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HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM

Leading the Way to Environmental Stewardship

An Assessment and Evaluation for Recycle/Reuse of Contaminated Process and Metallurgical Equipment at the DOE Rocky Flats Plant Site - Building 865

August 1993

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MASTER

Final Report

An Assessment and Evaluation for Recycle/Reuse of Contaminated Process and Metallurgical Equipment at the DOE Rocky Flats Plant Site - Building 865

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Preface

The U.S. Department of Energy (DOE) is evaluating the future mission for the Department's Weapons Complex in order that the goal of restoring the sites may be reached within the thirty years set by the Office of Environmental Restoration and Waste Management. Among other efforts, the cleanup will require decontamination and decommissioning of facilities used for research, development, production, testing, analysis, and storage.

The Decontamination and Decommissioning Program within the Office of Technology Development initiated a pilot project to assess and evaluate benefits of recycle, reuse, and resale for various equipment and materials associated with Building 865 at the Rocky Flats Plant Site, a research and development metallurgical facility there that has been shut down and designated for decontamination and decommissioning. The following document presents comparisons of the economies relative to disposal options for the waste that would be generated from a decontamination and decommissioning effort of Building 865.

Baseline costs were established for disassembly and burial of the metallurgical and process equipment in the building. Costs for this option were compared to three alternatives: (1) recycling as either scrap or as smelted metal; (2) reuse and resale within the government sector; and (3) resale for use in the private sector.

Two cost estimates for the baseline, landfill disposal alternative were developed to reflect the upper and lower boundaries for landfill fees. The upper boundary is based on costs derived from the use of landfill space at current commercial rates, and the lower boundary is based on the use of landfill space at current government rates. Similarly, cost estimates for each of the three alternatives were developed to reflect this great disparity in landfill fees, because each of the three alternatives involves the disposal of some material that is not suitable for the reuse or recycle option under consideration.

The results of comparing the recycle/reuse alternatives to the baseline (landfill alternative) indicated potential cost savings ranging from a low of \$1,346,200 (yielded by comparing the smelting alternative to the baseline using government disposal rates for both estimates) to \$25,600,000 (yielded by comparing the government transfer alternative to the baseline using commercial disposal rates for both estimates).

The following document outlines the methodology used for the development of costs and comparisons. Applicable federal and state regulations were incorporated, and a discussion of current policies and potential impacts has been included.

Executive Summary

Executive Summary

An economic analysis of the potential advantages of alternatives for recycling and reusing equipment now stored in Building 865 at the Rocky Flats Plant (RFP) in Colorado has been conducted. The inventory considered in this analysis consists primarily of metallurgical and process equipment used before January 1992, during development and production of nuclear weapons components at the site. The economic analysis consists of a thorough building inventory and cost comparisons for four equipment disposition alternatives. The first is a baseline option of disposal at a Low Level Waste (LLW) landfill. The three alternatives investigated are metal recycling, reuse with the government sector, and release for unrestricted use.

The work documented in this report fits within the overall planning framework for decontamination and decommissioning (D&D) at Rocky Flats. Specifically, the site's Transition Program Plan outlines specific plans for each building and states that an analysis shall be performed to determine the feasibility of releasing surplus equipment for unrestricted use. Complementing the Transition Program Plan is a general plant site D&D Plan that identifies the factors to be considered in this building-by-building feasibility analysis for unrestricted release:

- Value of each item
- Cost of disposing
- Cost of decontamination
- Contributions to waste management goals
- Risk to the public

This report provides item-by-item estimates of value, disposal cost, and decontamination cost. The economic evaluation methods documented here, the simple cost comparisons presented, and the data base provided as a supplement, should provide a foundation for D&D decisions for Building 865, as well as for similar D&D tasks at RFP and at other sites.

Two total costs are reported for disposing of all Building 865 equipment at a LLW landfill: \$ 4,854,000.00 and \$ 33,130,000.00. The first, much lower figure is based on assumptions of a contractor-provided work crew of 57, a support staff of 8, and a staff management team of 3 employed full-time over the course of two years. Note that disposal costs for this figure were calculated using a government rate of \$10/ft³. The second figure is based on the same staff and project duration assumptions, but on a much higher commercial disposal rate of \$400/ft³. Using this figure is an attempt to more thoroughly to account for costs that the government is likely to incur in disposing any or all of the RFP equipment, including the cost of closure, remediation, and the development of a landfill that adheres to strict construction and performance standards.

To determine the economic advantages of implementing the recycle/reuse alternatives instead of the baseline option, the decrease in cost was determined for each alternative. For each of the recycle/reuse alternatives—metal recycling, reuse within the government sector, and release for unrestricted use—estimates were formulated according to the following general methodology:

- Determine pieces of equipment suitable as candidates for each alternative, based on relevant factors such as degree of contamination, condition of equipment, potential market demand, and others.
- Estimate cost of necessary disassembly, decontamination, reassembly, or other cost elements, as well as potential revenue, for each piece of candidate equipment using assumptions detailed later in this report.
- Estimate disposal costs for non-candidate equipment using both governmental and commercial disposal rates, as was done in the estimate for the baseline option.

The total estimated costs for each of the alternatives represents the total potential for revenue generated by the qualifying equipment or material for that option minus the cost to dispose of any remaining equipment or material.

Once two total estimated costs for each option were generated (the first using the government disposal rate and the second using the commercial disposal rate), all were compared to the costs of the baseline, landfill disposal alternative. These simple comparisons identify the alternatives with the greatest potential for cost savings.

This report compares alternatives based on the rather unrealistic assumption that the selection of one of the three alternatives for disposition precludes the use of the other two. Of course, this is not the case. Maximizing the potential for cost savings or revenue generation will no doubt involve a combination of all of the options considered here.

All options offer a decrease in the total cost to the government compared to the baseline landfill option. See Figures S.1 and S.2 below. Assuming the use of a government waste disposal site, the range of cost savings is \$1,827,500 (38%) for transfer within the government to \$1,346,200 (28%) for recycling smelted metal. When using the commercial disposal rate to estimate costs for the baseline and alternatives, each of the three recycle/reuse alternatives offers a potential cost savings of approximately \$25,000,000 compared to the landfill disposal option.

The results of economic analyses presented here provide preliminary information that should prove useful to staff members at RFP in beginning to develop plans for the final disposition of Building 865 equipment. Another crucial component of final decision-making includes consideration of current and proposed policies that deal with disposition of equipment—particularly unrestricted release.

Planners and policy makers will find that the majority of impediments to implementing the most attractive economic alternatives, in combinations that will optimize savings, relate to current policies and institutional reluctance.

While current guidance in DOE Order 5400.5 does not clearly indicate requirements for restricted and unrestricted release criteria, a newly proposed rule, 10 CFR 834, does. Of particular interest to this economic analysis is the provision for free release of equipment previously used in radiation areas. Also of interest is the provision for determination of limits for volumetric, as well as surface contamination. (The process of determining volumetric contamination limits is illustrated in Section 3.1 of this report.) International experience provides examples of release limits used in various situations that may inform the process of establishing criteria for free release in the U.S.

Figure S.1 Cost Comparison of Baseline and Alternatives
Using Current Government Rate To Estimate Disposal Cost

Figure S.2 Cost Comparison of Baseline and Alternatives
Using Current Commercial Rate to Estimate Disposal Costs

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The proposed rule appears to reinforce the aims of D&D, including the ALARA principle, environmental compliance, and waste minimization. However, the culture at some DOE sites appears to stand in the way of achieving these aims within the proposed regulatory framework. In particular, institutional controls at RFP appear to reflect both overly cautious and sometimes erroneous interpretations of current DOE guidance and, to an even greater degree, reluctance to embrace the proposed guidance.

Clearly, the optimal cost savings to the government for the equipment disposition challenges that will be the focus of a great deal of work into the next century will involve establishing and enforcing policies that accomplish two objectives. First is protecting the public in accordance with accepted risk factors. Second is encouraging DOE sites to realistically consider several recycle/reuse alternatives for each piece of equipment. Related to this second objective is the need for training and other measures to overcome largely unexamined biases against unrestricted release of previously contaminated equipment that stem from the fear of liability and other historical features of the DOE culture.

A computerized, cost estimating database has been developed to allow easy modifications as assumptions are further refined. The disc provided with this report is intended for use with any DOS-based computer (version 4.0 or higher and 2 MB of RAM). In addition, the disc includes a FoxPro Run-time Library, and therefore, purchase of FoxPro database software is not required. Input screens allow the user to easily change values for the variable multipliers, such as labor rates, burial costs, and decontamination costs, while fixed values such as weight, volume, and surface area of equipment; labor estimates; equipment sales prices; and others remain constant. Simple output routines allow printing of "what-if" scenarios for data exploration, a function that will be useful in combining various alternatives to optimize the potential for cost savings and for waste minimization.

Glossary

Glossary of Terms

41 CFR 101—Federal regulation governing the disposition of surplus government equipment, including utilization, sale, abandonment, or destruction.

ALARA Principle—As Low as Reasonably Achievable (ALARA) is a phrase (acronym) used to describe an approach to radiation protection to control or manage exposures (both individual and collective to the work force and the general public) and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit, but rather it is a process that has as its objective the attainment of dose levels as far below the applicable limits of the relevant regulations as possible.

baseline alternative—The baseline alternative, burial of Building 865 equipment, represents the "worst case scenario" from an economic standpoint. That is, for the purposes of the baseline estimate, all equipment is assumed to have no economic worth. Furthermore, it is assumed for this option that the cost of decontamination, and subsequent sampling and surveying to verify decontamination, is prohibitive. The total estimated cost for this option reflects the assumption that all Building 865 equipment would be removed directly to a LLW landfill.

decommissioning—The process of removing a facility from operation, which may include decontamination, entombment, dismantlement, or conversion to another use.

decontamination—The removal of unwanted material (typically radioactive material) from facilities, soils, or equipment by washing, chemical action, mechanical cleaning, or other techniques.

disposition—See entry for 41 CFR 101.

excess personal property—Any personal property under the control of any Federal agency which is not required for its needs and the discharge of its responsibilities, as determined by the head of that agency.

exposure—Contact with a chemical or physical agent.

Federal Disposal Condition Codes—Codes established in 41 CFR 101 used to determine the status or state of useability of Federally owned property.

free release—Property meeting strict "no contamination" criteria may be released with no restrictions on its future use.

government sector—As used in this document, any agency of the Federal government or any state or local government body.

Glossary of Terms (continued)

inventory—As used in this report, that subset of the equipment and material in Building 865 at the Rocky Flats Plant Site considered for the baseline and recycle/reuse alternatives covered here.

Low Level Waste—Materials that are contaminated by less than 5×10^{-5} $\mu\text{Ci}/\text{ml}$ of mixed fission products.

recycling—Converting solid waste into new products by using the resources contained in discarded materials, including industrial scrap.

restricted use—As used in this document and in DOE Order 5400.5, DOE exercises its authority to release property from its control after confirming that residual radioactive material (over which DOE has authority) on the property has been determined to meet the guidelines for residual radioactive material in Chapter IV of the Order or any other applicable radiological requirements. There may be instances in which DOE or another authority will impose restrictions on the management and/or use of the property if the residual radioactive material guidelines of Chapter IV of the Order are not met or if other applicable Federal, state or local requirements cause the imposition of such restrictions.

reuse—The reintroduction of a waste material or product into the economic stream without any chemical or physical change.

risk assessment—A qualitative or quantitative evaluation of the environmental and/or health risks resulting from exposure to a chemical or physical agent (pollutant); combines exposure assessment results with toxicity assessment results to estimate risk.

scrap—Personal property that has no value aside from its basic material content.

surplus—Any excess personal property not required for the needs or for the discharge of responsibility of Federal agencies, as determined by the Administrator of General Services.

surface contamination—Radioactivity per unit surface area, expressed in disintegrations per minute.

Transition—The process of planning and carrying out the transfer to the Office of Environmental Restoration and Waste Management (EM) of production plants undergoing a mission change. Transition involves safely deactivating unneeded facilities and overseeing their smooth transfer to EM, where they may be either cleaned up or prepared for reuse.

Glossary of Terms (continued)

unrestricted use—See "free release."

volumetric contamination—Radioactivity per unit volume or mass in equipment and material resulting from years of use in radiation areas. Expressed as a mass concentration.

Acronyms

Abbreviations and Acronyms

As Low As Reasonably Achievable	ALARA
Atomic Energy Commission	AEC
Below Regulatory Concern	BRC
Becquerel	Bq
Bureau of National Affairs	BNA
Code of Federal Regulations	CFR
Comprehensive Environmental Response Compensation and Liability Act	CERCLA
Decontamination and Decommissioning	D&D
disintegrations per minute	dpm
direct numerical control	DNC
Environmental Restoration and Waste Management feet	EM ft.
Fiscal Year	FY
Health and Safety Plan	HSP
inches	in.
high efficiency particulate air (filter)	HEPA
International Atomic Energy Agency	IAEA
International Commission on Radiological Protection	ICRP
Low Level Waste	LLW
Low Specific Activity	LSA
Management and Operating	M&O
Mega Watt	MW
Memorandum of Understanding	MOU
micro Curie	μCi
micro Sievert	μSv
milli Sievert	mSv
millirem	mrem
nano Curies	nCi
National Priorities List	NPL
Nevada Test Site	NTS
Nuclear Regulatory Commission	NRC
Office of Environmental Health and Safety	EH-1
Percent of sealand container	SL%
Polychlorinated biphenyls	PCBs
Radioactive Material Management Area	RMMA
Radiological Controlled Area	RCA
Radiological Engineering	RE
Radiological Operational Instructions	ROI
Research and Development	R&D
Resource Conservation and Recovery Act	RCRA

Abbreviations and Acronyms (continued)

Rocky Flats Plant

Transition Program, U.S. Department of Energy

Toxic Substance Control Act

unrestricted use

U.S. Environmental Protection Agency

U.S. Department of Defense

U.S. Department of Energy

U.S. Department of Transportation

vertical turret lathe

year

RFP

EM-60

TSCA

URU

EPA

DoD

DOE

DOT

VTL

yr.

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1.0 Introduction

The U.S. Department of Energy (DOE) Headquarters Office of Technology Development has conducted an economic analysis of the potential advantages of alternatives for recycling and reusing equipment now stored in Building 865 at the Rocky Flats Plant (RFP) in Colorado. The inventory consists primarily of metallurgical and process equipment used before January 1992, during production of nuclear weapons components at the site. Briefly, this economic analysis consists of a thorough building inventory and cost comparisons for four equipment disposition alternatives: disposal at a Low Level Waste (LLW) landfill, metal recycling, reuse with the government sector, and release for unrestricted use. Details of the cost estimate calculations comprise Section 1.1 and Section 2.0 of this report.

