

**METHODOLOGY
FOR
DEVELOPING ENVIRONMENTAL QUALITY
REQUIREMENTS
FOR A
COST ANALYSIS REQUIREMENTS DESCRIPTION
(CARD)**



**PREPARED BY THE
US ARMY ENVIRONMENTAL CENTER
November 2001**

PREFACE

This methodology is a living document that is modified, as necessary, to incorporate changes in Federal Legislation, Executive Orders, and DoD and Army policy and guidance. Users are advised to periodically visit the US Army Environmental Center (USAEC) acquisition document website at <http://aec.army.mil/usaec/acquisition/documents00.html> to determine if a more current version exists.

TABLE OF CONTENTS

<u>SECTION TITLE</u>	<u>PAGE</u>
1. INTRODUCTION	1
2. PURPOSE	1
3. GENERAL APPROACH	1
4. METHODOLOGY	2
5. SUMMARY	12
6. GLOSSARY	13

LIST OF TABLES

<u>TABLE</u>	<u>PAGE</u>
Table 1 – Compliance (Including NEPA)	3
Table 2 – Hazardous Materials Management	5
Table 3 – Pollution Prevention	7
Table 4 – Conservation	8
Table 5 – Remediation and Restoration	10
Table 6 – Demilitarization and Disposal	11

1. INTRODUCTION

Minimization of life-cycle environmental quality costs has become an increasingly important aspect of a Program Manager's (PM) total management responsibilities. There is a requirement for a PM to determine the total impacts that environmental quality related activities have on his/her program's life-cycle costs as specified in environmental laws and regulations. The following are several of the more important sources/regulations which reinforce/illuminate this requirement:

- The National Defense Authorization Act for fiscal year 1995 requires the analysis of environmental costs as part of the life-cycle cost analyses of major defense weapon system acquisitions.
- Guidance from the Department of Defense (DoD) Cost Analysis Improvement Group (CAIG) states that environmental costs should be a component of the Program Office Estimate (POE) (Referred to as a Life-Cycle Cost Estimate (LCCE) in DoD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs*).
- DoD Regulation 5000.2-R requires that the PM review environmental, safety, and occupational health requirements, and assess their impact on cost, schedule, and performance.

In order for environmental quality costs to be adequately analyzed and included in the LCCE, all environmental quality requirements must be clearly identified in a program's Cost Analysis Requirements Description (CARD). Preparation of the CARD should begin upon the initiation of an acquisition program. It must be completed prior to milestone reviews in accordance with the time frames set out in DoD 5000.4-M.

2. PURPOSE

This guide was developed by the U.S. Army Environmental Center (USAEC) in accordance with its mission to improve environmental quality awareness, responsibility, and stewardship associated with Army activities. It provides a suggested methodology for documenting an acquisition program's environmental quality activities so that their cost can be estimated.

3. GENERAL APPROACH

This guide provides a suggested methodology for incorporating all applicable environmental quality requirements into an acquisition program's CARD. The methodology calls for the authors of a CARD to develop an environmental quality appendix for complete identification of the program's life-cycle environmental quality requirements. The suggested appendix would serve as the information base for cost analysis and development of the program's LCCE. As a program evolves through its acquisition phases, new information should be included to better refine the program's CARD.

Section 4 of this guide (Methodology) provides six matrices (Tables 1 through 6) which can be used as a guide to develop the environmental quality appendix for an acquisition program's CARD. The tables and the associated text are intended to guide the developers of a CARD through use of a structured thought process for identifying all of a program's life-cycle environmental quality requirements. Depending on the program, and the need for tailoring, the matrices provided may not be all-inclusive. Likewise, some of the environmental quality activities identified may not apply to a particular program. The appendix should identify environmental quality activities in the greatest detail possible to assist the cost analyst charged with developing the LCCE.

Development of the appendix will assist with the formulation of realistic estimates of a program's life-cycle environmental quality costs and related environmental quality cost risks. Upon completion of the CARD environmental quality appendix, brief statements may be incorporated into the following paragraphs of the basic CARD structure outline as presented in DoD 5000.4M:

<u>Paragraph</u>	<u>Title</u>
1.2.1 X 2	Environmental Conditions
3.2	Basing and Deployment Description
9.1	Development Phases
9.2	Development Test and Evaluation
10.1	Test & Production Facilities
10.4	Environmental Impact Analysis

These inputs may be summary statements of the environmental cost considerations pertinent to the paragraph, or simply referrals to the detail in the completed appendix, whichever is deemed more appropriate.

