.941	2011	N/A	327.0	888.3	955.4	0.0	60.0	268.3	21.6	19.0	22.9	16.7	245.1	14.0	174.1
PCB Waste Organics	26	1998	45,762	No. of Analyses	1.270	2011	N/A	44.0	581.1	739.2	470.8	1,117.0	1,003.8	989.2	820.0	593.0	442.0	469.0	330.0	326.0
Excess Chemicals	27	1998	4	No. of Lab Groups	178.250	2011	N/A	414.8	713.0	283.0	159.0	102.8	108.0	288.0	365.0	227.0	0.0	0.0	72.0	65.0

Hazardous Waste Name	WS No.	CY-09 SPU	CY-09 Actual Ratio	Targeted Percent Reduction	Goal Generation (kg)	Goal Ratio	Range Factor	Actual Ratio Less Than Goal Ratio (Y/N)
Miscellaneous Organic Ignitable Waste	2	23,231	0.435	10%	175.1	0.383	100	N
Miscellaneous Acids, Corrosive Waste	3	23,231	21,600	10%	9,028.3	25.859	100	Y
PCB Acids	24	23,231	0.749	10%	799.5	1.747	100	Y
PCB Waste Organics	26	23,231	1,403	10%	523.0	1.143	100	N
Excess Chemicals	27	3	21,667	50%	356.5	89.125	1	Y

Legend: CY - calendar year  
 kg - kilogram  
 N/A - not applicable  
 No. - Number  
 PCB - Polychlorinated biphenyls  
 SPU - standard production unit  
 WP - Waste Process  
 WS No. - Waste Stream Number

Note: (1) The goal ratios for all waste streams are established using the first 24 months of generation data for each waste stream, per the Tennessee Hazardous Waste Reduction Act requirements.  
 (2) These goals will be periodically evaluated and updated as appropriate.  
 (3) The 3 lab groups are defined as: Bioassay, Environmental Radiochemistry, and Organic Analysis. These groupings are not impacted by organizational changes. The number of lab groups would only change if one or more is removed from the Union Valley Facility or additional groups are added to the facility. One grouping was eliminated during 2007 at this facility. So the SPU for Waste Stream 27 is now 3 rather than 4.  
 (4) In 1999, waste stream number 29 was combined with waste stream number 3. As of December 31, 1999, waste stream 28 was closed because this material is used as a substitute treatment chemical, and waste stream 30 was closed and classified as scrap metal for recycle. In 2004, waste stream numbers 20 and 31 were closed. Batteries are now recycled, and mercury thermometer-related waste was eliminated. In CY 2006, waste stream number 32 was closed through implementation of a pollution prevention project.

**Table 2.**  
**Hazardous Waste Reduction Goal Impediments and Rationale for**  
**Analytical Chemistry Off-Site Union Valley Facility**  
 (Page 1 of 2)