Since 1992, the mission at RFP has been environmental cleanup. Beginning in FY 1993, responsibility for the site is being transferred from Defense Programs to Environmental Restoration and Waste Management (EM). As a part of the Transition Program (EM-60), the major focus for work at the site is on planning for Decontamination and Decommissioning (D&D) of the various facilities.

The work documented in this report fits within the overall planning framework for D&D at Rocky Flats. Specifically, the site's Transition Program Plan, which outlines specific plans for each building, states that an analysis shall be performed to determine the feasibility of release of the surplus equipment for unrestricted use. Complementing the Transition Program Plan is a general plant site D&D Plan that identifies the factors to be considered in this building-by-building feasibility analysis for unrestricted release:

- Value of each item
- Cost of disposing
- Cost of decontamination
- Contributions to waste management goals
- Risk to the public

This report provides item-by-item estimates of value, disposal cost, and decontamination cost. In addition, a sample exposure scenario and calculated concentration limits in Section 3.1 illustrate the method for calculating standards for free release of volumetrically contaminated equipment. Seven steps in credible cost estimating and planning for D&D are documented in this report.

- 1.) Thorough on-site equipment characterization, verified by professional brokers to be sufficient for future needs.
- 2.) Field research to determine the market value of equipment and scrap.
- 3.) Comprehensive formulation of computational models for each disposition alternative, developed by personnel with years of experience with similar equipment at DOE facilities.
- 4.) Documentation of site-specific cost estimates by personnel familiar with DOE facilities and operations. These estimates include:
 - Activity-dependent costs directly relating to worker's hands-on activities to disassemble, package, decontaminate, etc.
 - Period-dependent costs reflecting contractor and staff costs to manage programs through their duration

Collateral costs encompassing capital equipment purchases, health physics supplies, energy, licenses, insurance, taxes, and permits
Salvage and scrap values estimating the potential market value of equipment and scrap

Contingency costs including allowances for unanticipated cost overruns, such as rising disposal costs due to the limited availability of LLW landfill space and for the standard 30% contingency for fixed-price subcontractors

- 5.) Development of a data base to organize information and compute costs.
- 6.) Comparison of estimated costs to baseline, burial alternative.
- 7.) Consideration of policies and regulations that limit the implementation of economically attractive disposition alternatives.

The economic evaluation methods documented here, the simple cost comparisons presented, and the data base provided as a supplement, should provide a foundation for D&D decisions for Building 865, as well as for similar D&D tasks at RFP and at other sites.

One important aim of this report is to provide a source of information for decision-making by DOE program managers. Economically attractive options--those with the potential to save significant amounts of money while reusing or recycling existing resources--are balanced against relevant policies that some view as limiting the disposition alternatives.

Finally, the comprehensive, systematic approach and discussion is intended to be accessible to stakeholders among the general public who are participating in DOE's cleanup efforts.

1.1 Economic Analysis Methodology—Overview

Three alternatives for recycling and reusing Equipment in Building 865 are compared to a baseline estimate for disposal at an LLW landfill. These three alternatives are: (1) recycling, either as scrap metal or as ingots produced on-site by smelting; (2) transferring equipment for reuse at other government organizations; and (3) selling equipment to non-government organizations. The major assumptions underlying the estimates for the baseline and each of the three alternatives are briefly outlined in Table 1.1a below. As will be noted, these assumptions primarily encompass uncertainties about project duration and the decontamination process. More specific assumptions and other decision making criteria are discussed as each of the alternatives are presented in Section 2.0.

**Table 1.1a—Assumptions Underlying Cost Estimates
for Baseline and Alternatives**

Alternatives	Major Assumptions
Baseline Option—Disposal at a Low Level Waste Landfill	<ul style="list-style-type: none"> • Project Life—2 years • Procurement/Contract—Equipment Removal Contractor • Minimal Disassembly for Packaging • No Decontamination
Recycling Scrap Metal Smelted Ingots	<ul style="list-style-type: none"> • Project Life—2 years • Decontamination Facility Required (Capital and Operating) • Equipment Removal Conducted by a Subcontractor <ul style="list-style-type: none"> • Project Life—2 years • Procurement of Equipment Removal Contractor • Minimal Disassembly for Smelting • On-Site Equipment Used for Smelting to Produce Ingots • Smelting Process Is Effective for Decontamination (DOE, August 1991)
Transfer for Reuse Within the Government Sector	<ul style="list-style-type: none"> • Both Contaminated and Non-Contaminated Equipment May Be Considered
Release for Sale to Non-Government Organizations	<ul style="list-style-type: none"> • Project Life—2 years • Decontamination Facility Required • Public Sale In Accordance With 41 CFR 101

The cost for the baseline has been determined using Equation 1, shown in Appendix A. Each cost element of the equation was developed based on assumptions that are discussed in detail in Section 2.1 below. Two total costs are reported for the baseline option, \$ 4,854,000.00 and \$ 33,130,000.00. This first, much lower figure is based on a contractor-provided work crew of 57, a support staff of 8, and a staff management team of 3 employed full-time over the course of two years. Disposal costs for this figure were calculated using a government rate of \$10/ft³.

The second figure is based on the same assumptions, except that a commercial disposal rate of \$400/ft³ was used in an attempt to account for unpredictable costs that the government may incur, including the cost of closure, remediation, and the development of a landfill that adheres to strict construction and performance standards.

The costs for the three recycling and reuse options have been estimated using Equations 2, 3, 4, and 5 in Appendix A. These equations account for increases or decreases in the number of personnel required for each alternative. Details of the estimating process for each of the alternatives are discussed in Sections 2.2, 2.3, and 2.4. The total estimated cost for each of the three alternatives, as well as the estimates for the baseline option, appear in Table 1.1b below.

Table 1.1b Comparison of Economic Alternatives

Alternative	Estimated Cost		Cost Increase (or Decrease) Compared to Baseline	
Landfill (Baseline)	\$4,854,000 ¹	\$33,130,000 ²	---	
Recycle				
Scrap	\$3,095,500 ¹	\$7,504,500 ²	(\$1,758,500) ¹	(\$24,967,500) ²
Smelt	\$3,507,800 ¹	\$8,162,500 ²	(\$1,346,200) ¹	(\$24,619,500) ²
Government Transfer	\$3,026,500 ¹	\$7,435,500 ²	(\$1,827,500) ¹	(\$25,600,500) ²
Unrestricted Sale to the Public	\$3,421,500 ¹	\$7,830,500 ²	(\$1,432,500) ¹	(\$25,300,000) ²

¹—Reflects estimated government disposal rate of \$10/ft³

²—Reflects estimated commercial disposal rate of \$400/ft³

Cost estimates for each of the three alternatives have been calculated for the pieces of equipment that qualify based on relevant criteria, such as potential commercial value, metal content, or need within the government sector. Documentation of qualifying equipment for each alternative appears in Appendix B. The method of categorization was based on assigned condition codes, as well as on the suspected level of contamination and on the metal content, where applicable.

Total estimates are based on the number of personnel assumed to be required to implement each alternative for the qualifying equipment. The cost of necessary capital equipment required to complete the work has, in most cases, been prorated over 10 to 15 year periods, and the cost during the first two years has been used in calculations. This method avoids inflating the estimates with the full expense of capital equipment, such as decontamination facilities, that will be available for use after the work described in this report is complete. A description of the equipment purchases considered necessary is provided in Appendix C.

The total estimated cost for each of the three alternatives represents the total potential for revenue generated by the qualifying equipment or material for that

alternative minus the cost to dispose of any remaining material as described in the baseline option. These estimates are described in detail in Section 2.0. Cost backup data for the discussions in Section 2.0 are provided in Appendix D.

Once a total estimated cost for each option was generated, all were compared to the cost of the baseline, landfill disposal, alternative. This simple comparison identifies the alternative with the greatest potential for cost savings. Discussions of the potential for cost savings for each alternative are also tempered to reflect state, federal, and DOE policies and other circumstances that may limit the realization of the estimated savings.

As stated, this report compares alternatives based on the rather unrealistic assumption that the selection of one of the three alternatives for disposition precludes the use of the other two. Of course, this is not the case. Maximizing the potential for cost savings or revenue generation will no doubt involve a combination of all of the options considered here. The data provided in Appendix B of this report, along with the computerized database accompanying this report, will allow more detailed planning and estimation.

The computerized, cost estimating database has been developed to allow easy modifications as assumptions are further refined. The disc provided with this report is intended for use with any DOS-based computer (version 4.0 or higher and 2 MB of RAM). In addition, the disc includes a FoxPro Run-time Library, and therefore, the user need not purchase the FoxPro database software. Input screens allow the user to change values for the variable multipliers, such as labor rates, burial costs, and decontamination costs, while fixed values such as weight, volume, and surface area of equipment; labor estimates; equipment sales prices; and others remain constant. Simple output routines allow printing of "what-if" scenarios for data exploration, a function that will be useful in combining various alternatives to optimize the potential for cost savings and waste minimization.

1.2 Policy Implications—Overview

The alternatives under consideration were developed as potential options for disposition without regard to state and federal policies and procedures that may limit the viability of any alternative. Some alternatives that involve unrestricted release of equipment are controversial, and policies concerning release limits are currently under development. Section 3.0 of this report discusses the participants involved in the development of release guidelines and also presents the status of their development. The participants include DOE, the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA), the U.S. Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the State of Colorado Department of Health, and the RFP. Figure 1.2 presents a summarized flow diagram of the surplusing process for federal equipment, and more details of the process steps appear in Appendix E.

Also included in section 3.1 is a sample exposure scenario for a free-release level for volumetric contamination using the proposed DOE approach.

FIGURE 1.2 SURPLUS EQUIPMENT PROCESS FLOW DIAGRAM.

1.3 Equipment--Overview

As a foundation for the economic analysis, the physical condition and technological status of the equipment was evaluated. From visual inspections, a disposal condition code (as defined in 41 CFR 101-43.4801) was determined. Pieces of equipment with Federal Disposal Condition Codes of 6 or higher were considered for the disposal option only. Pieces of equipment with Federal Disposal Condition Codes of 5 or lower, or those classified "S" were considered for the recycle, reuse, or release options. (See Appendix B for the assigned condition codes.)

The research and development (R&D) mission of this facility dictated that the equipment be of small capacity for very low production and "state of the art" in application. A superlative maintenance program, coupled with very low usage, leaves the equipment in near mint condition. The proposed decontamination process promises to preserve this quality. Some of the metal forming and removal machines, manufactured in the late 1960's, are now worth more than their original cost, because they contain large cast iron components no longer available in the United States. In fact, industrial users are routinely willing to pay more for the older cast-based machines than the newer weld-based machines that replaced them. Table 1.3 below provides an overview of equipment classes and the likely disposition routes.

Reuse of the equipment within the DOE system or within other government sectors was also explored. As a result of the DOE decision to move to a smaller, more centralized weapons complex, many DOE sites face the same situation as the RFP—an abundance of surplus equipment. Also, the many sites with an environmental restoration and waste management mission have little demand for metallurgical and process equipment.

Historically, the Department of Defense (DoD) would seem to be a likely candidate for using the equipment in government-owned, contractor-operated R&D production facilities as well as for the maintenance of defense equipment. However, DoD currently faces the same trend in down-sizing as does DOE, and is planning the sale of a large inventory of surplus machining and metalworking equipment.

Table 1.3 Overview of Equipment Classes and Likely Disposition

Equipment	Potential Users	Disposition
<p><u>Laboratory Equipment.</u> State-of-the-art metallurgical laboratory equipment used for characterizing metal samples (hardness, grain structure, tensile strength, surface finish, etc.) and the preparation of samples. This equipment is new (acquisition dates mostly 1990-1992) and the instruments calibrated and certified.</p>	<p>Metallurgical labs, physics labs, and R&D facilities. Items 1 through 32 will be of particular interest to virtually all colleges and universities.</p>	<p>Practically all pieces of this equipment are candidates for disposition at some step in the Surplusing Process including, transfer, donation or sale.</p>
<p><u>Machining.</u> Lathes, milling machines, drill presses, grinders, etc. These are standard machine tools with manual controls (except item 51, Series II Bridgeport-DNC Control) with acquisition dates ranging from 1968 to 1991. With the exception of the 64" VTL, all are small tool room class machines with superior accuracies normally associated with that class of machine tools. The 64" VTL is a mid-sized VTL originally built in the late 60's and transferred to RFP in 1991. All these machines are in excellent condition and carry a Federal Disposal Condition Code of 4 with a few 5's. Includes equipment list items 35 through 72, 97 and 98 .</p>	<p>R&D facilities, job shops, DOE and other federal agencies bent on upgrading machine tool inventories, and educational institutions, particularly those with Vocational Training Programs.</p>	<p>Almost all pieces of the equipment are candidates for disposition at some step in the Surplusing Process, including recycling, transfer and sale. In fact, much of this equipment will find an aggressive commercial market.</p>

Table 1.3 (continued)
Overview of Equipment Classes and Likely Disposition

Equipment	Potential Users	Disposition
<p><u>Metal Cutting.</u> Band saws, cut off saws and shears. These are standard metal cutting machines with small to medium capacities with acquisition dates ranging from 1969 to 1992 (all but items 34, 62, 118 and 119 are 1991 and 1992 acquisitions). All equipment is in excellent condition and carries Federal Disposal Condition Codes of 4 and 5. Includes equipment list items 34, 41, 45, 62, 86, 94, 117, 118, 119, 140 and 141.</p>	<p>R&D facilities, job shops, DOE and other federal agencies bent on upgrading machine tool inventories, and educational institutions, particularly those with Vocational Training Programs.</p>	<p>Almost all pieces of the equipment are candidates for disposition at some step in the Surplus Process, including recycling, transfer and sale. In fact, much of this equipment will find an aggressive commercial market.</p>
<p><u>Metal Forming.</u> Draw benches, roll formers, rolling mills, hydro formers, swagers, and forging forming and extrusion and isostatic presses. These are standard commercial machines with small to medium capacities. All are in excellent condition with Federal Disposal Condition Codes of 4 and 5. Acquisition—1968 to 1992.</p>	<p>R&D facilities, and job shops:</p> <ul style="list-style-type: none"> • Production of small batches of thin wall shapes (121, hydrosin and 148, 150-ton press). Re-rolling alloy strip (135 and 136) strip and foil rolling mills, alloy billet rolling, hot or cold, (137, 24" rolling mill), hot and cold extrusion (2000-ton extrusion press). • Conventional forging (144, 5000-pound forging hammer and 145 and 146, swagers). • Hydraulic and high pressure tubing production (96, draw bench and 145 and 146, swagers). • Compaction/molding of metal (or ceramic) powder (120 and 158, isostatic presses). 	<p>Almost all pieces of the equipment are candidates for disposition at some step in the Surplus Process, including recycling, transfer and sale. In fact, as much as half of the equipment in this category has potential to be offered for public sale.</p>

Table 1.3 (continued)

Overview of Equipment Classes and Likely Disposition

Equipment	Potential Users	Disposition
<p><u>Heat Treating.</u> Furnaces and their auxiliaries for heat treating (annealing and solution hardening) pyrophoric and/or air corroding metals. Atmospheres include nitrogen, argon, and helium (no helium) and full vacuum. Temperature range from 1200 to 1600 C. Resistance and induction size range from 6" diameter x 6" long to 60" diameter x 50" long heated chamber, vertical and horizontal loading configurations. These are state-of-the-art heat treating units with small to medium capacities and very high temperatures. They are in excellent condition with Federal Disposal Condition Codes of 4 and 5 and procurement dates ranging from 1970 to 1992.</p>	<p>R&D facilities, specialty heat treaters, particularly those involved with high temperature metals and their alloys. The physical size and minimal environmental impact would make them equally at home in a laboratory or industrial setting. Specifically these are items 93, 108 through 113, and 149.</p>	<p>Almost all of the pieces of equipment are candidates for disposition at some step in the Surplusing Process, including recycling, transfer and sale. In fact, many will find a very receptive industrial market.</p>
<p><u>Metal Melting.</u> Items 99—Electron Beam Furnace and 15—Vacuum Induction Furnace. The units were acquired in 1970 and 1990 respectively and both carry a Federal Disposal Condition Code of 4. These are state-of-the-art laboratory size units for melting and casting high purity, high temperature metals.</p>	<p>R&D facilities and any laboratory engaged in basic metallurgical research.</p>	<p>Candidates for disposition at some step in the Surplusing Process, most probably transfer or sale.</p>

2.0 Economic Analysis of Alternatives for Disposition

This section describes the four disposition alternatives under consideration, including details of the activities considered necessary to conduct work under each alternative. Further details supporting the cost estimates are provided in Appendix D.