4. METHODOLOGY

The enclosed matrices (tables) depict program life-cycle phases in the left column plotted against key elements of the broad environmental quality tenants (e.g., Compliance, Hazardous Materials Management, etc.) Each of six major tenants is portrayed in Tables 1 through 6. Following each table is a description of factors that need to be quantified for completion of the matrix. Recognizing that the CARD should allow a cost estimator to link environmental quality cost elements to total program cost elements, the data presented in a completed table must be as specific as possible.

Matrices (tables) are presented as follows:

- Compliance (Including National Environmental Policy Act (NEPA))
- Hazardous Materials Management
- Pollution Prevention
- Conservation
- Remediation and Restoration
- Demilitarization and Disposal

Quantification of program data in the appendix should be as complete as possible.

The preferred method of completing the total environmental quality appendix is through use of a multidisciplinary team (e.g., environmental, systems engineering, logistics, test and evaluation, etc.). The detailed description of environmental quality activities should quantify the efforts it describes. To the extent possible, identify the frequency of the activity and who will perform it.

It may not be possible to identify all environmental quality life-cycle activities during the early phases of an acquisition program. However, as more is known, the CARD should be updated and all information should be described in as great a detail as possible.

Table 1. Compliance (Including NEPA)

Program Phase	NEPA	Other Laws, EOs & Regs	Plans & Permits	Site Surveys
Concept & Technology Development	<ul style="list-style-type: none"> • Preliminary Issue Identification • Analysis & Documentation • Public & Government Agency Coordination • Mitigation & Monitoring 	<ul style="list-style-type: none"> • Assessments • Monitoring • Reporting • Contractor Compliance Reviews 	<ul style="list-style-type: none"> • PESHE • Documentation & Submission • Construction, Water, Air, etc., Permits • Permit Compliance 	<ul style="list-style-type: none"> • R&D Sites • Test Sites
System Development & Demonstration	<ul style="list-style-type: none"> • Preliminary Issue Identification • Analysis & Documentation • Public & Government Agency Coordination • Mitigation & Monitoring 	<ul style="list-style-type: none"> • Assessments • Monitoring • Reporting • Contractor Compliance Reviews 	<ul style="list-style-type: none"> • Update PESHE • Documentation & Submission of Construction, Water, Air, etc., Permits • Permit Compliance 	<ul style="list-style-type: none"> • R&D Sites • Test Sites • Production Sites
Production & Deployment	<ul style="list-style-type: none"> • Analysis & Documentation • Public & Government Agency Coordination • Mitigation & Monitoring 	<ul style="list-style-type: none"> • Assessments • Monitoring • Reporting • Contractor Compliance Reviews 	<ul style="list-style-type: none"> • Update PESHE • Documentation & Submission of Construction, Water, Air, etc., Permits • Permit Compliance 	<ul style="list-style-type: none"> • Training Sites • Test Sites • Deployment Sites • Logistic Support Sites
Operations & Support	<ul style="list-style-type: none"> • Analysis & Documentation • Public & Government Agency Coordination • Mitigation & Monitoring 	<ul style="list-style-type: none"> • Assessments • Monitoring • Reporting • Contractor Compliance Reviews 	<ul style="list-style-type: none"> • Update PESHE • Documentation & Submission of Construction, Water, Air, etc. Permits • Permit Compliance 	<ul style="list-style-type: none"> • Deployment Sites • Logistic Support Sites • Training Sites

↑ Indicates that phase related activities in each column are dependent on the extent of program initiation efforts accomplished during Concept & Technology Development.

NEPA (Table 1)

Within Table 1, the second column includes information associated with maintaining program compliance with all substantive requirements of NEPA and 40 CFR Parts 1500 - 1508.

The extent of analysis and documentation required in each phase is determined by the potential for adverse environmental impact(s) occurring from acquisition activities in the phase.