Hazardous Waste Name	WS No.	Impediments	Comments Including Additional Information Concerning Impediments and Rationale as Needed
Miscellaneous Organic Ignitable Waste	2	b. Technical feasibility c. Economic practicality f. Implementation Experience/Previous Efforts	Waste reduction opportunities will continue to be pursued for this waste stream as resources allow. Implemented P2 includes (1) material substitution of scintillation cocktail fluid, (2) sequential separation of neptunium and thorium by chromatographic resin, (3) solvent dispensing stations, and (4) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. Planned pollution prevention projects include: as new solvents are added to laboratory operations, they will be evaluated as potential candidates for use in solvent dispensing stations. Impediments include identifying cost-effective P2 options that can be implemented while continuing to meet all analytical and quality requirements.
Miscellaneous Acids, Corrosive Waste	3	b. Technical feasibility c. Economic practicality f. Implementation Experience/Previous Efforts	In CY 2009, the goal ratio for this waste stream has been satisfied. Implemented P2 includes (1) material substitution of scintillation cocktail fluid; (2) column waste reduction using automated solid phase extraction (SPE) system; (3) radiochemical determination of uranium, plutonium, americium, and curium; (4) sequential separation of neptunium and thorium by chromatographic resin; (5) use of high-performance liquid chromatography (HPLC); (6) flow-through scintillation analysis (FTSA) to reduce acid waste and analysis time; (7) material substitution of nitric acid for cleaning glassware with a superior soap-based product; (8) replacement of ion exchange column with resin system, and (9) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. Impediments include identifying cost-effective P2 options that can be implemented while continuing to meet all analytical and quality requirements.
PCB Acids	24	b. Technical feasibility c. Economic practicality f. Implementation Experience/Previous Efforts	In CY 2009, the goal ratio for this waste stream has been satisfied. Implemented P2 includes (1) material substitution of scintillation cocktail fluid; (2) column waste reduction using automated SPE system; (3) radiochemical determination of uranium, plutonium, americium, and curium; (4) sequential separation of neptunium and thorium by chromatographic resin; (5) establishment of a PCB-concentration-related agreement with the EPA; (6) use of HPLC and FTSA to reduce acid waste and analysis time; and (7) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. The agreement with the EPA was finalized in February 2000 and allows wastes generated within this waste stream to be managed based on the concentration rather than based on the source. Impediments include identifying cost-effective P2 options that can be implemented while continuing to meet all analytical and quality requirements.
PCB Waste Organics	26	b. Technical feasibility c. Economic practicality f. Implementation Experience/Previous Efforts	Waste reduction opportunities will continue to be pursued for this waste stream as resources allow. Implemented P2 includes (1) material substitution of scintillation cocktail fluid, (2) sequential separation of neptunium and thorium by chromatographic resin, (3) implementation of solvent dispensing stations, (4) establishment of a PCB-concentration-related agreement with the EPA, and (5) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. Planned pollution prevention projects include: as new solvents are added to laboratory operations, they will be evaluated as potential candidates for use in solvent dispensing stations. Impediments include identifying cost-effective P2 options that can be implemented while continuing to meet all analytical and quality requirements.

**Table 2.**  
**Hazardous Waste Reduction Goal Impediments and Rationale for**  
**Analytical Chemistry Off-Site Union Valley Facility**  
 (Page 2 of 2)

Hazardous Waste Name	WS No.	Impediments	Comments Including Additional Information Concerning Impediments and Rationale as Needed
Excess Chemicals	27	b. Technical feasibility c. Economic practicality f. Implementation Experience/Previous Efforts	In CY 2009, the goal ratio for this waste stream has been satisfied. This waste stream is generated because this material was deemed to be excess chemicals. Since 1999, this facility examined and implemented enhanced material management techniques, such as integrating pollution prevention into training, ordering smaller containers and smaller quantities of laboratory materials, expanded use of the Hazardous Materials Management Inventory System (HMIS), implemented solvent dispensing stations, utilized the Unneeded Materials and Chemicals (UMC) process for identified UMCs at this lab, and used the Y-12 Product Exchange. Planned pollution prevention projects include: as new solvents are added to laboratory operations, they will be evaluated as potential candidates for use in solvent dispensing stations. Impediments include varying requests for analyses, which can impact material management, and material transportation related to material transfer.

- Legend: CY - calendar year  
 EPA - U.S. Environmental Protection Agency  
 FTSA - Flow - Through Scintillation Analysis  
 HMIS - Hazardous Materials Inventory System  
 HPLC - High-Performance Liquid Chromatography  
 P2 - pollution prevention  
 PCB - Polychlorinated Biphenyls  
 SPE - Solid Phase Extraction  
 UMC - Unneeded Materials and Chemicals  
 WS No. - Waste Stream Number

- (1) Rationale for establishing goal ratios for these waste streams was based on an examination of implemented P2 options, planned P2 activities, and identified impediments. Once this examination was complete and the resulting potential for further reductions was evaluated, a goal was then set for each waste stream.
- (2) In 1999, waste stream number 29 was combined with waste stream number 3. As of December 31, 1999, waste stream 28 was closed because this material is used as a substitute treatment chemical, and waste stream 30 was closed and classified as scrap metal for recycle. In 2004, waste stream numbers 20 and 31 were closed. Batteries are now recycled, and mercury thermometer-related waste was eliminated. In CY 2006, waste stream number 32 was closed through implementation of a pollution prevention project.