The economic analysis depends on the development of credible cost estimates. Therefore, each option was broken down into the activities that are expected to be required, and estimates were made for the various operating, management and capital costs associated with each activity. All cost estimates are fully documented to allow future refinements. The cost estimates were developed to the level of detail commonly used at the conceptual design phase of engineering projects. In addition, the equations for calculating each estimate, presented in Appendix A, have been computerized to allow easy incorporation of future changes or refinements.

To evaluate the potential increase or decrease in the cost of implementing each of the three alternatives compared to the baseline, estimated costs and revenues have been calculated for the pieces of equipment that qualify for an alternative based on relevant criteria, such as metal value, potential demand in the government sector, or commercial value. Documentation of qualifying equipment for each alternative appears in Appendix B. The method of categorization was based on assigned condition codes, as well as on the suspected level of contamination and on the metal content, where applicable. In each alternative, the equipment that does not qualify is disposed of as described in Section 2.1 below, and costs estimated accordingly for inclusion in the grand total estimated cost for the option.

2.1 Baseline Alternative—Landfill Disposal

The baseline alternative, burial of Building 865 equipment, represents the "worst case scenario" from an economic standpoint. That is, for the purposes of this estimate, all equipment is assumed to have no economic worth. Furthermore, it is assumed for this option that the cost of decontamination, and subsequent sampling and surveying to verify decontamination, is prohibitive. In such cases, the procedures outlined in 10 CFR 101-45.9, Abandonment or Destruction of Personal Property; 48 CFR 45.603, Disposal Methods; 48 CFR 45.611, Destruction or Abandonment; and 48 CFR 45.613, Property Disposal Determination, would be invoked to classify the equipment as waste for disposal in an approved LLW landfill.

The total estimated cost for this option reflects the assumption that all Building 865 equipment would be removed directly to a LLW landfill.

2.1.1 Assumptions Underlying the Landfill Disposal Alternative

The following major assumptions were used to develop the cost estimate for the baseline option:

- 2-year project life
- Equipment disassembly, removal, and packaging conducted by a subcontractor
- Disassembly and/or volume reduction includes only the minimum for

- packaging
- Packaging in 20' x 8' x 8' sealand containers with a 40,000 lb. weight limit (U.S. Department of Transportation (DOT) regulation)
- No decontamination
- The waste is classified as a mixed waste (U-238 and beryllium contamination)
- Management and compliance activities will be conducted by a DOE-RFP Management and Operating (M&O) contractor staff
- Removal of all fluids from equipment
- Drained oils, coolants, and lubricants are Toxic Substance Control Act (TSCA) regulated waste only

2.1.2 Elements of the Landfill Disposal Cost Analysis

Figure 2.1 shows a schematic of the elements used in developing a comprehensive estimate of the cost of disposing of the Building 865 equipment. Appropriate cost categories, including operations, management, regulatory compliance, transportation, and disposal were included for each element. A brief description of the cost elements is provided below.

2.1.2.1—Cost of Removal and Disposal of Hydraulic and Coolant Oils

Before disposal, the coolant and lubricant fluids will be drained and the reservoirs flushed with cleaning solvents. The likelihood of fluids containing PCBs is high for equipment that was in service during the early 1970s, as DOE, then the Atomic Energy Commission (AEC) promoted the use of PCB-laden fluids as a part of an agency-wide fire protection program. Cost estimates were based on disposal (incineration) of the drained fluids plus two reservoir volumes of cleaning solvents to flush any residual PCBs and ensure compliance with the TSCA limits for PCB contamination. Costs for labor to drain, flush, and package have been estimated, as well as costs for transportation, disposal, and materials. The following calculation was developed to determine a cost for each item in this category. This estimate of disposal costs is for TSCA wastes only. Note that the estimated average labor cost per item for this step is \$200.

$$\text{Per Item Cost} = \$200 + \$34.15 * (\text{gallons to be disposed}).$$

Costs for disposal of TSCA/LLW wastes are considerably higher, and should be estimated according to the following equation:

$$\text{Per Item Cost} = \$200 + \$115.15 * (\text{gallons to be disposed}).$$

**Cost of Removal and
Disposal of Hydraulic and
Coolant Oils**

+

**Cost of Labor and Equipment
for Disassembly and Removal to
a Staging Area**

+

**Cost of Additional
Disassembly, Cutting,
and/or Shredding
Necessary for Packaging**

+

**Cost of Shipping Containers
and Transportation**

+

**Landfill Fees and
Surcharges**

+

**Cost of Management and
Regulatory Compliance**

=

Cost of Landfill Disposal

Figure 2.1

Cost Elements for Baseline Alternative - Landfill Disposal

2.1.2.2—Cost of Labor and Equipment for Disassembly and Removal to a Staging Area

The disassembly of equipment and removal of components to a staging area will be conducted by a fixed-price subcontractor. The cost for equipment disassembly and removal was developed by assuming that work crews would be variably comprised, designed to include persons with the minimum skills required to work with particular types of equipment (such as milling machines, furnaces, extrusion presses, etc.). Once appropriately qualified crews were defined for particular types of equipment, the time required for the disassembly and removal of individual pieces of equipment was estimated. Costs for this element include only the resources and equipment required to disassemble the equipment and remove components to a staging area. Cost varied greatly depending on equipment size and complexity, ranging from < \$200.00 per piece to \$66,000 per piece.

2.1.2.3—Cost of Additional Disassembly, Cutting, and/or Shredding Necessary for Packaging

Any additional volume reduction necessary for packaging will be conducted by a fixed-price subcontractor. As discussed in the disassembly element above, appropriately qualified crews were defined for the various classes of equipment likely to require this additional step. Final labor estimates were based on the amount of time required to disassemble each of these pieces of equipment for packaging. Only the minimum reduction in volume for packaging was used to formulate this estimate. Packaging in compliance with DOT regulations was considered.

2.1.2.4—Cost of Shipping Containers and Transportation

It was assumed that sealand containers would be used for disposal, as their use on large jobs reduces handling costs. When using these relatively large containers, a major constraint will be the weight limit. Much of the equipment is constructed of dense material, and will fill only a fraction of the volume of these containers when, in fact, the weight limit of the container has been reached. Cost estimates are based on the total number of partially filled (volume) sealand containers that will be required to accommodate the estimated weight of equipment to be disposed. Additional costs for blocking to limit the likelihood of shifting loads within the containers was included. These costs are estimated to average \$7,550 per sealand container.

2.1.2.5—Landfill Fees and Surcharges

Cost estimates were developed for burial of LLW at both current government facilities and commercial facilities. Current government cost does not reflect the added cost of operating a LLW landfill within the regulatory framework. Commercial rates do reflect these costs and include items such as public involvement, design and construction of facilities that meet or exceed current design criteria, and state imposed surcharges. Using the commercial rate provides a potential future cost to the DOE for burial, either for using commercial facilities or for operational changes at DOE facilities.

DOE burial rates ranged from \$10/ft³ at the Nevada Test Site (NTS) to approximately \$60/ft³ at Hanford. Commercial rates ranged from \$300 to \$500/ft³ depending on the site. An international cost comparison of nuclear waste disposal (Vira, 1992) reported the disposal price for the U.S. between \$100 and \$600/ft³, depending on the type of waste. For this study, the government disposal rate used was \$10/ft³ and the commercial rate used was \$400/ft³. Total burial costs for one sealand container are estimated at \$12,800 using the current government rate and \$512,000 using the estimated commercial rate.

2.1.2.6—Cost of Management and Regulatory Compliance

Cost estimates for regulatory and management activities include planning and management of the various activities conducted by both subcontractor and M&O staff. These include equipment removal, waste packing, and health and safety surveillance. In addition to regular management, a staff will be needed to develop waste management plans, complete the necessary documentation to meet waste acceptance criteria, adhere to regulatory compliance activities to declare equipment and scrap as waste, manifest waste shipments, and correspond to state and federal regulatory agencies. Estimates for the staff requirements to conduct these activities for the landfill disposal option were developed and include the following:

- 1 Program Manager
- 2 Project Managers
- 6 Regulatory Compliance Support Staff
- 2 Administrative Support Staff

2.1.3 Summary of the Land Disposal Cost Estimate

The estimated costs for the baseline alternative are summarized in Table 2.1 below. Approximately 57 sealand containers are estimated to require disposal under this alternative. Two totals are provided to reflect the potential cost to government for landfill fees. The first total reflects the current government rate of \$10/ft³. This rate is being re-evaluated by the NTS and is likely to increase for FY '94. The second total is more reflective of the real cost to the government, which will include elements such as future changes in closure and remediation regulations.

Table 2.1 Cost Summary for Baseline Alternative

Cost Element	Cost Estimate for the Element
Cost of Removal and Disposal of Hydraulic and Coolant Oils	\$173,000.00
Cost of Labor and Equipment for Disassembly and Removal to a Staging Area	\$538,000.00
Cost of Additional Disassembly, Cutting, and/or Shredding Necessary for Packaging	\$222,000.00
Cost of Shipping Containers and Transportation	\$433,000.00
Landfill Fees and Surcharges	\$724,000.00 ¹ \$29,000,000.00 ²
Cost of Management and Regulatory Compliance	\$2,764,000.000
Grand Totals	\$4,854,000.00 ¹ \$33,130,000.00 ²

¹—Reflects estimated government disposal rate of \$10/ft³.

²—Reflects estimated commercial disposal rate of \$400/ft³.

This option is considered the "worst case scenario" from an economic standpoint, and it is also the least desirable when considering the waste minimization hierarchy established by the National Pollution Prevention Act of 1990. This act stipulates that a landfill option should only be pursued after all other options are found to be impractical.

Estimates developed in the following sections will be compared to the baseline totals in Table 2.1 and summarized in Section 2.5.

2.2 Metal Recycling

In recent years, changes in the regulatory and political climate have increased the awareness of potential impacts to the environment from waste treatment, storage, and disposal. Both regulators and management have begun to develop and implement waste minimization plans that reduce or eliminate the generation of wastes. In an effort to estimate the economic impacts of such waste minimization efforts for the D&D of Building 865 equipment, estimates have been developed for two recycling alternatives, namely, segregating and decontaminating metals as scrap, and smelting metals to produce ingots for future use.

Note that these cost analyses account only for the estimated value of the scrap or the ingots as raw materials. Neither further refinements of the scrap, nor further uses of the ingots (for applications such as constructing shielding or LLW boxes) are proposed here. An economic evaluation of the best alternatives for final use of scrap or of ingots is beyond the scope of this report.

The following section outlines the approach used to develop cost estimates for these two alternatives.

2.2.1 Assumptions Underlying the Metal Recycling Alternatives

The economic analysis of metal recycling alternatives includes consideration of two possible plans for recycling the metal content of the equipment. These two (2) scenarios are:

Recycle Scenario 1

Recycle as scrap metal—segregate and decontaminate

Assumptions:

- Decontamination facilities required
- Disassembly includes only the minimum required for decontamination

Recycle Scenario 2

Recycle as ingots—smelt to decontaminate

Assumptions:

- Disassembly includes only the minimum required for smelting
- Use of on-site equipment (including smelter) to perform work
- The alternative involves the production of an ingot
- Smelting process is effective for decontamination (DOE, August 1991)

In addition to these scenario-specific recycle assumptions, the following are the major assumptions used to develop the cost estimates for both methods of recycling the metal:

- 2-year project life
- Equipment disassembly conducted by a subcontractor
- Management and compliance activities will be conducted by a DOE-RFP M&O contractor staff
- Removal of all fluids from equipment
- Drained oils, coolants, and lubricants are TSCA regulated waste only

2.2.2 Elements of the Metal Recycling Cost Analysis

Figures 2.2a and 2.2b show schematics of the elements used in developing a comprehensive estimate of the cost of disposition of the Building 865 equipment by disassembling and either recycling as scrap metal or recycling as smelted metal. Appropriate cost categories, including operations, management, regulatory compliance, transportation, and disposal were included for each element. A brief description of the cost elements is provided below.

2.2.2.1—Cost of Removal and Disposal of Hydraulic and Coolant Oils

See Section 2.1.2.1 for a discussion of this cost element.

2.2.2.2—Cost of Labor and Equipment for Disassembly and Removal to a Staging Area

The disassembly of equipment and removal of components to a staging area for both decontamination and smelting will be conducted as described in Section 2.1.2.2 earlier in this report.

2.2.2.3—Cost of Additional Disassembly and Segregation to Prepare for Decontamination or Smelting

In addition to disassembly, smelting requires segregating of metals and the further reduction of the components to a size that can be accommodated by the charging opening of the smelter. The smelter is assumed to be an arc furnace with a 3000-pound ingot mold and a 3-inch diameter charging opening. The metals selected for smelting will be limited to cast iron and steel. The non-ferrous metal content of the equipment is considered to be negligible.

Similarly, decontamination requires segregation of metals and reduction of the components to a suitable size. Although it is possible to decontaminate larger pieces than can be accommodated by the smelting operation, the cost estimates for disassembly in this step are based on the size limitations of the smelting operation. The metals selected for decontamination will be limited to cast iron and steel.