Under procedures established in AR 200-2, *Environmental Effects of Army Actions*, there are three basic levels of environmental impact analyses and resulting documentation: Categorical Exclusion (CX), Environmental Assessment (EA), and Environmental Impact Statement (EIS). Careful review of AR 200-2 will assist in identifying program actions which will need to be examined under NEPA, thus allowing quantification of the extent of analysis and documentation required.

The amount of public and Government agency coordination required is directly proportional to the level of NEPA analysis and documentation prepared. CX coordination requirements are almost insignificant while EIS requirements are invariably substantial. Throughout the acquisition phases, analysis and documentation updates may reopen coordination requirements.

Mitigation actions undertaken to lessen the significance of environmental impacts may become major program activities themselves. This can also be true of mitigation monitoring requirements established to ensure reduced environmental impacts. Clear definitions of these two activities are essential.

Other Laws, EOs, and Regulations (Table 1)

In addition to NEPA, there are other Federal and state environmental quality protection laws (e.g., Clean Water Act, Clean Air Act, Endangered Species Act, etc.) which may impact program activities in any or all of the acquisition phases. Also, Executive Orders (e.g., EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*; EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*; etc.) which carry the full weight of Federal regulations must be complied with in all phases. Army Regulations, such as AR 200-1, *Environmental Protection & Enhancement*; AR 200-4, *Cultural Resources Management*; plus others, as applicable, must be reviewed for program compliance requirements. The program environmental quality coordinator along with other specialists such as legal, safety, health, etc. may assist in determining the necessary actions and establishing, monitoring, and/or reporting activities, as required.

Government Contractor Compliance Reviews are a critical element of environmental quality program management. Both formal and informal reviews are necessary to insure full compliance. Cite the scope and results of such review efforts in the CARD appendix.

Plans and Permits (Table 1)

The Programmatic Environmental, Safety, and Occupational Health Evaluation (PESHE), as required by DoD Regulation 5000.2-R, is a critical component of a program's acquisition strategy. The program office is required to initiate the PESHE at the earliest possible time and to maintain an updated PESHE throughout the program life-cycle. The PESHE describes the PM's strategy for meeting Environmental, Safety, and Occupational Health (ESOH) requirements, establishes responsibilities, and identifies how progress will be tracked. As such, it represents

the programs top-level plan for environmental quality activities across the board (NEPA, Environmental Compliance, Hazardous Materials Management, Pollution Prevention, and Explosives Safety). This capstone plan is continually updated and given wide distribution throughout the Army Acquisition community.


ESOH-related permits covering activities associated with prototyping, fabrication, production, testing, operations and demilitarization/disposal may be required by various Federal, state, and local agencies. All potential ESOH impacts associated with an activity must be conveyed to the permit issuers. Cite specific activities pertaining to the weapon system that will have the potential to exceed current permit limits or create new permit requirements at contractor plants or Government installations.

Site Surveys (Table 1)

Site Surveys may occur throughout the acquisition cycle. These surveys, which deal primarily with environmental quality concerns and issues, may include research and development facilities, test areas, production facilities, training and operational test areas, operational sites, and demilitarization and disposal locations.

Table 2. Hazardous Materials (HAZMAT) Management

Program Phase	Trade-Off Analyses	Safety & Protection	Planning & Execution	Handling, Storage & Disposal
Concept & Technology Development	<ul style="list-style-type: none"> • Elimination of HAZMAT • Assessment/Development of Alternate Materials 	<ul style="list-style-type: none"> • Prepare Documentation • Personnel Protective Equipment • Training 	<ul style="list-style-type: none"> • Documentation (HMMP) • Contractor Execution of HMMP 	<ul style="list-style-type: none"> • Documentation • Installation/Facility Requirements • Fees
System Development & Demonstration	<ul style="list-style-type: none"> • Elimination of HAZMAT • Assessment/Development of Alternate Materials 	<ul style="list-style-type: none"> • Prepare Documentation • Personnel Protective Equipment • Training 	<ul style="list-style-type: none"> • Update Plans • Contractor Execution of HMMP 	<ul style="list-style-type: none"> • Documentation • Installation/Facility Requirements • Fees
Production & Deployment	<ul style="list-style-type: none"> • Elimination of HAZMAT • Assessment/Development of Alternate Materials 	<ul style="list-style-type: none"> • Prepare Documentation • Personnel Protective Equipment • Training 	<ul style="list-style-type: none"> • Update Plans • Contractor Execution of HMMP 	<ul style="list-style-type: none"> • Documentation • Installation/Facility Requirements • Fees
Operations & Support		<ul style="list-style-type: none"> • Prepare Documentation • Personnel Protective Equipment • Training 	<ul style="list-style-type: none"> • Update Plans • Contractor Execution of HMMP 	<ul style="list-style-type: none"> • Documentation • Installation/Facility Requirements • Fees