$$\text{Actual Ratio} = \frac{\text{Generation Amount}_{(\text{year}), \text{ kg}} * \text{Range Factor}}{\text{SPU}_{(\text{year})}}$$

where  $\text{Generation Amount}_{(\text{year})}$  = Stream generation amount in current reporting year in kilograms (kg)

$\text{SPU}_{(\text{year})}$  = Standard Production Unit in current reporting year

Range Factor = Multiplication factor required to adjust ratio for TDEC-specified range of 0.0001 to 1000. The TDEC has since reset the lower limit to 0.001. Range Factor of 1 was used for waste streams with an SPU based on the number of laboratory groups. A Range Factor of 100 was used for waste streams with an SPU based on the number of analyses performed during the year. Two different range factors were used because all baseline and goal ratios are required to be within the TDEC-specified range.

The goal ratio is determined by taking the anticipated new generation rate for the goal year and dividing it by the SPU and adjusting it with the same range factor to ensure that the value is within TDEC guidelines. The goal ratios were calculated as follows:

$$\text{Goal Ratio} = \frac{\text{Baseline Generation Amount}_{(\text{year}), \text{ kg}} * [1 - (\%R/100)] * \text{Range Factor}}{\text{SPU}_{(\text{year})}}$$

where  $\text{Baseline Generation Amount}_{(\text{year})}$  = Stream generation amount in baseline year

$\%R$  = Reduction goal percentage

$1 - (\%R/100)$  = Anticipated portion of waste stream remaining

$\text{SPU}_{(\text{year})}$  = Standard Production Unit in baseline year

Range Factor = Multiplication factor required to adjust ratio for TDEC-specified range of 0.0001 to 1000. The TDEC has since reset the lower limit to 0.001.

## 5.2 Baseline Year, Rates, and SPUs

Since this plan was established, each year the data in Tables 1 and 2 have been revised to reflect the current calendar year waste generation, ratio, range factors, SPU, and status data and related impediment information for each waste stream. The goal year value was also updated for all active waste streams by adding 10 years to the original goal year. No new waste streams were added from 2000 through 2009. If new hazardous waste streams are generated in subsequent years, the baseline year, SPU, goal ratio, and goal year will be established at that time. Additionally, this information will be included in the progress report and in an update of this plan at the appropriate time.

## 6.0 Schedule of Implementation Activities

Information regarding previously implemented reduction activities is included as follows for each hazardous waste stream as well as plans and schedules for future implementation activities and impediments for waste stream reduction.

Waste Stream 2 - Miscellaneous Organic Ignitable Waste: This waste stream is generated from sample preparation and analysis including samples and analyses for bioassay, environmental compliance, and development. The ACO Union Valley Facility has implemented four pollution prevention projects that have reduced this waste stream: (1) material substitution of scintillation cocktail fluid, (2) sequential separation of neptunium and thorium by chromatographic resin, (3) solvent dispensing stations, and (4) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. The solvent dispensing stations were initially implemented for methylene chloride. In 2001 and 2002, hexane and acetone, respectively, were added to the solvent dispensing stations. In September 2006, the current supply vendors informed the lab that they were no longer able to provide pesticide grade hexane in dispensing stations. The lab had to start purchasing hexane in bottles and transferring it to the retained dispensing stations. The lab is currently working with a new vendor who may be able to supply the needed hexane in dispensing stations. Planned pollution prevention projects include evaluating new solvents that are added to laboratory operations as potential candidates for use in solvent dispensing stations. Impediments to identifying and implementing additional pollution prevention activities that would reduce this waste stream include identifying cost-effective pollution prevention options that can be implemented while continuing to meet all analytical and quality requirements.