This additional volume reduction necessary for either decontamination or smelting will be conducted by a fixed-price subcontractor. As discussed in the disassembly element above, appropriately qualified crews were defined for the various classes of equipment likely to require this additional step. Final labor estimates were based on the amount of time required to disassemble each of these pieces of equipment for either decontamination or smelting.

**Cost of Removal and
Disposal of Hydraulic
and Coolant Oils**

+

**Cost of Labor and
Equipment for
Disassembly and
Removal to a Staging
Area**

+

**Cost of Additional
Disassembly and
Segregation to
Prepare for
Decontamination**

+

**Cost of
Decontamination
of Scrap Metal for
Unrestricted
Release**

27

+

**Cost of Sampling
and Survey**

+

**Cost of Shipping Containers
and Transportation**

+

**Landfill Fees and
Surcharges**

+

**Cost of Management and
Regulatory Compliance**

-

Metal Value

=

**Cost of Recycling -
Scrap**

Figure 2.2a
Cost Elements for Metal Recycling - Scrap

**Cost of Removal and
Disposal of Hydraulic and
Coolant Oils**

+

**Cost of Labor and Equipment for
Disassembly and Removal to a
Staging Area**

+

**Cost of Additional
Disassembly and Segregation
to Prepare for Smelting**

+

Cost of Smelting

+

**Cost of Shipping Containers and
Transportation**

+

**Landfill Fees
and Surcharges**

+

**Cost of Management and
Regulatory Compliance**

-

Metal Value

=

Cost of Recycling - Smelting

Figure 2.2b

Cost Elements for Metal Recycling - Smelting

2.2.2.4—Cost of Decontamination of Scrap Metal for Unrestricted Release

The cost for decontamination was developed by first assuming that work crews would be variably comprised, designed to include persons capable of conducting the level of decontamination necessary to meet the regulatory standards for unrestricted release. Also considered in the estimate was the amount of time necessary to decontaminate each piece of metal to the level necessary to meet the regulatory standards for unrestricted release.

It was assumed that decontamination waste are mixed wastes. The costs for packaging, transport, disposal and material were estimated. Disposal cost for materials are for mixed waste. Landfill fees and surcharges for waste generated during decontamination were included. Waste generated from decontamination efforts consist of HEPA filters which will be compacted into drums.

Cost estimates for decontaminating the segregated bulk metals were developed by adjusting the decontamination costs developed for both the equipment reuse and the free-release alternatives discussed in Section 2.3.2.4 and 2.4.2.4. These adjustments include no allowances for repainting and an increase in the cost per square foot of surface area to account for the additional decontamination resulting from additional disassembly and volume reduction.

Although maintaining the integrity of the equipment is not an issue for this recycling alternative, as it is for both reuse and free-release, consideration of waste minimization concepts leads to the selection of the CO₂ method as the preferred decontamination method for recycling as well. The cost estimates are based on the assumption that removal of all paint will decontaminate metals to levels satisfying free-release criteria. The estimated cost of decontamination of scrap metal is \$24/ft².

The assumption used as an end point for decontamination is the removal of all paint. Estimates of the amount of surface area to be cleaned were based on an envelope area that totally enclosed the equipment. Although the surface area to be decontaminated under this option will undoubtedly be greater than for either the transfer or sale options, this likely increase is accounted for in the development of a higher cost estimate for decontamination per square foot. Cost backup is provided in Appendix D.

2.2.2.5—Cost of Sampling and Survey

The cost for sampling and survey was developed by assuming appropriately qualified crews needed to manually survey and sample the decontaminated scrap metal. Estimates of the amount of survey and sampling required are based on the level of decontamination required for unrestricted release. Once the crews were defined, the time required for the survey and sampling of the metal was estimated. Cost backup is provided in Appendix D.

2.2.2.6—Cost of Smelting

Existing equipment at RFP will be used for smelting operations. The estimated per-pound cost of smelting presented here includes labor and electricity costs. The costs for smelting cast iron and steel were estimated to be \$1.15/lb. and \$1.25/lb., respectively. These costs reflect the charge by commercial metal processors.

2.2.2.7—Cost of Shipping Containers and Transportation

Materials not suitable for smelting or for processing as scrap, such as electrical and nonmetallic components, will be disposed as LLW. In addition, equipment with a disposal condition of "S" will be disposed as LLW based on its potential level of contamination and low metal content. It was assumed that sealand containers would be used for disposal of equipment that is not suitable for recycling, as described in Section 2.1.2.4.

2.2.2.8—Landfill Fees and Surcharges

Cost estimates were developed for burial of sealand containers at both current government facilities and commercial LLW facilities, as described in Section 2.1.2.5.

In addition to sealand containers, some drums of slag resulting from the smelting operation will require disposal. The smelting operation will produce an estimated 10% (by volume) of slag containing the bulk of the contamination from the original material. After being placed into 55-gallon drums, the material will be transported to a LLW landfill. Costs for disposal at commercial and government landfills were estimated to be \$640/ft³ and \$16/ft³, respectively. These values account for transportation and landfill fees.

2.2.2.9—Cost of Management and Regulatory Compliance

Cost estimates for regulatory and management activities include planning and management of the various activities conducted by both subcontractor and M&O staff. These include sampling and surveying, equipment removal, decontamination or smelting, waste packing, and health and safety surveillance. In addition to regular management, a staff will be needed to develop waste management plans, complete the necessary documentation to meet waste acceptance criteria, adhere to regulatory compliance activities to declare equipment and scrap as waste, manifest waste shipments, and correspond to state and federal regulatory agencies. Estimates for the staff requirements to conduct these activities for the recycle option were developed and include the following:

- 1 Program Manager
- 1 Project Manager
- 2 Regulatory Compliance Support Staff
- 1 Administrative Support Staff

2.2.2.10—Metal Value

Once the equipment has been smelted to form ingots or has been segregated and decontaminated as scrap, a variety of options are available for consideration by DOE. These include public sale of the metals or reuse within a controlled environment, such as for shielding or construction of radiation waste containers. DOE is currently conducting demonstration projects in these areas. A full economic evaluation of these options is beyond the scope of this study. However, this economic study did attempt to make allowances for the value of the ingots and of the decontaminated scrap. Values for bulk cast iron and steel, as obtained from Metal Working News, were found to be \$0.17 and \$0.18 per pound, respectively.

2.2.3 Summary of the Metal Recycling Cost Estimates

Table 2.2a summarizes the cost for recycling the candidate equipment as scrap. The alternative was developed assuming that a free-release criteria could be both approved by DOE and attained by decontamination.

Under this option, more than one million pounds of scrap metal will be produced. Equipment that was not considered for recycle was slated for landfill, and costs calculated accordingly using both governmental and commercial landfill cost estimates.

Table 2.2b below summarizes the cost for recycling the candidate equipment as smelted ingots. The estimated total cost for this option is quite close to that for the scrap metal option because the cost of smelting is close to the total of decontamination plus sampling and survey for the scrap metal option.

Table 2.2a Cost Summary for Metal Recycling—Scrap

Cost Element	Cost Estimate for the Element
Cost of Removal and Disposal of Hydraulic and Coolant Oils	\$173,000.00
Cost of Labor and Equipment for Disassembly and Removal to a Staging Area	\$538,000.00
Cost of Additional Disassembly and Segregation to Prepare for Decontamination	\$222,000.00
Cost of Decontamination of Scrap Metal for Unrestricted Release	\$341,000.00
Cost of Sampling and Survey	\$480,000.00
Cost of Shipping Containers and Transportation	\$67,500.00
Landfill Fees and Surcharges	\$113,000.00 ¹ \$4,522,000.00 ²
Cost of Management and Regulatory Compliance	\$1,352,000.00
Metal Value (Revenue)	(\$191,000.00)
Grand Total	\$3,095,500.00 ¹ \$7,504,500.00 ²

¹—Reflects estimated government disposal rate of \$10/ft³.

²—Reflects estimated commercial disposal rate of \$400/ft³.

Table 2.2b Cost Summary for Metal Recycling—Smelting

Cost Element	Cost Estimate for the Element
Cost of Removal and Disposal of Hydraulic and Coolant Oils	\$173,000.00
Cost of Labor and Equipment for Disassembly and Removal to a Staging Area	\$538,000.00
Cost of Additional Disassembly and Segregation to Prepare for Smelting	\$222,000.00
Cost of Smelting	\$1,210,000.00
Cost of Shipping Containers and Transportation	\$67,500.00
Landfill Fees and Surcharges	\$119,300.00 ¹ \$4,774,000.00 ²
Cost of Management and Regulatory Compliance	\$1,352,000.00
Metal Value (Revenue)	(\$174,000.00)
Grand Total	\$3,507,800.00 ¹ \$8,162,500.00 ²

¹—Reflects estimated government disposal rate of \$10/ft³.

²—Reflects estimated commercial disposal rate of \$400/ft³.

2.3 Reuse Within the Government Sector

The governmental reuse alternative accounts for both decontaminated and contaminated equipment transferred within the government sector according to the provisions set out in 41 CFR 101, Federal Property Management Regulations, and in accordance with current and proposed release criteria established by DOE in Order 5400.5. Building 865 equipment likely to be successfully decontaminated and transferred within the government sector has been identified. A list of these pieces of equipment appears in Appendix F. In addition, contaminated equipment that has the potential to be transferred for use in applications involving radioactivity has been identified, and a list appears in Appendix F. Most of this equipment has the potential to be transferred for reuse within DOE, although transfers to other agencies are within the scope of the projections given here.

According to current guidance, if equipment can be decontaminated to authorized levels, that equipment may be transferred and used within the government sector with no further restrictions. Both current and proposed regulations require documentation that the authorized decontamination limits are justified and will adequately protect members of the public within the basic dose limits.

If contaminated equipment is slated for transfer within the government sector, it must also fall within authorized limits or within supplemental limits established and approved for particular cases. In such transfers, the new equipment owner/agency is responsible for implementing the appropriate administrative controls after transfer, including periodic monitoring; shielding; physical barriers; and radiological safety measures during maintenance, renovation, demolition or other activity that might disturb or cause the radioactive material to migrate.

Equipment likely to be transferred as contaminated for use in a controlled radiological area within DOE has been identified. These pieces of equipment could be transferred to other DOE facilities as a part of normal equipment upgrading, since the equipment at the RFP is high-quality, specialized, and in excellent working order. This equipment can be categorized into two classes—(1) machining, which includes lathes, milling machines, drill presses, and grinders; and (2) metal forming, which includes rolling machines; hydro-formers; and swager, forging forming, extrusion, and isostatic presses.

2.3.1 Assumptions Underlying the Reuse Alternative

The following major assumptions were used to develop cost estimates for the reuse option:

- 2-year project life
- Equipment removal, disassembly, reassembly, and packaging conducted by a subcontractor
- Disassembly for decontamination
- Decontamination where appropriate
- Reassembly
- Sampling and survey crew supplied by the M&O contractor
- Management and regulatory compliance activities will be conducted by a DOE-RFP M&O contractor staff

- Packaging and shipping of equipment
- Shipping transportation handled by the agency acquiring the equipment
- Drained oils, coolants, and lubricants are TSCA regulated waste only
- Decontamination waste is classified as a mixed waste
- Decontamination waste management, storage, handling and disposal activities will be conducted by DOE-RFP M&O contractor staff
- Transfer of equipment results in transfer of the book value of the equipment to the acquiring agency

2.3.2 Elements of the Reuse Cost Analysis

Figures 2.3a and 2.3b show schematics of the elements developed to estimate the cost of both release of contaminated and decontaminated equipment from Building 865 for reuse within the government sector. Appropriate cost categories, including operations, management, regulatory compliance, transportation, and disposal were included for each element. A brief description of the cost elements is provided below.

2.3.2.1—Cost of Removal and Disposal of Hydraulic and Coolant Oils
See Section 2.1.2.1 for a discussion of this cost element.

**2.3.2.2—Cost of Labor and Equipment for
Disassembly and Removal to a Staging Area**

The disassembly of equipment and removal of components to a staging area will be conducted as described in Section 2.1.2.2 earlier in this report.

2.3.2.3—Cost of Additional Disassembly for Decontamination

Additional disassembly will be required for some of the larger pieces of equipment to allow the removal of the maximum amount of contamination (both beryllium and uranium) and to ensure compliance with release limits and ALARA principles. To estimate the additional cost, the time required for an appropriately qualified, fixed-price, subcontracted disassembly crew was determined for each piece of qualifying equipment. Using the labor rates of the work crew, the additional disassembly costs were estimated. This approach is similar to method used to determine the disassembly cost for removal to a staging area.

Cost of Removal and Disposal of Hydraulic and Coolant Oils

+

Cost of Labor and Equipment for Disassembly and Removal to a Staging Area

+

Cost of Additional Disassembly for Decontamination

+

Cost of Decontamination of Equipment for Transfer

+

Cost of Reassembly

+

Cost of Sampling and Survey

+

Cost of Shipping Containers and Transportation

+

Landfill Fees and Surcharges

+

Cost of Management and Regulatory Compliance

=

Cost of Transfer for Reuse in the Government Sector - Decontaminated

Figure 2.3a

Cost Elements for Reuse within the Government Sector - Decontaminated

Figure 2.3b

Cost Elements for Reuse within the Government Sector - Contaminated

2.3.2.4—Cost of Decontamination of Equipment for Transfer

Decontamination level is dependent on the intended reuse of the equipment within the government sector. The cost for equipment decontamination was developed by first assuming that work crews would be variably comprised, designed to include persons with the minimum skills required to work with particular types of equipment and capable of conducting the level of decontamination necessary to meet the regulatory standards for transfer. Also considered in the estimate was the amount of time necessary to decontaminate each piece of equipment to the appropriate level.

It was assumed that decontamination waste are mixed wastes. The costs for packaging, transport, disposal and material were estimated. Disposal cost for materials are for mixed waste. Landfill fees and surcharges for waste generated during decontamination were included. Waste generated from decontamination efforts consist of HEPA filters which will be compacted into drums.

Since the equipment is intended for reuse, only a limited number of decontamination methods are feasible. Abrasive cleaning or chemical etching will compromise the physical integrity of the equipment components, destroying its precision. Therefore, only high-pressure water and CO₂ impingement are viable options. The specifications for a decontamination facility are provided in Appendix C, including descriptions of both high-pressure water and CO₂ cleaning methods.

Capital equipment cost for CO₂ are considerably higher than those for high-pressure water. Capital costs for equipment become comparable when treatment equipment for the wastewater generated by the high-pressure water unit is included. (High-pressure water system generates approximately 4 gallons of wastewater per minute.) In an effort to minimize the generation of wastewater, consideration was given to a closed-loop system that would reuse wastewater for the high-pressure cleaning process, recycling it through a precipitation and filtration system. There are inherent uncertainties associated with this alternative, such as criticality issues and water quality from the treatment system. A full exploration of these issues is beyond the scope of this report. However, once waste treatment costs are compared for the two alternatives, the CO₂ decontamination system becomes economically more attractive.