 Indicates that phase related activities in each column are dependent on the extent of program initiation efforts accomplished during Concept & Technology Development.

Trade-Off Analyses (Table 2)

In order to perform meaningful trade-offs to reduce or eliminate hazardous materials, it is necessary to establish a baseline. This baseline may be established on technical, cost, schedule, or other program parameters. The ultimate goal of the trade-off analyses should be to minimize the usage and disposal of HAZMAT. The use of any HAZMAT carries program risks (cost, schedule, and performance). Risk reduction through use of alternate materials is normally desirable, although cost savings are not necessarily a given with this practice. Critical studies of these issues are programmatically important. Quantifying the number and extent of trade studies required for this particular program, as well as the selection process and criteria to be used for screening HAZMAT, requires input from systems engineers, cost analysts, production and safety engineers, contractor representatives, and the program office environmental quality coordinator.

Safety and Protection (Table 2)

Specialized training to support the objectives of proper handling and disposal of HAZMAT by both contractor and government personnel is essential. This applies in all phases of the acquisition cycle. Proper procedures and safety criteria must be implemented and documented. Describe and quantify any training and protection requirements, which are unique to this system as a result of the HAZMATs contained in the system or required for maintenance.

Planning and Execution (Table 2)


The Hazardous Materials Management Plan (HMMP) is the contractor's plan to ensure appropriate consideration is given to the elimination/reduction of hazardous materials, and to the proper control of hazardous materials that are not eliminated for system items throughout all phases of the life-cycle. A HMMP is submitted by the contractor and updated as contractually required throughout the program. An approved HMMP provides the basis of understanding between the contractor and the government with respect to how the minimization of use of hazardous materials shall be accomplished to meet program requirements.

Handling, Storage, and Disposal (Table 2)

HAZMAT handling and disposal costs, are typically considered to be primary cost drivers. Early and effective planning can minimize hazardous waste generation. When hazardous waste generation does occur, it usually involves heavy facility and support equipment usage. Permit and fee considerations often occur solely due to disposal activities. Specialized training once again becomes critical as demilitarization and disposal efforts occur. Appropriate disposal procedures need to be defined for hazardous wastes, to include necessary emergency response to accidents and spills. Describe any additional transportation requirements as well as additional equipment needs due to storage and disposal requirements.

Table 3. Pollution Prevention

Program Phase	Studies & Trade-Off Analyses	Mitigation	Management
Concept & Technology Development	<ul style="list-style-type: none"> • Studies (Ambient Air Emissions, Water Effluents, etc.) • Assessment/Development of Alternate Materials & Technologies 	<ul style="list-style-type: none"> • Material Substitution • New Technologies/Materials 	<ul style="list-style-type: none"> • P2 Plan • Training • Monitoring • Compliance w/Laws (Fed, State, Local), EO's, Regulations, & Applicable Installation Plans
System Development & Demonstration	<ul style="list-style-type: none"> • Studies (Ambient Air Emissions, Water Effluents, etc.) • Assessment/Development of Alternate Materials & Technologies 	<ul style="list-style-type: none"> • Process Improvement & Modification • Facility Modification • Recycling 	<ul style="list-style-type: none"> • P2 Plan • Training • Monitoring • Compliance w/Laws (Fed, State, Local), EO's, Regulations, & Applicable Installation Plans
Production & Deployment	<ul style="list-style-type: none"> • Studies (Ambient Air Emissions, Water Effluents, etc.) • Assessment/Development of Alternate Materials & Technologies 	<ul style="list-style-type: none"> • Process Improvement & Modification • Facility Modification • Recycling 	<ul style="list-style-type: none"> • P2 Plan • Training • Monitoring • Compliance w/Laws (Fed, State, Local), EO's, Regulations, & Applicable Installation Plans
Operations & Support		<ul style="list-style-type: none"> • Process Improvement & Modification • Facility Modification • Recycling 	<ul style="list-style-type: none"> • P2 Plan • Training • Monitoring • Compliance w/Laws (Fed, State, Local), EO's, Regulations, & Applicable Installation Plans