Waste Stream 3 - Miscellaneous Acids, Corrosive Waste: Waste Streams 3 and 29 were combined in 1999. This waste stream is generated from sample preparation and analyses including samples and analysis for bioassay, environmental compliance, and development. The ACO Union Valley Facility has implemented several pollution prevention projects that have reduced this waste stream including: (1) material substitution of scintillation cocktail fluid; (2) column waste reduction using automated solid phase extraction (SPE) system; (3) radiochemical determination of uranium, plutonium, americium, and curium; (4) sequential separation of neptunium and thorium by chromatographic resin; (5) use of high-performance liquid chromatography (HPLC); (6) flow-through scintillation analysis (FTSA) to reduce acid waste and analysis time; (7) material substitution of nitric acid for cleaning glassware with a superior soap-based product; (8) replacement of ion exchange column with resin system, and (9) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. Impediments to identifying and implementing additional pollution prevention activities that would reduce this waste stream include identifying cost-effective pollution prevention options that can be implemented while continuing to meet all analytical and quality requirements.

Waste Stream 24 - PCB Acids: This waste stream is generated from sample preparation and analysis including samples and analyses for bioassay, environmental compliance, and

development [contaminated with polychlorinated biphenyls (PCB)]. The ACO Union Valley Facility has implemented several pollution prevention projects that have reduced this waste stream including: (1) material substitution of scintillation cocktail fluid; (2) column waste reduction using automated SPE system; (3) radiochemical determination of uranium, plutonium, americium, and curium; (4) sequential separation of neptunium and thorium by chromatographic resin; (5) establishment of an agreement with the U.S. Environmental Protection Agency (EPA); (6) use of HPLC and FTSA to reduce acid waste and analysis time; and (7) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. The agreement with the EPA was finalized in February 2000 and allows wastes generated within this waste stream to be managed based on the concentration of PCBs rather than based on the source. Consequently, waste generation per analysis for this waste stream has decreased, but generation per analysis has then increased for Waste Stream 3, Miscellaneous Acids, Corrosive Waste. In 2001, the PCB laboratory implemented separating and segregating non-PCB and PCB extracts per implementation of the agreement with the EPA. Impediments to identifying and implementing additional pollution prevention activities that would reduce this waste stream include identifying cost-effective pollution prevention options that can be implemented while continuing to meet all analytical and quality requirements.

Waste Stream 26 - PCB Waste Organics: This waste stream is generated from sample preparation and analysis including samples and analyses for bioassay, environmental compliance, and development (contaminated with PCBs). The ACO Union Valley Facility has implemented several pollution prevention projects that have reduced this waste stream: (1) material substitution of scintillation cocktail fluid, (2) sequential separation of neptunium and thorium by chromatographic resin, (3) implementation of solvent dispensing stations, (4) establishment of the February 2000 PCB-concentration-related agreement with the EPA, and (5) use of segregation of wastes and use of process knowledge to decrease the use of chemical analysis to characterize waste generated at the facility. The solvent dispensing stations were initially implemented for methylene chloride. In 2001 and 2002, hexane and acetone, respectively, were added to the solvent dispensing stations. In September 2006, the current supply vendors informed the lab that they were no longer able to provide pesticide grade hexane in dispensing stations. The lab had to start purchasing hexane in bottles and transferring it to the retained dispensing stations. The lab is currently working with a new vendor who may be able to supply the needed hexane in dispensing stations. The PCB laboratory also implemented separating and segregating non-PCB and PCB extracts per implementation of the agreement with the EPA. Planned pollution prevention projects include evaluating new solvents that are added to laboratory operations as potential candidates for use in solvent dispensing stations. Impediments to identifying and implementing additional pollution prevention activities that would reduce this waste stream include identifying cost-effective pollution prevention options that can be implemented while continuing to meet all analytical and quality requirements.