Although the CO₂ method is effective for surface cleaning, the long-term attainment of contaminant removal is questionable. Leaching of volumetric contamination following CO₂ cleaning may be a possibility. This phenomenon has been reported by the decontamination industry, but so far not documented. The CO₂ method is successful in removing loose particles on the equipment surfaces sufficiently to pass the wipe-test as specified by DOE 5400.5 and 5480.11. Even though the potential for recontamination exists, the levels may still be in compliance with the release criteria. Therefore, estimates in this report are based on the use of a CO₂ cleaning system.

Cost estimates for the CO₂ cleaning system were developed using data from manufacturers and from RFP. A cost estimate was developed based on an estimate of the square footage required for a treatment facility of adequate size. The estimate

has built-in allowances for staffing, sampling, waste disposal and repainting.

The assumption used as an end point for decontamination is the removal of all paint. Estimates of the amount of surface area to be cleaned were based on an envelope area that totally enclosed the equipment. Decontamination cost for equipment reuse is based on a \$13.50/ft² estimate. Estimated costs for individual pieces of equipment ranged from \$100 to \$35,000.

2.3.2.5—Cost of Reassembly

The cost for equipment reassembly was developed by assuming appropriately qualified crews needed to reassemble the various classes of equipment. Reassembly may be extensive due to the amount of dismantling for the levels of decontamination required. Once the crews were defined the time required for the reassembly of each piece of equipment was estimated. The assumption that reassembly and disassembly are virtually the same was used.

2.3.2.6—Cost of Sampling and Survey

Estimates of the amount of survey and sampling required to verify decontamination are based on the level of decontamination required for the particular transfer. The cost for equipment sampling and survey was developed by assuming appropriately qualified crews needed to manually survey and sample the various classes of equipment. Once the crews were defined, the time required for the survey and sampling of each piece of equipment was estimated. This cost includes the use of a two-member health physics sampling crew for the duration of the project.

2.3.2.7—Cost of Shipping Containers and Transportation

It was assumed that pallets or custom-built skids would be used for equipment transfer. This arrangement facilitates handling and preserves basic alignment of equipment. After painting, items will be strapped to the pallet to provide stability. Costs are calculated based on the number of pallets plus the number of skids, not the volume of their contents. Costs are essentially the same for both transferring both decontaminated and contaminated equipment. Transportation costs are assumed to be the responsibility of the agency that acquires the equipment. For equipment that does not meet the criteria for this reuse alternative, and therefore requires disposal, cost of shipping containers and transportation is estimated as described in Section 2.1.2.4. Appendix D provides the cost backup.

2.3.2.8—Landfill Fees and Surcharges

Cost estimates were developed for burial of sealand containers at both current government facilities and commercial LLW facilities as described in Section 2.1.2.5.

2.3.2.9—Cost of Management and Regulatory Compliance

Cost estimates for regulatory and management activities include planning and management of the various activities conducted by both contracted and M&O staff. These include sampling and surveying, equipment dismantling and

reassembly, decontamination, waste packing, transfer, and health and safety surveillance. In addition to management, a staff will be needed to develop waste management plans, complete the necessary documentation to meet release acceptance criteria, waste acceptance criteria, adhere to regulatory compliance activities to declare equipment and scrap as surplus, manifest decontamination waste shipments, and correspond to state and federal regulatory agencies. Estimates for the staff requirements to conduct these activities for this reuse option are as follows:

- 1 Program Manager
- 1 Project Manager
- 2 Regulatory Compliance Support Staff
- 1 Administrative Support Staff

2.3.3 Summary of the Reuse Cost Estimate

Table 2.3 summarizes the cost estimate for the transfer of equipment within the government sector. This alternative includes transfer of equipment to both DOE and other federal agencies in accordance with 41 CFR 101. Also included are allowances for decontamination of equipment transferred on an unrestricted basis.

Table 2.3 Cost Summary for Reuse Within the Government Sector

Cost Element	Cost Estimates for Tasks Required for Both Contam- inated and Decon- taminated Equipment	Additional Cost Estimates for Equipment Requiring Decontamin- ation
Cost of Removal and Disposal of Hydraulic and Coolant Oils	\$173,000.00	--
Cost of Labor and Equipment for Disassembly and Removal to a Staging Area	\$537,000.00	--
Cost of Additional Disassembly for Decontamination	--	\$82,000.00
Cost of Decontamination of Equipment for Transfer	--	\$140,000.00
Cost of Reassembly	--	\$82,000.00
Cost of Sampling and Survey	--	\$480,000.00
Cost of Shipping Containers and Transportation	\$67,500.00	--
Landfill Fees and Surcharges	\$113,000.00 ¹ \$4,522,000.00 ²	--
Cost of Management and Regulatory Compliance	\$1,352,000.00	--
Subtotals	\$2,242,500.00 ¹ \$6,651,500.00 ² --	\$784,000.00 \$3,026,500.00 ¹ \$7,435,500.00 ²
Grand Total		

¹—Reflects estimated government disposal rate of \$10/ft³.

²—Reflects estimated commercial disposal rate of \$400/ft³.

2.4 Unrestricted Sale to Non-Government Organizations

The unrestricted sale or free-release to non-government organizations alternative allows for the equipment to be categorized as surplus (reference 41 CFR 101) and released in accordance with current and proposed release criteria. Under current and proposed free-release criteria, the equipment cannot exceed a combined (volumetric and surface) dose rate of 100 mrem to the public. Theoretically, once decontamination is achieved, the equipment can be evaluated based on current market value and be utilized, donated or sold on the open market.

The current and proposed regulations require an in-depth examination of the equipment being considered for release. Item description, data on historic use, radiological history, DOE-approved criteria for release, survey description, current radiological condition, quantity and disposition of decontamination waste, and equipment recipient must be disclosed. Additionally, before release, contamination limits are to be evaluated and approved based on the nature of the equipment and its potential use; potential dose to individuals; actual, likely, and worst scenarios; collective dose to the population; and location of closest public contact.

2.4.1 Assumptions Underlying the Unrestricted Sale Alternative

The following are the major assumptions used to develop cost estimates for the unrestricted sale option:

- 2-year project life
- Equipment disassembly, removal, reassembly and packaging conducted by a subcontractor
- Disassembly for decontamination
- Decontamination
- Reassembly
- Sampling and survey crew supplied by the M&O contractor
- Management and regulatory compliance activities will be conducted by a DOE-RFP M&O contractor staff
- Cost of shipping equipment the responsibility of the buyer
- Drained oils, coolants, and lubricants are TSCA regulated waste only
- Decontamination waste is classified as a mixed waste
- Decontamination waste management storage, handling and disposal activities will be conducted by DOE-RFP M&O contractor staff
- Sale conducted by a contracted liquidator

2.4.2 Elements of the Unrestricted Sale Cost Analysis

Figure 2.4 shows a schematic of the cost elements developed to estimate the cost of free release of the equipment from Building 865. Appropriate cost categories, including operations, management, regulatory compliance, transportation, and disposal were included for each element. A brief description of the cost elements is provided below.

2.4.2.1—Cost of Removal and Disposal of Hydraulic and Coolant Oils
See Section 2.1.2.1 for a discussion of this cost element.

**2.4.2.2—Cost of Labor and Equipment for
Disassembly and Removal to a Staging Area**

The disassembly of equipment and removal of components to a staging area will be conducted as described in Section 2.1.2.2 earlier in this report.

2.4.2.3—Cost of Additional Disassembly for Decontamination

Additional disassembly will be required for some of the larger pieces of equipment will be conducted as described in Section 2.3.2.3 earlier in this report.

2.4.2.4—Cost of Decontamination of Equipment for Unrestricted Release

The cost of decontamination of equipment for unrestricted release was determined as described in Section 2.3.2.4 for the government transfer alternative.

2.4.2.5—Cost of Reassembly

See Section 2.3.2.5 for a discussion of this cost element.

2.4.2.6—Cost of Sampling and Survey

See Section 2.3.2.6 for a discussion of this cost element.

2.4.2.7—Cost of Shipping Containers and Transportation

See Section 2.3.2.7 for a discussion of this cost element.

2.4.2.8—Landfill Fees and Surcharges

See Section 2.1.2.5 for a discussion of this cost element.

2.4.2.9—Cost of Management and Regulatory Compliance

Cost estimates for regulatory and management activities include planning and management of the various activities conducted by both contracted and M&O staff. These include sampling and surveying, equipment dismantling and reassembly, decontamination, waste packing, sale, and health and safety surveillance. In addition to management, a staff will be needed to develop waste management plans, complete the necessary documentation to meet release acceptance criteria, waste acceptance criteria, adhere to regulatory compliance activities to declare equipment and scrap as surplus, manifest decontamination waste shipments, and correspond to state and federal regulatory agencies. Estimates for the staff requirements to conduct these activities for the free-release option are as follows:

- 1 Program Manager
- 2 Project Managers
- 8 Regulatory Compliance Support Staff
- 3 Administrative Support Staff

Figure 2.4

Cost of Elements for Unrestricted Sale to Non-Government Organizations

2.4.2.10—Cost to the Government for Conducting the Sale

The cost of conducting the sale, including advertising and warehousing the equipment for public view is based on a percentage of the total sale price of the equipment. Discussions with local liquidators and auction companies identified a range of cost for these services as 15-20% of the sale price. An average of 18% was used for the cost estimate. Included below is a list of Rocky Mountain Equipment Brokers that may serve in this capacity.

Table 2.4a

Rocky Mountain Equipment Brokers

<u>Used Machinery</u>	
Boulder Machinery and Equipment Used Metal Working Machinery	1-303-449-6240
Campbell Industrial Sales Fabricating Machinery	1-303-893-0752
Machinery Wholesalers Corp., Casper, WY	1-307-577-0935
<u>Liquidators</u>	
Dickensheet & Associates, Inc. Liquidators, Auctioneers Commercial and Industrial	1-303-934-8322
M. F. Bank & Company Nationwide Liquidators	1-303-937-1171
Rocky Mountain Liquidators	1-303-429-3337
National Remarketing Service (NRS)	1-303-530-7607
<u>Appraisers</u>	
ACI Associates Industrial Machinery and Equipment Owner—Alan C. Iannacito	1-303-279-3277
Donald Freedburg & Associates Industrial Machinery and Equipment	1-303-758-1510
<u>Auctioneers</u>	
Roller and Associates	1-303-427-1600
Pacific Auction	1-303-698-1269

2.4.2.11—Revenue Generated by the Sale

The revenue generated by the sale of equipment was developed by estimating the fair market value of the equipment. First, acquisition costs were converted to present value dollars using DOE escalation factors to determine a replacement value. Next, a discount factor of approximately 40% was applied to determine the fair market value of the used equipment. Calculated values were discussed with brokers and liquidators as a validation, and found to be reasonable. The actual sale price may vary widely and depends greatly on the working order and overall shape of the equipment as well as the advertising and timing of the sale. Experienced brokers are knowledgeable of market conditions and are usually more effective at attracting larger numbers of qualified buyers as well as timing the sale during peak demands. In addition, having several smaller sales, as opposed to one large sale, will likely result in a higher sale price. The expected sale price of the equipment is provided in Appendix B, with a discussion of the estimation method in Appendix D.

2.4.3 Summary of the Unrestricted Sale Cost Estimate

Table 2.4b summarizes the costs estimates for the public sale alternative. The cost estimate for this option includes consideration of decontamination to a release limit determined by the proposed method outlined in 10 CFR 834. All costs for documentation in accordance with the proposed guidelines are included in this cost estimate.

Table 2.4b Cost Summary for Unrestricted Sale to Non-Government Organizations

Cost Element	Cost Estimate for the Element
Cost of Removal and Disposal of Hydraulic and Coolant Oils	\$173,000.00
Cost of Labor and Equipment for Disassembly and Removal to a Staging Area	\$537,000.00
Cost of Additional Disassembly for Decontamination	\$222,000.00
Cost of Decontamination of Equipment for Unrestricted Release	\$223,000.00
Cost of Reassembly	\$222,000.00
Cost of Sampling and Survey	\$480,000.00
Cost of Shipping Equipment and Transportation	\$67,500.00
Landfill Fees and Surcharges	\$113,000.00 ¹ 4,522,000.00 ²
Cost of Management and Regulatory Compliance	\$3,384,000.00
Cost of Conducting the Sale	\$439,000.00
Revenue Generated by the Sale (Revenue)	(\$2,439,000.00)
Grand Total	\$3,421,500.00 ¹ \$7,830,500.00 ²

¹—Reflects estimated government disposal rate of \$10/ft³.

²—Reflects estimated commercial disposal rate of \$400/ft³.

2.5 Comparison of Economic Alternatives

In this section, the total cost estimate for each of the recycling/reuse alternative are compared to the baseline. While tabulated results are presented below, total costs are not the only factors for consideration in determining which option offers the greatest cost savings to the government. Additional factors for consideration are presented in Section 2.5.2.

The results presented here are not intended to determine the course of action to pursue, but are offered as input for discussions as to the need for changes in policies that limit recycle/reuse options within DOE. Clearly, the optimal cost savings to the government for these types equipment disposition challenges will involve establishing policies that accomplish two objectives. First is protecting the public in accordance with accepted risk factors. Second is allowing DOE sites to realistically consider several recycle/reuse alternatives for each piece of equipment.

2.5.1 Overview of Potential Cost Savings Compared to Baseline Alternative

To determine the economic advantages of implementing the recycle/reuse options instead of the baseline option, the decrease in cost was determined for each option and is presented in Table 2.5 below. All options offer a decrease in the total cost to the government compared to the baseline landfill option. The range of cost savings is \$1,827,500 (38%) for transfer within the government to \$1,346,200 (28%) for recycling smelted metal, both assuming the use of a government waste disposal site. When using commercial disposal costs, recycle/reuse alternatives offer a potential cost savings of up to \$25,600,000 compared to landfill disposal.

Table 2.5 Comparison of Economic Alternatives

Alternative	Estimated Cost		Cost Increase (or Decrease) Compared to Baseline	
Landfill (Baseline)	\$4,854,000 ¹	\$33,130,000 ²	---	
Recycle Scrap Smelt	\$3,095,500 ¹	\$7,504,500 ²	(\$1,758,500) ¹	(\$24,967,500) ²
	\$3,507,800 ¹	\$8,162,500 ²	(\$1,346,200) ¹	(\$24,619,500) ²
Government Transfer	\$3,026,500 ¹	\$7,435,500 ²	(\$1,827,500) ¹	(\$25,600,500) ²
Unrestricted Sale to the Public	\$3,421,500 ¹	\$7,830,500 ²	(\$1,432,500) ¹	(\$25,300,000) ²

¹—Reflects estimated government disposal rate of \$10/ft³

²—Reflects estimated commercial disposal rate of \$400/ft³

2.5.2 Uncertainties

Each alternative under consideration has inherent uncertainties that impact the viability of implementing that option. This section discusses the uncertainties associated with each alternative that should be considered along with the potential for cost savings.