 Indicates that phase related activities in each column are dependent on the extent of program initiation efforts accomplished during Concept & Technology Development.

Studies and Trade-Off Analyses (Table 3)

During the program's initial design process, the opportunity exists to minimize the potential environmental quality impacts which may occur in later program phases. It is critical that known pollution prevention (P2) opportunities be considered early in program development.

Trade-off studies must be identified and quantified so they may be subsequently estimated in the LCCE. Studies can identify potential alternatives for pollution sources. Research can also be valuable to identify previous industry/government studies dealing with pollutant substitutions. Quantify the effort to be used in performance of P2 studies and trade-off analyses.

Mitigation (Table 3)

Most of the P2 mitigation measures pertain to the use of viable substitutes for hazardous materials or processes that minimize or eliminate pollutants. Mitigation measures can also


include waste stream segregation and improved procurement and best management practices. Identify and quantify mitigation measures in the form of processes, training, and facility modification/construction.

Management (Table 3)

A P2 program is necessary to ensure that through program reviews, personnel training, compliance appropriate activities, mitigation efforts are identified, funded, and executed. A documented plan is needed to ensure organizational responsibilities and implementing procedures are known and disseminated. Contractor incentives, recycling, and reporting measures also need to be addressed. Both contractor and Government efforts, in the form of planning, oversight, monitoring, and reporting, should be quantified to allow costing in the LCCE. (Note: this will normally take the form of manpower, which may be covered in another portion of the CARD. If so, where it is covered should be identified.)

Table 4. Conservation

Program Phase	Cultural Resources	Natural Resources	Mitigations
Concept & Technology Development	<ul style="list-style-type: none"> • Site Surveys • Monitoring • Reporting 	<ul style="list-style-type: none"> • Site/Habitat Surveys • Monitoring • Reporting 	
System Development & Demonstration	<ul style="list-style-type: none"> • Site Surveys • Monitoring • Reporting 	<ul style="list-style-type: none"> • Site/Habitat Surveys • Monitoring • Reporting 	<ul style="list-style-type: none"> • Protection & Prevention Activities • Training
Production & Deployment	<ul style="list-style-type: none"> • Site Surveys • Monitoring • Reporting • Installation Management Plan Requirements 	<ul style="list-style-type: none"> • Site/Habitat Surveys • Monitoring • Reporting • Installation Compliance Requirements 	<ul style="list-style-type: none"> • Protection & Prevention Activities • Training
Operations & Support	<ul style="list-style-type: none"> • Site Surveys • Monitoring • Reporting • Installation Management Plan Requirements 	<ul style="list-style-type: none"> • Site/Habitat Surveys • Monitoring • Reporting • Installation Compliance Requirements 	<ul style="list-style-type: none"> • Protection & Prevention Activities • Training

 Indicates that phase related activities in each column are dependent on the extent of program initiation efforts accomplished during Concept & Technology Development.

Cultural Resources/Natural Resources (Table 4)

These two columns of the table, although different in their title and subject matter, are somewhat similar in the approach used to gather the information and subsequent data quantification for input to the CARD.

The activity-driven efforts associated with these areas are attributed to land usage (e.g., manufacturing facilities, test ranges, fielding installations, training centers, etc.).

Review of existing information will assist in determining if Cultural or Natural Resources have already been identified in areas of concern during each of the phases. Especially for non-Army lands, coastal areas, and waterways, this information can be obtained from the State Historic Preservation Office for Cultural Resources and the US Fish and Wildlife Service or State equivalent for Natural Resources. On Army installations, Cultural Resource Management Plans and Natural Resource Management Plans should provide the location and sensitivity of all known resources.