Waste Stream 27 - Excess Chemicals: This waste stream is generated because this material was deemed as excess materials due to being off-specification or being out-of-date per Union Valley Facility analytical procedures. Since 1999, the Union Valley Facility examined and implemented enhanced material management techniques, such as integrating pollution

prevention into training, ordering smaller containers and smaller quantities of laboratory materials, expanded the use of the Hazardous Management Inventory System (HMIS), used the Y-12 Product Exchange, implemented solvent dispensing stations, and utilized the Unneeded Materials and Chemicals (UMC) process for identified UMCs at this laboratory. The Union Valley Facility also examined the possibility of increasing the transfer of these materials to other operations on the Oak Ridge Reservation (ORR) that can use them, and the ACO HMIS Coordinator implemented an ACO Specific Hazardous Material Requestor Training that addresses how to minimize excess chemicals. The solvent dispensing stations were initially implemented for methylene chloride. In 2001 and 2002, hexane and acetone, respectively, were added to the solvent dispensing stations. In September 2006, the current supply vendors informed the lab that they were no longer able to provide pesticide grade hexane in dispensing stations. The lab had to start purchasing hexane in bottles and transferring it to the retained dispensing stations. The lab is currently working with a new vendor who may be able to supply the needed hexane in dispensing stations. When the Union Valley Facility has excess chemicals, it sends out a request to see if other ORR organizations can use the materials and has been able to transfer some materials on a case-by-case basis. Planned pollution prevention projects include evaluating new solvents that are added to laboratory operations as potential candidates for use in solvent dispensing stations. Impediments include varying requests for analyses, which can impact material management, and material transportation related to material transfer.

As described in Section 7.3, ACO pollution prevention projects and related information are tracked using a computerized tracking system from which current project data can be obtained. If new hazardous waste streams are generated in subsequent years, implementation plans will be established for those waste streams in the update of this plan.

## **7.0 Hazardous Waste and Project Accounting Systems**

### **7.1 Cost Accounting**

In general, the Y-12 accounting, timekeeping, and waste tracking systems are used to retrieve waste stream-specific cost data for use when compiling DOE required reports, during PPOAs, and for project assessments including in support of the Union Valley Facility. Specific costs applied based on each project's needs include costs of raw materials, direct personnel costs, management costs, transportation costs, storage costs, and disposal costs. As appropriate, the costs associated with compliance activities, regulatory oversight, and future liabilities, as well as life cycle costs are considered to the extent feasible as part of the cost calculations performed during assessments.

From Fiscal Year (FY) 2003 through FY 2007, the Y-12 Program was funded through Defense Programs under the Common Site Support (CSS) funding mechanism. In FY 2008, the CSS funding was reduced to a funding level below that which would allow the Y-12 Program to maintain compliance with DOE Orders and environmental regulations. Therefore, it was determined that the Y-12 Program would be funded by a legacy pool, a tax on all Y-12 organizations, which was newly established during FY 2008 and funds approximately two and a half full-time equivalent Program personnel. This legacy funding option provided for a synergistic approach to be able to fund various other Programs that naturally fell under the newly established Y-12 Sustainability and Stewardship Program. In addition to the Y-12 Program, some of the other programs funded by this newly established legacy pool include the Y-12 PrYde Program, the Clean Sweep Program, the Unneeded Materials and Chemicals (UMC) Program, and the Recycling Program. This bundled funding approach allows the major principles of pollution prevention following the pollution prevention hierarchy to be engrained into each and every program as well as being imbedded into the overall goals of Waste Management.

Additionally, pollution prevention initiatives are funded internally by the various organizations at the Y-12 Complex. This historical funding approach for the completion of pollution prevention projects has become more typical due to the overall awareness of project successes and through the integration of overall pollution prevention activities in the daily routine operations. As the organizations become more aware of various successful sustainable activities, then they continue to provide funding to clean up their respective areas or complete small pollution prevention initiatives.

### **7.2 Tracking of Hazardous Waste Generation and Disposition**

A comprehensive, computerized tracking system is required to identify trends and measure achievements concerning pollution prevention opportunities and future efforts at Y-12 including the Union Valley Facility. Overall, during the last several years, Y-12 developed collection mechanisms and database management systems to track generated wastes and developed an integrated system. The current waste tracking system has been integrated into the Y-12 Systems, Applications, and Products (SAP) system.