Landfill. The major uncertainties for the landfill alternative involve restrictions on this option posed by waste minimization considerations and the availability of government landfill space. Meeting acceptance criteria for disposal at the NTS and Hanford requires considerable effort by individual Field Offices and must be obtained for each waste stream (Building 865 equipment may be considered a waste stream). In addition, surplus and scrap equipment must be properly classified and documented as having no economic value, and thus waste in accordance with the applicable sections of 41 CFR 101 and 48 CFR 45.

Metal Recycling. Recycling metal as scrap is economically favored over the smelting option. The major uncertainty of implementing either of these options is the absence of a free-release criteria for volumetrically contaminated metal. Although release is feasible under current DOE and NRC guidelines, the procedure is not well defined or tested, and it requires approval within the highest levels of DOE. However, efforts are currently underway to establish clearer guidelines through agreement between EPA, NRC, and DOE.

DOE is currently pursuing demonstrations to use materials in environments where residual contamination does not adversely affect the public or the environment. Examples are waste packing boxes and shielding. Overall, these options are likely to have a relatively small economic impact, since the expected volume of metals from D&D actions throughout DOE will quickly outpace the demand for these materials.

Policy guidance drafted by DOE (10 CFR 834) applies a graded approach to establishing release limits that are dependent on the final use of the material. Under this approach, higher limits would be tolerated for material to be used in situations in which there will be little or no exposure to the public or the environment. Using this approach, a wide variety of uses may be possible, such as structural steel and rebar for concrete. However, the DOE would have to ensure and document that material released for reuse in these low exposure scenarios could not find its way into a more general use.

Cost estimates for decontamination were difficult to develop. Commercial decontamination companies are reluctant to divulge their cost data, and the literature offers only gross estimates appropriate for data checks for this study. In addition, the true surface area was estimated based on an encompassing envelope. The decontamination estimates were based on the time of CO₂ impingement necessary to remove paint, as it was assumed that this would be sufficient to meet a developed release criteria. In the absence of more definitive decontamination data, the estimates appear to be reasonable.

Transfer Within the Government. This alternative offers the greatest potential for cost savings to DOE based on the economic analysis. This is not surprising since the options allows for the transfer of selected contaminated equipment, eliminating the cost associated with disassembly for decontamination, for decontamination, and for reassembly. Even though the potential for cost savings can be demonstrated, the likelihood for much of the equipment to be transferred is very low. Both the DOE and DoD have experienced major reductions in programs that support defense programs, programs that would have a use for this equipment for R&D, production, or maintenance.

Unrestricted Release to the Public. This alternative has the second highest potential for cost savings for DOE. Discussions with brokers and appraisers indicated that a strong demand for this equipment could be expected, and that, assuming proper marketing, the estimated sale prices are reasonable.

As stated previously, cost estimates for decontamination were difficult to develop. But again, in the absence of more definitive decontamination data, the estimates appear to be reasonable.

The major uncertainty for the unrestricted sale of equipment to the public is the lack of a definitive release policy with defined free-release criteria, although a draft DOE policy (10 CFR 834) is currently under review. Under the current regulatory environment, where considerations for potential liabilities for harm to the public and the environment have a major impact on decision making, many sites are reluctant to authorize the release of potentially contaminated equipment.

The proposed policy provides an outline for developing a release criteria. The policy considers the expected use of the equipment in establishing this limit and requires approval from DOE Headquarters. It appears that equipment can be grouped based on similarities for usage or function in the development of a release limit. Results of a sample release scenario have been provided in Section 3.1.

In summary, this information on economic and policy considerations should prove useful in developing plans for the final disposition of the Building 865 equipment. The majority of the impediments to implementing the most attractive economic alternatives relate to policy and institutional reluctance. Changes in policies and training to overcome ingrained biases against unrestricted release of previously contaminated equipment are needed. The following sections discuss policies that affect the alternatives presented here as well as some institutional constraints.

3.0 Policy Implications

One aspect of planning and conducting decontamination and decommissioning activities at DOE facilities warrants detailed analysis in light of DOE's relatively new emphasis on D&D. That is, the regulatory guidance and current interpretation of that guidance as pertaining to the recycling or reuse of equipment and other material. Vast amounts of natural resources previously required by DOE facilities for defense and other related programs now await disposition. The time is right for carefully analyzing current policies, regulations, guidelines, accepted approaches, and cultural mores that arose at a time when D&D issues were not at the forefront of planning considerations. The aim of the analysis could be to bring D&D issues to the forefront to streamline and standardize approaches to such D&D activities as recycling, transferring, or selling equipment now in the DOE inventory. Policies should be optimized to facilitate the use of resources while not compromising the environment or human health. (IAEA, 1988)

As indicated by Section 2 of this report, much of the material in Building 865 at the RFP has commercial value, either as it currently exists or in some recycled form. These resources will realize their full value either if the radionuclide content of the items currently does not exceed or can be reduced to prescribed levels. The discussion in this section attempts to introduce the pertinent national and international policy considerations and some potential site-specific problems for addressing both surface and volumetric contamination of RFP equipment within accepted guidelines.

3.1 U.S. Department of Energy Guidance

As the owner of the equipment at the RFP, DOE has primary responsibility for properly managing contaminated equipment in a manner that protects workers, the public, and the environment. DOE has developed policies to ensure proper control, and may also rely on policies developed by other agencies, including state, federal, and international organizations.

DOE operations involving the release of equipment having residual radioactive material are governed by the DOE Order 5400.5—Radiation Protection of the Public and the Environment. This order establishes standards and requirements for release of equipment. Provisions for restricted and unrestricted release are not clearly stated, but are implied within the general wording of the standard regarding supplemental limits. By promulgating this order, DOE achieves its objective to operate facilities and conduct activities so that radiation exposure to members of the public are as low as reasonably achievable (ALARA). The order requires the development of an ALARA program for all DOE operations (DOE 5400.5, CH 2, p II-5).

Under DOE order 5400.5 (CH 2, p II-10), all property is considered potentially contaminated if it has been used or stored in a radiation area. Prior to release, the equipment must be surveyed using appropriate instruments and techniques to determine if the removable and fixed surface contamination meet release criteria. 5400.5 provides contingency plans for the release of property with inaccessible areas,

calling for a case-by-case evaluation and documentation demonstrating that any contamination in the inaccessible areas is likely to be within acceptable limits.

5400.5 (CH 4, p IV-6) establishes "general surface contamination guidelines" that are generally consistent with standards of the NRC, as stipulated in the Regulatory Guideline 1.86 (USAEC, 1974). The guidelines in 5400.5 specifically address surface contamination only.

Currently, DOE 5400.5 does not specifically state limits for releasing volumetrically contaminated or activated equipment (e.g., radioactivity per unit volume or per unit mass), but, such equipment or material may be released if criteria and survey techniques are approved by the Office of Environmental Health and Safety, DOE Headquarters, Assistant Secretary for Environmental Health and Safety (EH-1) as stated in CH 2, p II-10.

5400.5 requires the records of any release to include a description of the property, date of last survey, identity of the surveyor (and organization), type and identification of monitoring instruments, results of the monitoring operation, and identity of the recipient of the released equipment. It establishes basic dose limits to the public for exposure to residual radioactive material at 100 mrem (1 mSv) effective dose equivalent in a year. A demonstration of compliance with basic dose limit is also required.

5400.5 promulgates authorized limits for residual radioactive material. This provision states that authorization of limits for each property shall be equal to the generic or derived guidelines unless it can be established, on the basis of specific property data, that the guidelines are not appropriate for use for the specific property. The authorized limits shall be established to provide, at a minimum, that the basic dose limits of 100 mrem/yr. will not be exceeded under the worst case or plausible-use scenarios.

5400.5 provides for the development of Supplemental Limits and Exceptions (CH 4, p IV-9). If a specific property's potential use indicates that the guidelines or authorized limits for release are not appropriate for any portion of that property, the operations office may request that supplemental limits or an exception be applied. The responsible operations office must document the decision that the guidelines or authorized limits are not appropriate and that the alternative action selected will provide adequate protection, giving due consideration to health and safety, the environment, costs and public policy. Any supplemental limits are to fall within the basic dose limit of 100 mrem/yr. for both current and potential unrestricted use of the property and the supplemental limits require documentation and evaluation on a case-by-case basis.

Like 5400.5, 10 CFR 834, Proposed Rule, Subpart D—Release and Evaluation for Release of Property Having Radioactive Material, spells out requirements for decontamination, survey, management, storage, disposal, and release of buildings, land, equipment, and personal property containing residual radioactive material. The proposed rule differs from DOE 5400.5 essentially in format rather than substance. It maintains the stance that all releases of property are to be assessed and the ALARA principle applied no matter how small the dose. The proposed rule also maintains the established primary dose limit of 100 mrem/yr.

However, upon closer inspection of the proposed rule, subtle difference can

be noted that have implications for the release of equipment, including releases to non-government organizations. In the proposed rule, unlike 5400.5, requirements for restricted and unrestricted release criteria are clearly indicated. The proposed rule would require that assessments of potential doses associated with releases be specific to the particular release considered and that all subsurface contamination, such as contamination in depth (i.e. mass concentration or volumetric contamination) be assessed and limits established consistent with the principles set forth in proposed Subpart D. It specifically states that DOE must review and approve authorized limits before properties with residual radioactive material are released to members of the general public for unrestricted use. Note that the proposed rule does allow for the potential of free release of equipment previously used in radiation areas.

The proposed rule specifically provides for the development of authorized and supplement limits for both unrestricted and restricted use. It is stricter than DOE Order 5400.5 in the requirements for supporting documentation verifying that ALARA and release criteria have been accomplished.

Basic steps for equipment release contained in Section 834.301—Release of Property Containing Residual Radioactive Material, are as follows:

1. Evaluation of the historical use of property prior to release to determine if it has been subjected to radiological contamination
2. Item survey characterization, including mass contamination, removable surface radioactive material, and total surface radioactive material
3. Current and future use of property assessment and evaluation
4. Establishment of authorization limits for release actions (calculate exposure from equipment or property from future use scenarios)
5. Approval of any release by DOE Headquarters with documentation that: describes the item, describes its radiological history, states the proposed criteria for release of the property, describes the survey of the item, indicates the radiological condition of the property, indicates the quantity and disposition of the waste resulting from any decontamination effort, and identifies the recipient of the property

The evaluation of current and future use would consider "actual," "likely," and "worst" plausible use of the property over the long run. Allowable doses for release of the properties calculated under any "worst plausible" scenario may be relatively large fractions of the general dose limit if the probability of that scenario occurring is relatively low. In cases where the probability of the "worst plausible" scenario is high, potential doses associated with the release would be limited to a relatively small fraction of the 100 mrem/yr. dose limit.

Persons responsible for the decontamination and release of property with residual radioactive material subject to the proposed rule would ensure that the property to be released has been assessed and potential impacts are appropriately documented.

Authorized limits, set by DOE and regulated under Section 834.302—Authorized Limits, shall be based on the nature of the property and its potential use, and on the potential dose to an individual in:

- (1) the actual and likely use scenario to ensure that potential

doses are not likely to exceed a small fraction of the applicable dose limits in this part and applicable dose limits in this part and (2) the worst plausible use scenario to ensure that potential doses are not likely to exceed the applicable dose limits in this part

DOE may authorize for a particular DOE activity, supplemental limits, regulated under Section 834.310—Supplemental Limits, for the release of property containing residual radioactive material in lieu of any general limits authorized under this Subpart if:

- Remedial action consistent with authorized limits would pose a clear and present risk of injury to workers or members of the public, notwithstanding reasonable measures to avoid or reduce risk.
- Remedial action consistent with authorized limits, even after all reasonable mitigative measures have been taken, causes environmental harm that is clearly excessive compared to the health benefits to persons living on or near affected properties now or in the future.
- It is determined that the scenarios or assumptions used to establish the authorized limits do not apply to the property identified or where more appropriate scenarios or assumptions indicate that other limits are applicable or appropriate for protection of the public and environment.
- The cost of remedial action for contaminated soil is unreasonable high relative to long-term benefits and where the residual material does not pose a clear present or future risk after taking necessary control measures.
- There is no feasible remedial action that can achieve the authorized limits and supplemental limit shall achieve the dose and ALARA requirements of this part for any current or future use of the property and shall contain any restriction necessary to achieve the objectives of this part.

Using accepted risk assessment techniques, an acceptable level of volumetric contamination for free release can be calculated. Using the modeling software, ISOSHLD, the regulatory exposure dose rate of 100 mrem/yr., and the assumptions listed, the permissible limit for uranium activity in a piece of equipment can be calculated.

The levels of contamination calculated in the example that follows can be readily measured using hand-held instruments under the current conditions in Building 865. Thus, under present and proposed DOE regulations, permissible limits for free release can be established on a case-by-case basis.

Table 3.1—Sample Calculation To Establish Authorized or Supplemental Limits for Volumetric Contamination for Unrestricted Equipment Release

Requirement:	Characterization of volumetric contamination requires that the activity ($\mu\text{Ci/cc}$) of radionuclides be established.	
Nuclide of Concern:	Depleted Uranium-238	
Equipment for Release:	Lathe Machine	
Exposure Limit:	100 mrem/yr. (total exposure from both surface and volumetric contamination)	
Modeling Assumptions:	<ul style="list-style-type: none"> • The contamination consists of U-238 that is a by product of uranium enrichment. Since it is extremely chemically pure, no long-term daughter products have built up since enrichment, except for a minor amounts ($1.4 \times 10^{-2} \%$) of U-234. A small amount (0.5%) of U-235 also remains in the containment after the enrichment process. Thus, the ratio of isotopes in the containment (in $\mu\text{Ci/cc}$) is $1/0.005/0.00014$ of U-238/U-235/U-234. • All loose surface contamination has been removed, so that the radiation consists of beta and gamma only. Thus, the conversion factor between rem and rad is 1. • The operator works at the machine for 40 hours per week for 50 weeks per year, or 2,000 hours per year. Thus, the allowable exposure rate is 5×10^{-5} R/hour. • The machine is modeled as a cylinder of length 241.5 cm and radius 144.8 cm. The cylinder is composed of a homogenous mixture of iron and air of density 3.9 g/cc, approximately modeling the interior spaces in the real equipment. The contamination is homogeneously distributed throughout the cylinder. • The "reasonable and likely" location at which the exposure is measured is one cm outward from the cylinder surface (145.8 cm from the cylinder center line) and 73.3 cm from one end. 	
Aim of the Calculation:	Determine the allowable activity of depleted uranium contamination for the lathe machine targeted for free-release that is compatible with the current 100 mrem/yr. total exposure limit.	
Model Used:	ISOSHLD	
Source Activity Limits:	U-235	1.950×10^{-5}
	U-234	5.000×10^{-7}
	U-238	3.900×10^{-3}

3.2 International Experience

Approximately 288 nuclear installations could be decommissioned within the next twenty to thirty years. A colossal amount of metals, equipment and other materials will result, all of which will either have to be recycled, reused or disposed of as waste. If dismissed out of hand as waste with no effort to establish release criteria, this material will place a tremendous burden on already stressed disposal facilities. Therefore, due to the amount of potentially reusable material foreseen, a desirable internationally accepted criteria should be developed for the release of components arising from the decommissioning of nuclear facilities. (IAEA, 1988)

The development of such international standards is of interest to DOE since it commonly adopts internationally accepted standards or uses them in the development of its own radiation protection standards. The following sections provide a brief discussion of international agencies involved in standards and policies.