In areas that have not been previously assessed, the program may be required to perform surveys to determine if Cultural or Natural Resources are in activity areas. For Cultural Resources, an inventory will identify historic properties and any archaeological sites. Evaluation will be required to determine the National Register eligibility of the properties and sites that were discovered during the inventory. Any adverse effects on National Register-eligible or listed properties will have to be resolved. This is often done through mitigation measures identified in a Memorandum of Agreement.

AR 200-4, Cultural Resources Management, provides a review of major Cultural Resource laws, regulations, Executive Orders, and consultation procedures, and defines Cultural Resources as follows: Cultural Resources are historic properties as defined by the National Historic Preservation Act; cultural items as defined by the Native American Graves Protection and Repatriation Act; archaeological resources as defined by the Archeological Resources Protection Act; sacred sites as defined in Executive Order 13007, *Indian Sacred Sites*, to which access is afforded under the American Indian Religious Freedom Act; and collections and associated records as defined in 36 CFR 79. Applicability to specific program activities must be determined. *AR 200-3, Natural Resources – Land, Forest, and Wildlife Management*, provides a review of Natural Resource directives. There are many program areas within Natural Resources. Included are endangered species management, ecosystem management, erosion and sedimentation control, agriculture, grazing, and commercial forestry. Not only do Natural Resources managers have to consider multiple uses for the Army's lands, but these uses must also support the military mission. Efforts to perform these functions must be quantified in the CARD.

Mitigation Measures (Table 4)

Mitigation measures may be established to treat the adverse effect on Cultural and Natural Resources, which result from program actions. The simplest form of mitigation is avoidance. Early decision-making may allow for changes in activities or activity locations to avoid resources. Another minor mitigation is the prior training of personnel to recognize and avoid resources. This should be part of every program. (In some cases, this will be the only mitigation measure.) If avoidance is not possible, other mitigation measures can be both time consuming and expensive. Some possible mitigation measures include: on-site monitoring by archaeologists and naturalists; seasonal restrictions on activities; archaeological site data recovery; and new wetland establishment. The extent of expected mitigations must be quantified so it can be costed in the LCCE.

Table 5. Remediation and Restoration

Program Phase	Accidental Contamination	New Laws, EOs, Regs & Changes	Equipment/Facility Decontamination & Disposal
Concept & Technology Development	<ul style="list-style-type: none"> Historical Data for like Equipment at Expected Sites 	<ul style="list-style-type: none"> Study of Historical Trends to Extrapolate Future Risk 	<ul style="list-style-type: none"> Labs
System Development & Demonstration	<ul style="list-style-type: none"> Historical Data for like Equipment at Expected Sites 	<ul style="list-style-type: none"> Study of Historical Trends to Extrapolate Future Risk 	<ul style="list-style-type: none"> Labs & Contractor Facilities
Production & Deployment	<ul style="list-style-type: none"> Historical Data for like Equipment at Expected Sites 	<ul style="list-style-type: none"> Study of Historical Trends to Extrapolate Future Risk 	<ul style="list-style-type: none"> Contractor, Installation & Training Facilities
Operations & Support	<ul style="list-style-type: none"> Historical Data for like Equipment at Expected Sites 	<ul style="list-style-type: none"> Study of Historical Trends to Extrapolate Future Risk 	<ul style="list-style-type: none"> Training, Contonment, and Support Facilities

↑ Indicates that phase related activities in each column are dependent on the extent of program initiation efforts accomplished during Concept & Technology Development.

Accidental Contamination (Table 5)

Although a PM and others would never intentionally plan to cause contamination, accidental contamination from program activities can occur at any time during the life-cycle. This represents a program cost risk. Restoration/remediation involves all costs associated with the cleanup of an incident having an environmental quality impact. The recommended method of quantifying the risk of accidental contamination for a particular acquisition program is the research of like commodities and equipment. Factors such as the planned operational tempo (OPTEMPO), the quantity and type of hazardous materials contained in equipment and used during maintenance and operations, expected fielding locations, etc. must be factored in when determining and quantifying the accidental program contamination cost risk. Maintain consistency with the quantities in Section 4 of the CARD.