### **7.3 Program Activity Tracking**

A computerized database system, Pollution Prevention Information Management System (P2IMS), has been developed and updated to document and provide feedback to generators, management, and DOE on the progress of the Program, including the results of PPOAs, pollution prevention projects, and other implemented pollution prevention options. P2IMS aids in documenting, tracking, and reporting pollution prevention activities and in documenting the funding and implementation status of pollution prevention projects. P2IMS contains many forms, tables, queries, and reports including a form for collecting all of the project-related information that must be retrieved from the waste generators and entered into the database. The Advocates provide the vital interface between the waste generators and the Program by ensuring that projects are identified and related information is captured. The Advocates help ensure that required information is collected by working with the waste generators. P2IMS also contains a project activity report form that is extensively used as a summary report for each project and as a tool for data validation. The ACO Advocate provides the vital interface between the waste generators and the P2 Program by ensuring that projects are identified and related information is captured. The ACO Advocate ensures that each form is correctly completed by working with the waste generators.

## 8.0 Employee Involvement, Participation, and Training

### 8.1 Pollution Prevention Awareness

The purpose of the Program's awareness activities is to foster the philosophy that prevention is superior to remediation. The goal of the activities is to incorporate pollution prevention and sustainability into the decision-making process at every level throughout the organization.

The Y-12 Program's awareness objectives are to instill awareness, disseminate information, provide training and rewards for recognizing the benefits of sustainable measures and using them, identifying the true source or cause of wastes, and encouraging employee participation in solving environmental issues and preventing pollution. The awareness activities are ongoing, continual efforts. Specifically, the Program uses awareness activities to:

- Increase employees' awareness of the benefits of using sustainable measures on site and off site, the general environmental activities and hazards at Y-12 including the Union Valley Facility, and of the Program requirements, goals, and accomplishments.
- Inform employees of specific environmental issues.
- Train employees on their responsibilities in pollution prevention.
- Recognize employees for sustainable efforts that reduce Y-12's impact on the environment through pollution prevention.
- Encourage employees to participate in pollution prevention at Y-12.
- Publicize success stories.

The Y-12 Program and Advocates are responsible for the awareness activities and incorporate many of these activities into other Y-12 activities including at the Union Valley Facility. The Y-12 Program manages the associated planning and implementation of awareness activities. The pollution prevention awareness activities are conducted throughout the year. The Y-12 Program attempts to fully utilize established systems for information dissemination, existing training programs, and existing incentive programs as described in other sections of this plan. Specific activities include the dissemination of information through the Y-12 Pollution Prevention homepage, the Y-12 Employee Handbook, Y-12-wide bulletin distribution, posters, exhibits, Y-12 YSource articles, Y-12 newsletter, and internal and external newsletters. The Program also supports outreach activities such as environmental fairs and symposiums, and supports and coordinates special one-time activities. Scheduled promotional activities are listed in the *Y-12 Pollution Prevention Program Plan*. Awareness and training activities such as the Earth Day and America Recycles activities periodically promote source reduction and recycling of reusable materials, including composting. Related training activities are discussed in Section 8.3.

## **8.2 Incentive Awards and Recognition**

Awards are used to recognize individual and team pollution prevention achievements. Potential awards for which successful projects will be submitted as candidates as well as a compilation of awards received to date are listed in the *Y-12 Pollution Prevention Program Plan*.

## **8.3 Training**

### **8.3.1 Training Goals**

One of the most important elements of the Y-12 Program is training. The training program includes all levels of personnel within Y-12 including at the Union Valley Facility. The goal of the training program is to make each employee aware of the benefits of sustainable practices and resource conservation, waste generation and its causes, its impact on Y-12 and the environment, and ways to reduce waste and prevent pollution. Y-12 training is coordinated by Y-12 Training Management and Delivery and is performed by trainers within each of the Y-12 organizations including ACO. Additionally, training is tracked in SAP.