3.2.1 International Commission on Radiological Protection

DOE currently adopts and implements radiation protection dose standards consistent with the recommendations of the ICRP. In 1977, the ICRP recommended a system of dose limitations that has been adopted and implemented by essentially all countries with nuclear programs. The ICRP system of dose limitations provides a scientific basis for health protection and selection of dose limits. The system also reflects current information on health risk, dosimetry, and radiation practices, and promotes a more uniform and consistent application of radiation protection among diverse activities than had previously been possible. The ICRP system is based on sophisticated analytical models and requires computer capabilities for making evaluations or using the dose conversion tables produced from such evaluations.

The principle objective of ICRP is to protect man from undue radiation exposure from current and future sources. The objective is applicable to all radiological work including the recycling/reuse of components from nuclear programs. The system of dose limitation as laid down by ICRP in Publication 26, and subsequently adopted by the IAEA, the NRC and DOE, contains three essential components:

- Justification of a practice
- Optimization of radiation protection
- Individual dose limitation

Justification. In order to prevent unnecessary exposure, no practice involving exposure to ionizing radiation shall be adopted unless its introduction produces a positive net benefit.

Optimization. All exposure to radiation is assumed to involve some degree of risk, and the optimization of radiation protection requires that exposure should be kept ALARA, economic and social factors taken into consideration. This can be interpreted as meaning that the detriment associated with the practice under consideration should be appropriately small in relation to the benefit resulting from it. The detriment is the harm to health caused by the practice and is assumed to be proportional to the total radiation dose to the population as a whole.

Dose limitation. Dose limits are necessary as an overriding limit on the risk to the

individuals. They may be regarded as the lower bound of a region of unacceptable risk. Recommendations on the individual dose limits are given by ICRP in Publication 26.

Practices involving the release of components from the decommissioning of nuclear installations are controlled on the basis of these principles of radiological protection. If unrestricted release is intended, it is necessary to demonstrate that the radiological risk associated with the practice are trivial. The IAEA has issued a recommended policy to establish if a dose is trivial.

3.2.2 International Atomic Energy Agency

In 1988, the IAEA issued Safety Guide #89, Principles for the Exemption of Radiation Sources and Practices for Regulatory Control. The purpose of this safety guide was to recommend a policy on exemption of radiation sources and practices from regulatory program. The IAEA recommendations on individual and related risks consider two main approaches in deciding whether a dose is trivial. The first consideration is risk-based, and the recommended level of trivial effective dose equivalent is in the range of 1-10 mrem/yr. The other consideration is based on comparison with the natural background radiation, a small dose that can be regarded as trivial. The recommended whole body or effective dose is a few percent of the natural background, i.e., 1-10 mrem/yr. The IAEA draws the conclusion that an individual radiation dose, regardless of its origin, may be regarded as trivial if it is of the order 1-10 mrem/yr. DOE's guidance requiring report of release events of greater than 10 mrem is consistent with this policy. (DOE, August 1991)

3.2.3 International Criteria for Unrestricted Release

Several countries having nuclear facilities have established permissible levels of surface and volumetric contamination for objects intended to be removed from controlled areas (i.e. unrestricted release). Some of the criteria used for unrestricted release of materials are shown in the following table, along with their corresponding country and released material. (IAEA, 1988)

Table 3.2 International Release Criteria

Country/Facility Type	Remarks	Unrestricted Release Limits:	
		Surface	Volumetric (fixed)
France-- 3 uranium processing plants in Le Bouchet, Gueugnon, and Forez	Plants and sites released for URU. 1400 t steel scrap released for URU. 900 t of equipment released for use in similar plants.	0.2 Bq/cm ² (alpha) 7.5 µSv/h (beta) 1.25 µSv/h (gamma)	0.2 Bq/cm ² (alpha)
30,000 drums (750 t) per year Uranate transport	Decontaminated, remelted, and released for URU.	74 Bq/drum (alpha)	---
Germany-- Gundremmingen-A NPP, 250 MW(E)	1100 t metal and 400 t concrete release for URU.	0.37 Bq/cm ²	3.7 Bq/g
Würgassen NPP refurbishment	140 t of steel melted and used to make waste containers for service in nuclear stations. 100 t metal scrap remelted and released for URU.	0.37 Bq/cm ²	3.7 Bq/g
Nuclear ship Otto Hahn	Contaminated components removed; ship released for URU.	0.37 Bq/cm ²	3.7 Bq/g
Sweden-- R-1 research reactor, 1 MW (Stockholm)	Facility components released for URU. 15% of scrap metal recycled for URU. 1500t remelted for URU since 1982.	8 KBq/m ²	---
Nuclear reactor heat exchange tubes	Used for production of ship propellers and similar items.	500 Bq/kg (gamma)	---

3.3 U.S. Environmental Protection Agency Involvement

According to DOE Order 5400.5, Real Properties owned by DOE that are being sold to the public are subject to the requirements of Section 120(h) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended. The requirements of 40 CFR Part 192 are applicable to properties remediated by DOE under Title I of the Uranium Mill Tailings Radiation Control Act.

The EPA has entered into a Federal Facility Compliance Agreement with RFP and the State of Colorado, under RCRA and CERCLA. This may give EPA power of review, if not approval, for any action involved in the free release of property for RFP. The fact that RFP is a National Priorities List (NPL) Site coming under EPA review for CERCLA cleanup issues strengthens this hypothesis.

Uniform cleanup standards for radiologically contaminated federal facilities are in the formative stages of rule-making at EPA, but could be proposed as soon as early 1994. They would cover residual radioactivity and other types of contamination as well. The first part of EPA's upcoming proposal will deal with actual cleanup, and the second part (proposed approximately six months later) will pertain to management of removed waste. (BNA, April 16, 1993)

Along with EPA, NRC has regulatory responsibility in the radiological cleanup area. However, EPA in some sense has broader regulatory authority. EPA's generally applicable standards would cover not only NRC licensees, but also DOE and some DoD facilities. NRC is responsible only for the development of standards for its licensees. Both agencies have signed a memorandum of understanding stipulating that if EPA determines NRC standards for cleanup are protective of public health, then NRC licensees will be regulated by those standards. EPA is not only concerned with the cleanup but what is done with the waste after it is removed and whether any material may be reused. (BNA, April 16, 1993)

3.4 Nuclear Regulatory Commission Position

On July 3, 1990, the NRC adopted a policy statement on Below Regulatory Concern (BRC). This policy established a framework for NRC to approve exemptions from some or all regulatory controls for material involving small quantities of radioactive material. "The recycling of slightly contaminated equipment and materials" is one of the practices addressed in the BRC policy for which exemptions may be granted.

The BRC policy states that the average dose to individuals should be less than 10 mrem/yr. for exempted practices. In addition, an interim dose criterion of 1 mrem/yr. average annual dose to individuals has been established for those practices involving widespread distribution of radioactive materials in items such as consumer products or recycled material and equipment. (NRC, 1990) A collective dose limit of 1000 person-rem/year was also established for an exempted practice.

At the present time, NRC has placed the BRC policy on hold and has assembled a task force to reevaluate the policy. Surface contamination limits used for the termination of licenses for nuclear facilities are considered inadequate and work is in progress to develop general criteria for the unrestricted release of components. (DOE, August 1991)

Recently, the need for generic NRC decommissioning standards was recommended at a workshop held by NRC. Participants agreed that NRC should develop generic rather than site-specific standards for decommissioning sites. Currently, NRC is using a site-by-site approach for cleaning up and decommissioning facilities licensed by NRC and "agreement states," including Colorado. (BNA, May 14, 1993)

Generic standards would provide radiological criteria on "how clean is clean enough" in decommissioning sites and releasing the property for unrestricted use. Participants also agreed that flexibility for site-specific standards and efficient implementation should be built into the generic standards. This guidance was the result of public workshops NRC held around the U.S. on its enhanced participation rule-making process on establishing criteria for residual contamination at site. (BNA, May 14, 1993)

NRC so far has identified four distinct alternatives for the radiological criteria:

- Risk limits, where a limiting value is selected and criteria are established below the limit using practical considerations
- Risk goal, where a goal is selected and practical considerations are used to establish criteria as close to the goal as possible
- Best effort, where the technology for decontamination considered to be the best vehicle is applied
- Return to existing background, where the decontamination would continue until the radiological conditions were the same as those that existed before the licensed activities

NRC hopes to have a final rule by May 1995. NRC has set up an electronic bulletin board to provide information and accept comments on the enhanced participation rule-making process. Information on how to connect to the bulletin board can be obtained by calling (301) 492-3999 or (301) 492-3790 weekdays between 10:00 a.m. and 3:00 p.m. (BNA, May 14, 1993)

3.5 State of Colorado

The recycling and eventual release of DOE's equipment from D&D installations is not only regulated in the federal sector. If DOE transfers the property to a contractor for treatment on private land in an Agreement State and the contractor releases the property, the state has regulatory authority for the treatment process and the release of the property. As of 1991, 29 states, including Colorado, have entered into an agreement with NRC under subsection 274 (b) of the Atomic Energy Act of 1954, as amended, to regulate radioactive material. (DOE, August 1991)

DOE facilities that may have large quantities of equipment are in Agreement States such as New Mexico, Tennessee, Washington, and Colorado. RFP has a Federal Facilities Agreement in place with the state of Colorado, which may give the state power of review, if not approval, of actions associated with the decontamination and free-release of radiologically contaminated equipment. As of 1991, the state regulators had not dealt with a case involving volumetrically contaminated equipment. (DOE, August 1991)

3.6 Rocky Flats Plant Guidance Interpretations

Institutional controls at RFP appear to reflect overly cautious interpretations of current DOE guidance. Also, current site policies are sometimes inconsistent with one another.

RFP institutional requirements and procedures for free-release of equipment are as follows:

- Health and Safety Plan (HSP) 18.10—Release of Property/Waste for Conditional and Unrestricted Use
- Radiological Engineering (RE) 1003—Radiological Evaluation for Unrestricted Release of Property
- Radiological Operational Instructions (ROI) 3.02—Survey Requirements for Conditional and Unrestricted Use

At RFP, a Property Release Moratorium Phase II has been implemented. Phase II provides for a mobile team at RFP and RFP facilities to monitor items and equipment for unrestricted release. This mobile team will survey materials, property, and equipment in accordance with RFP policy, including HSP 18.10 and ROI 3.02, for unrestricted release.

Beryllium contamination of the equipment in Building 865 was discussed with Mike Richen of Industrial Hygiene. Mr. Richen was very helpful in describing the problems encountered in decontamination of the equipment and the associated liabilities with unrestricted release. The problems stem from the inability to check all the equipment surfaces to verify the beryllium limit of 25 $\mu\text{g}/\text{ft}^2$ is met.

Requirements for unrestricted release of radiologically contaminated equipment from RFP was discussed with Gwen Aldrich, Radiological Engineering Section Manager for EG&G. Mr. Aldrich described the same problems Mr. Richen described for beryllium contamination. Mr. Aldrich also stated that EG&G requirements for unrestricted release were based on the assumption that decontamination has been conducted and levels of contamination meeting the allowable limits have been achieved. According to Mr. Aldrich, RFP's practice for verification of decontamination requires a 100% surface survey, which in turn requires total disassembly of equipment.

RE 1003 does not specifically state that 100% of the surface area must be surveyed. Provisions for specific exemptions are contained in the RE 1003. On request and approval by the Assistant General Manager, Plant Safety and Security, the release is to be processed through the DOE operations office. Requests for exceptions shall demonstrate a clear need for an exception and detail compliance with the basic dose limits set forth in DOE Order 5400.5.

HSP 18.10—Release of Property/Waste for Restricted and Unrestricted Use, defines requirements and criteria established by 40 CFR part 261, DOE Radiological Control Manual; DOE Order 5400.5, Radiation Protection of the Public and the Environment; DOE Order 5480.11, Radiation Protection of Occupation Workers; and the Plant Policy 13-3 and Property Removal Permits for the restricted and unrestricted release of property.

Unrestricted Release is defined in Section 3.16 of HSP 18.10 as "release of property from anywhere within the Plant Boundary without restriction on future

movement or disposal, in accordance with guidelines and requirements of DOE Orders 5400.5 and 5480.11, DOE Radiological Control Manual and HSP 18.10."

According to HSP 18.10, Section 4.4, RE is responsible for establishing alternate, non-routine, and/or special methods to meet release criteria established by DOE. This is accomplished and documented using RE 1003, Radiological Evaluation for Unrestricted Release of Property. Additionally, the RE classifies buildings or areas as Radioactive Material Management Area (RMMAs), Radiological Controlled Areas (RCAs), or uncontrolled areas, maintains the building evaluation files and current building lists, and performs property release evaluations.

RO as defined in HSP 18.10, Section 4.5, performs initial property release evaluations in accordance with ROI 3.02, Survey Requirements for Conditional and Unrestricted Use; performs radiological surveys as required for property transfers or releases in accordance with ROI 3.02; and refers property release to RE when the property meets certain criteria listed in ROI 3.02. The unrestricted property release/transfer procedure and conditional property release/transfer procedure are contained in HSP 18.10, Section 5.1 and Section 5.2, respectively.

References cited in HSP 18.10 and pertaining to disposition of materials are as follows:

- RE 1003—Radiological Evaluation for Unrestricted Release of Property
- 40 CFR 261—Material Destined for a Landfill, Offsite Disposal, or Treatment Prior to Disposal
- ROI 3.02—Survey Requirements for Conditional and Unrestricted Use
- ROI 3.1—Performance of Surface Contamination Surveys
- DOE Order 5400.5—Radiation Protection of the Public and Environment
- DOE Order 5480.11—Radiation Protection of Occupational Workers
- 40 CFR 261—Identification and Listing of Hazardous Wastes

The impacts of the 100% surface survey practice at RFP must be resolved prior to attempting free release. Cost estimates presented here are based on the ability to ensure decontamination compliance without 100% surface survey. In turn, the level of decontamination, disassembly and exposure are based on equipment type. Some equipment may require minimal decontamination/disassembly and survey to ensure compliance with regulatory standards for contaminant levels. Other equipment may be too complex, and require total disassembly and surface survey to ensure compliance. RFP procedures and policies governing the level of decontamination and verification need to be revised to allow for case-by-case evaluation of equipment for release, as indicated in current and proposed DOE guidance.