New Laws, Executive Orders (EOs), Regulations, and Changes to Existing Requirements (Table 5)

Trends over time have shown that environmental quality restrictions and requirements have steadily increased. A study of the historical trends of the sites to be used for production, testing, training, fielding, operation and maintenance, and disposal is important in order to develop a general trend for the future. This is particularly important because of varying requirements in different areas of the U.S. and foreign deployment locations. It is especially true for the subjects of water, air, and noise. Considering that the normal operational life of a system is in excess of twenty years, in addition to development and production time, these trends represent considerable potential cost growth and risk over the life of an acquisition program.

Equipment/Facility Decontamination and Disposal (Table 5)

The use or presence of hazardous materials during design, testing, production, fielding, operation and maintenance, and demilitarization and disposal may result in the contamination of equipment and facilities. This “anticipated” contamination can be more easily predicted and identified than accidental contamination (e.g., spills). Much of this “anticipated” contamination is dependent on the materials and processes used during the program life-cycle. Equipment and facilities used for production, maintenance, and decommissioning and disposal typically are the most common items/areas requiring future restoration and remediation.

Table 6. Demilitarization and Disposal

Program Phase	Trade-Off Analyses	Planning and Execution	Site Surveys	Equipment and Facilities
Concept & Technology Development				
System Development & Demonstration	<ul style="list-style-type: none"> Assessment of Disposal Alternatives 			
Production & Deployment	<ul style="list-style-type: none"> Assessment of Disposal Alternatives 	<ul style="list-style-type: none"> Prepare Documentation 		<ul style="list-style-type: none"> Identification
Operations & Support	<ul style="list-style-type: none"> Assessment of Disposal Alternatives 	<ul style="list-style-type: none"> Prepare Documentation Update Plans Training Transportation Removal of Materials & Waste 	<ul style="list-style-type: none"> Disposal Sites 	<ul style="list-style-type: none"> Identification Design & Construction Disposition/Disposal

Trade-Off Analyses (Table 6)

As early in the program life-cycle as possible (normally the System Development & Demonstration Phase), studies are undertaken to identify and assess alternatives for equipment disposal. Initial assessments are continually updated to ensure eventual safe and efficient approaches to the disposal of hazardous wastes and distribution of all inert materials upon de-commissioning and demilitarization.

Planning and Execution (Table 6)

More detailed demilitarization and disposal planning is finalized and documented as a part of initial deployment planning. Execution of this planning may entail distribution and transportation of original system equipment, and associated support equipment, to specific locations.

Hazardous materials, including ammunition items, propellants, and chemical and radioactive wastes, must be disposed of utilizing proper procedures. Additional environmental quality compliance and remediation requirements may be identified at this time.

Site Surveys (Table 6)

Site surveys and environmental quality baseline studies may be required depending upon the location(s) selected for demilitarization and disposal.

Equipment and Facilities (Table 6)

Use of specialized equipment/facilities required for dismantling and demilitarizing may become necessary. Waste treatment, recycling, and facility decontamination activities, may need to take place. In some cases local activity permitting may be required.

5. SUMMARY

The methodology presented in this guide for identifying, quantifying, and portraying total acquisition program environmental quality life-cycle activities is but one of several possible approaches. It was selected and developed because it leads program office personnel who are the authors of a CARD through a deliberate thought process, and portrays the information in a complete format that can be utilized by cost analysts when developing the LCCE. As stated earlier, a multidisciplinary team is the best way to obtain a quality product, given the breadth of quantification required. The CARD is a living document and should be updated as necessary.

6. GLOSSARY

AR	Army Regulation
CAIG	Cost Analysis Improvement Group
CARD	Cost Analysis Requirements Description
CFR	Code of Federal Regulations
CX	Categorical Exclusion
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESOH	Environmental, Safety, and Occupational Health
HAZMAT	Hazardous Material
HMMP	Hazardous Materials Management Plan
LCCE	Life-Cycle Cost Estimate
NEPA	National Environmental Policy Act
OPTEMPO	Operational Tempo
P2	Pollution Prevention
PESHE	Programmatic Environmental, Safety, and Occupational Health Evaluation
PM	Program Manager
POE	Program Office Estimate
USAEC	U.S. Army Environmental Center