### **8.3.2 Employee Orientation and Refresher Training**

A brief overview of pollution prevention is provided as part of the General Employee Training (GET), which is required for all new Y-12 employees, including new ACO employees, and specific Y-12 contractors. Every 2 years, all Y-12 employees, including ACO employees and specific Y-12 contractors are also required to complete the GET refresher. Both the overview and refresher training modules are performance-based programs.

### **8.3.3 Specialized Training Program**

EMS Training has been integrated in Y-12's General Employee Training and Regulatory Compliance Overview Training. In addition, a web-based Y-12 EMS Assessment course is available, and a 4-hour classroom training on this subject is also available on a limited basis. The EMS training discusses pollution prevention and sustainability commitments and concepts incorporated into the Y-12 Environmental, Safety, and Health Policy (Y72-001) and the Y-12 EMS Objectives and Targets.

A training module for stormwater pollution prevention was developed for Y-12-wide use. The required module covers the Clean Water Act (CWA) stormwater pollution prevention plan requirements as they apply to Y-12. This module has been incorporated into the regularly-scheduled training program.

Y-12 Universal Waste training for personnel that generate or manage Universal Waste addresses all regulatory and operational requirements. This training is required to be completed every 2 years. Complying with the requirements delineated in this training allows Y-12 to maximize the recycle of all universal wastes generated on site as well as comply with regulatory requirements.

Specific awareness training was conducted with all Y-12 ACO Union Valley Facility personnel in 1999 to convey the need for and goals of pollution prevention through the required reading of a summary of this plan.

## 9.0 References

Babcock and Wilcox Technical Services Y-12, L.L.C., *Y-12 Pollution Prevention Program Plan*, Y/TS-2093/R2 (March 2010).

Babcock and Wilcox Technical Services Y-12, L.L.C., *2009 Resource Conservation and Recovery Act (RCRA) Annual Reporting of Hazardous Waste Activities at the U.S. Department of Energy (DOE) Union Valley Facility*, Y/TS-2171 (2010).

Babcock and Wilcox Technical Services Y-12, L.L.C. (B&W Y-12), *2009 Annual Hazardous Waste Reduction Progress Report for the Y-12 Analytical Chemistry Off-Site Union Valley Facility*, Y/TS-2159 (March 2010).

Babcock and Wilcox Technical Services Y-12, L.L.C. (B&W Y-12), *Y-12 Pollution Prevention Program Implementation Instruction*, Y77-311 (May 2007).

Babcock and Wilcox Technical Services Y-12, L.L.C. (B&W Y-12), *Pollution Prevention Annual Report October 2008 through September 2009* (March 2010).

Tennessee Department of Environment and Conservation (TDEC), *Tennessee Hazardous Waste Reduction Act of 1990*, TCA 68-212-301 et. seq. (1990).

U.S. Department of Energy (DOE), *Environmental Protection Program*, DOE Order 450.1A (June 4, 2008).

U.S. Environmental Protection Agency (EPA), *Clean Water Act of 1992*, PL 102-580 (October 31, 1992).

U.S. Environmental Protection Agency (EPA), *Hazardous and Solid Waste Amendments*, PL 98-616, 98 Stat. 3221 (November 8, 1984).

U.S. Environmental Protection Agency (EPA), *The Pollution Prevention Act of 1990*, PL 101-508 (November 5, 1990).

U.S. Environmental Protection Agency (EPA), *Strengthening Federal Environmental, Energy, and Transportation Management*, Executive Order 13423 (January 24, 2007).

U.S. Environmental Protection Agency (EPA), *Federal Leadership in Environmental, Energy, and Economic Performance*, Executive Order 13514 (October 5, 2009).

**Appendix A**

**for the**

**Pollution Prevention Plan**

**for the**

**Y-12 Analytical Chemistry Organization**

**Off-Site Union Valley Facility**

**Y-12 Pollution Prevention Policy**

## **Appendix A**

### **Y-12 Pollution Prevention Policy**

This appendix contains the current dated and signed Y-12 Environment, Safety, and Health Policy (Figure A-1) which articulates management support for pollution prevention and support the Y-12 Pollution Prevention Program at the Y-12 National Security Complex and the Y-12 Analytical Chemistry Organization Off-Site Union Valley Facility, Oak Ridge, Tennessee. Specifically at all Y-12 facilities, policies are the highest level statements of the Y-12 philosophy for conducting business. Y-12 personnel are expected to familiarize themselves with Y-12 policies and ensure they are an integral part of daily work.

**Figure A-1**  
**Y-12 Environment, Safety, and Health Policy**  
(Page 1 of 3)

**Babcock & Wilcox Technical  
Services Y-12, LLC  
Management Requirements**

Number: Y72-001  
Revision: 02/18/09  
Supersedes: 12/17/07  
Page: 1 of 3

B&W Y-12  
Policy

Subject: Environment, Safety and Health Policy

**Approvals:**

*M. M. Reichert* /M. M. Reichert  
Executive Manager/Signature/Printed Name

2/23/09  
Date

*D. P. Kohlhorst* /D. P. Kohlhorst  
President and General Manager/Signature/Printed Name

2/25/09  
Date

\_\_\_\_\_  
Effective Date

This document has been reviewed by a  
Derivative Classifier and UCNI Reviewing  
Official and has been determined to be  
UNCLASSIFIED and contains no UCNI.  
This review does not constitute clearance  
for public release.

*X. Wayne McMahon* 2/23/09  
Signature and Date

## Figure A-1 (Page 2 of 3)

Y72-001

Rev. Date: 02/18/2009

Supersedes: 12/17/07

Page 2 of 3

Subject: Environment, Safety and Health Policy
--

### 1 POLICY

As we work to achieve the Y-12 mission and our vision of a modernized Y-12 Complex, we will do so by ensuring the safety and health of every worker, the public, and the environment. Every employee, contractor, and visitor is expected to take personal responsibility for their actions.

- Environmental Policy: We protect the environment, prevent pollution, comply with applicable requirements, and continually improve our environment.
- Safety and Health Policy: The safety and health of our workers and the protection of public health and safety are paramount in all that we do. We maintain a safe work place and plan and conduct our work to ensure hazard prevention and control methods are in place and effective.

### 2 PURPOSE

In support of this policy, we are committed to:

- Integration of Environment, Safety and Health (ES&H) into our business processes for work planning, budgeting, authorization, execution, and change control in accordance with our Integrated Safety Management System.
- Continuously improving our processes and systems by establishing, tracking, and achieving goals that drive performance excellence.
- Direct, open, and truthful communication of this policy and our ES&H performance to our employees, contractors, customers, and stakeholders.
- Strive to minimize the impact of our operations on the environment in a safe, compliant, and cost-effective manner using sustainable practices for energy efficiency, fleet management, water consumption, pollution prevention, recycling/reuse, source reduction, resource conservation, and environmentally preferable purchasing.
- Incorporate sustainable design principles into the design and construction of facility upgrades, new facilities, and infrastructure considering life-cycle costs and savings.
- Incorporate the use of engineering controls to reduce or eliminate hazards whenever possible into the design and construction of facility upgrades, new facilities, and infrastructure.
- Strive to provide a clean and efficient workplace free of occupational injuries and illnesses (Target Zero).
- Foster and maintain a work environment of mutual respect and teamwork that encourages free and open expression of ES&H concerns.

### 3 SCOPE

This policy applies to all B&W Y-12 activities, personnel and subcontractors.

**Figure A-1**  
**(Page 3 of 3)**

Y72-001

Rev. Date: 02/18/2009

Supersedes: 12/17/07

Page 3 of 3

Subject: Environment, Safety and Health Policy

**4 ADMINISTRATION**

The Vice President for Environment, Safety and Health is responsible for administration, interpretation and maintenance of this policy.