3.7 Regulations for the Transportation of Radioactive Materials

The policies and regulations for the safe transport of radioactive materials through interstate and foreign commerce by all modes of travel except postal shipments, falls under the jurisdiction of the Department of Transportation Act and the Transportation Safety Act of 1974 and is regulated by the U.S. DOT. Shipments within a single state are subject to control by that state's transportation agency. In addition, under the Atomic Energy Act, as amended, the NRC has the responsibility

for safety in the possession and use, including transport, of by-product, source, and special nuclear materials. Since both agencies possess statutory authority to regulate transport of radioactive materials, the NRC and DOT have a written Memorandum of Understanding (MOU) for regulating the transportation of radioactive materials. The MOU generally delineates the respective responsibilities of each agency so as to avoid overlap, duplication and/or conflicting regulatory standards. Table 3.7a lists the federal regulations for transporting radioactive materials.

Table 3.7a
Sources of Federal Regulations Regarding
Transportation of Radioactive Material

Title 49 Department of Transportation's "Hazardous Materials Regulations," Parts 100-178	
Main Headings	
49 CFR 106	Rulemaking Procedures
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 171	General Information, Regulations and Definitions
49 CFR 172	Hazardous Materials Tables and Hazardous Materials Communications Regulations
49 CFR 173	Shippers-General Requirements for Shipments and Packagings
49 CFR 174	Carriage by Rail
49 CFR 175	Carriage by Aircraft
49 CFR 176	Carriage by Vessel
49 CFR 177	Carriage by Public Highway
49 CFR 178	Shipping Container Specifications
Title 10 U.S. Nuclear Regulatory Commission	
10 CFR 71	Packaging and Transportation of Radioactive Material Note: Pursuant to 10 CFR 71.5 [7], NRC licensee shippers are directly subject to 49 CFR shipper requirements.

The purpose of these regulations is to ensure the safety of transport workers, property, the environment, and the general public. The regulations provide for:

1. Containment of the material during handling and transport
2. Protection of persons from radiation emitted by the material
3. Dissipation of any excessive heat from thermal decay of the material
4. Prevention of accidental criticality if the radioactive material is also a fissile material

The foremost responsible party, the shipper, achieves these objectives through maintaining extensive operational controls for packaging containers. The packaging requirements are designed to be commensurate with the hazards of the radioactive material in relation to its type, quantity and form. The degree of container integrity required covers a continuum ranging from: (1) essentially no

specific package requirements for specific radioactivity $< 2.0 \text{ nCi/g}$, de minimus level or Low Specific Activity (LSA); (2) minimal packaging, or Type A; (3) very stringent, high integrity packaging for Type B or "Highway Route Controlled Quantity." The NRC periodically publishes a directory of certificates of compliance for the radioactive materials package designs that have been approved.

In addition to requirements for packaging corresponding to activity of contents, the regulations contain a number of other requirements, including control of radiation during transport, warning labels, vehicle and storage limits, package markings, shipping paper requirements, contamination control and vehicle placards.

The radiation levels allowed during transport are summarized in Table 3.7b. Each package of radioactive material, unless excepted (i.e. LSA), must be labeled on two opposite sides with one of the approval forms of the distinctive warning signs indicating radioactive contents. To control the radiation level of accumulations of multiple numbers of packages once in the transportation environment, the regulations require that the carrier maintain certain required separation distances between packages and other areas which are occupied by persons and photographic film. Unless excepted from marking (LSA) each completed radioactive materials package must be marked by the shipper with the following:

1. Applicable DOT package specification
2. Applicable NRC, DOE or IAEA Certificate Identification Number
3. Package exceeding 50 kg (110 lbs.) gross weight
4. Labeled LSA, Type A or B
5. Applicable DOT Proper Shipping Name and Identification Number (49 CFR 172.101)

Table 3.7b
Maximum Radiation Levels Limitations
for Packaging and Transportation

Radiation level (dose) rate at any point on external surface of any package of radioactive material may not exceed:

- A. 200 mrem/h
- B. 10 mrem/h at one m (3.3 ft.) (Transport Index may not exceed 10).

Unless the packages are consigned to a "Sole Use" or "Exclusive Use" transport vehicle (except aircraft) then the Maximum Radiation Levels may be:

- (a) 1 mrem/h at the External Package Surface (closed transport vehicle)
- (b) 200 mrem/h at external surface of vehicle
- (c) 10 mrem/h at 2 m (6.6 ft. from lateral external surface of the vehicle)
- (d) 2 mrem/h in any position of the vehicle which is occupied by a person. This provision does not apply to a private carrier whose personnel are under a radiation protection program and using a personnel monitoring device.

Additionally, each dispatch of radioactive material must be accompanied by a properly prepared shipping paper, containing the following required elements of information:

1. DOT proper shipping name (49 CFR 172.101)
2. Description of the physical and chemical form of the material (if not LSA)

3. Shipper's certification
4. Activity in each package
5. Transport index assigned to each package
6. Name of each radionuclide
7. Category of label applied to each package
8. NRC, DOE, or IAEA Certificate Identification
9. DOT identification number from 49 CFR 171.101

Finally, DOT regulations mandate certain limits for the control of removable external (nonfixed) radioactive surface contamination (Table 3.7c) and for transport vehicles, with the exception of LSA materials, to be marked on all four sides with a DOT radioactive placard.

Table 3.7c
Contamination Limits for Removable Surface Contamination for Transport
(49 CFR 173.443) (nCi/100 cm²) (dpm/m/100 cm²)

Contaminant	Package Wipe Sample Limits	
	nonexclusive use	exclusive use*
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than 10 days; uranium and thorium and their daughters when contained in ores or concentrates	1 (220)	10 (22,000)
All other alpha-emitting radionuclides	0.1 (220)	1 (2200)

* When these higher wipe sample limits are applied, the transport vehicle must be surveyed after each use. Vehicle may not be placed in service until the surfaces are within the limits for nonexclusive use packages.

References

Code of Federal Regulations:

- 10 CFR Part 834, "Radiation Protection of the Public and the Environment; Proposed Rule." Federal Register, Thursday March 25, 1993, Part II.
- 40 CFR 192, "EPA Standards For Protection Against Uranium Mill Tailings."
- 40 CFR 261, "Identification and Listing of Hazardous Wastes."
- 41 CFR 101, "Federal Property Management Regulations."
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Grella, Alfred W. 1986. Radioactive Waste Technology, Chapter 10 "Regulation of Nuclear Waste Transportation," pp. 407-420.

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- U.S. DOE Order 5480.11, "Radiation Protection of Occupational Workers."
- U.S. DOE, August 1991. Draft White Paper, Radioactive Scrap Metal Recycling: A DOE Assessment. Prepared for the U.S. Department of Energy Office of Environmental Restoration by the Office of Technical Service/Weston and H&R, Germantown, MD.
- Vira, J. and M. Yasui, "International Comparisons of Decommissioning Cost Estimates: Reasons for Discrepancies." From Decommissioning Policies For Nuclear Facilities: Proceedings of an International Seminar, Paris 2-4 October 1991. Nuclear Energy Agency, Organization for Economic Co-operation and Development (OECD), Paris, 1992

A.1 Baseline Alternative Landfill Disposal

Each cost estimation consists of the addition of two summation components which summed an individual cost for each piece of equipment considered; added to a third component - a one time "fixed management cost". The summation components are: 1) equipment with hydraulic fluid- cost of drain and flush, and 2) applicable individual cost for removal, transportation, and disposal. These are delineated by post scripts in the equation below. Inputs to these equations are from two sources. The first source is the raw, fixed data stored in the equipment database. These data include such items as gallons of hydraulic fluid, equipment weight, volume, surface area and manhour estimates for labor. Other parameters contained in the equation are input in the screen shown below. Results from applying these equations are presented in Appendix B.

For Commercial Disposal:

$$\sum_{i=1}^n \$200 + (\$34.15/\text{gal} * \text{gals}) + \sum_{i=1}^m [(\text{labor}^a * \text{rate}) + (\text{labor}^b * \$467) + (\#SL * \text{transport cost}) + (\#SL * \text{disposal cost})] + \$2,764,000$$

Example Item 72: Bullard Vertical Turret Lathe, Crew Type D, #SL = 2.2:

$$\$200 + (\$34.15/\text{gal} * 130) + [(24 * \$1,472) + (60 * \$467) + (2.2 * \$7,650) + (2.2 * \$12,000)]$$

Item 72 Disposal Cost only = \$1,211,217.50

For Government Disposal:

$$\sum_{i=1}^n \$200 + (\$34.15/\text{gal} * \text{gals}) + \sum_{i=1}^m [(\text{labor}^a * \text{rate}) + (\text{labor}^b * \$467) + (\#SL * \text{transport cost}) + (\#SL * \text{disposal cost})] + \$2,764,000$$

Example Item 72: Bullard Vertical Turret Lathe, Crew Type D, #SL = 2.2:

$$\$200 + (\$34.15/\text{gal} * 130) + [(24 * \$1,472) + (60 * \$467) + (2.2 * \$7,650) + (2.2 * \$12,800)]$$

Item 72 Disposal Cost only = \$112,977.50

Note:

n = equipment with hydraulic fluid

m = all other equipment

SL number of sealand container utilized

a: labor rate for removal crew (i.e. A,B,C, or D)

b: labor rate of crew E (miscellaneous labor crew)

c: fixed management price for entire option

The Multiplier Data Base Screen is included below:

Utility Calculation Values			
<Help> <Find> <Edit> <Add> <Dele> <Top> <Last> <Next> <Prev> <Quit>			
Option Key: LANDFILL			
Landfill Fees/Surcharges:		Work Crew Rates:	
Government Rate:	\$12800.00	Crew A Rate:	\$233.00
Commercial Rate:	\$512000.00	Crew B Rate:	\$865.00
		Crew C Rate:	\$1175.00
		Crew D Rate:	\$1472.00
		Crew E Rate:	\$467.00
Regulatory Costs Fee: 2764000.00			
Decontamination:		Oil Drain & Flush:	
Wipe:	\$100.00	Cost Per Gallon:	\$34.15
Per Square Foot:	\$9.00	Fixed Labor Chg:	\$200.00
Melting Costs Per Pound:		Slag Costs Per Ft3: \$16.00	
Cast Iron:	\$1.15		
Steel:	\$1.25	Shipping Cost Per	
		Sealand: \$7650.00	
<OKAY>			
Theta Technologies, Inc.			

A3 Reuse Within the Governmental Sector

Each cost estimation consists of the addition of two summation components which summed an individual cost for each piece of equipment considered, added to a third component - a one time "fixed management cost". The summation components are: 1) equipment with hydraulic fluid- cost of drain and flush, and 2) applicable individual cost for removal, decontamination, transportation, and sampling and survey. These are delineated by post scripts in the equations below. Inputs to these equations are from two sources. The first source is the raw, fixed data stored in the equipment database. These data include such items as gallons of hydraulic fluid, equipment weight, volume, surface area and manhour estimates for labor. Other parameters contained in the equation are input in the screen shown below. Results from applying these equations are presented in Appendix B.

Contaminated Equation:

$$\sum_{i=1}^n \$200 + (\$34.15/\text{gal} \cdot \text{gals}) + \sum_{i=1}^m [(\text{labor}^a \cdot \text{rate}) + (\text{labor}^b \cdot \$467) + (\# \text{pallet} \cdot 50 + \text{cost of skids})] + \$1,352,000^c + \text{Packing Cost}^d$$

Example Item 72: Bullard Vertical Turret Lathe, Crew Type D

$$\$200 + (\$34.15/\text{gal} \cdot 130) + [(24 \cdot \$1,472) + (60 \cdot \$467) + (\$12,100)]$$

Item 72 Transfer Cost only = \$80,087.50

Decontaminated Equation:

$$\sum_{i=1}^n \$200 + (\$34.15/\text{gal} \cdot \text{gals}) + \sum_{i=1}^m [(\text{labor}^a \cdot \text{rate}) + 2(\text{labor}^b \cdot \$467) + (\text{area} \cdot \$13.50) + (\# \text{pallet} \cdot 50 + \text{cost of skids})] + \$1,352,000^c + \$480,000^e + \$65,000^f$$

Example Item 72: Bullard Vertical Turret Lathe, Crew Type D

$$\$200 + (\$34.15/\text{gal} \cdot 130) + [(24 \cdot \$1,472) + 2(60 \cdot \$467) + (166 \cdot \$13.50) + (\$12,100)]$$

Item 72 Transfer Cost only = \$110,348.50

Note:

n = equipment with hydraulic fluid a: labor rate for removal crew rate dependent (i.e. A,B,C, or D)
m = all other equipment b: labor rate of crew E (miscellaneous labor crew)
c: sample/survey fixed price d: fixed management price for entire option
e: double for disassemble & reassemble f: capital cost for decon equipment

The Multiplier Data Base Screen is included below:

Utility Calculation Values			
<Help> <Find> <Edit> <Add> <Dele> <Top> <Last> <Next> <Prev> <Quit>			
Option Key: TR_CONTAM			
Landfill Fees/Surcharges:		Work Crew Rates:	
Government Rate:	\$12800.00	Crew A Rate:	\$233.00
Commercial Rate:	\$512000.00	Crew B Rate:	\$865.00
		Crew C Rate:	\$1175.00
		Crew D Rate:	\$1472.00
		Crew E Rate:	\$467.00
Regulatory Costs Fee: 1352000.00			
Decontamination:		Oil Drain & Flush:	
Wipe:	\$100.00	Cost Per Gallon:	\$34.15
Per Square Foot:	\$13.50	Fixed Labor Chg:	\$200.00
Melting Costs Per Pound:		Slag Costs Per Ft3: \$16.00	
Cast Iron:	\$1.15		
Steel:	\$1.25	Shipping Cost Per Sealand: \$7650.00	
<OKAY>			
Theta Technologies, Inc.			

A.4 Unrestricted Release To Non Government Organizations

Each cost estimation consists of the addition of two summation components which summed an individual cost for each piece of equipment considered; added to a third component - a one time "fixed management cost". The summation components are: 1) equipment with hydraulic fluid - cost of drain and flush, and 2) applicable individual cost for removal, decontamination, equipment market value, reassemble, transportation, and sampling and survey. These are delineated by post scripts in the equations below. Inputs to these equations are from two sources. The first source is the raw, fixed data stored in the equipment database. These data include such items as gallons of hydraulic fluid, equipment weight, volume, surface area and manhour estimates for labor. Other parameters contained in the equation are input in the screen shown below. Results from applying these equations are presented in Appendix B.

Decontaminated Equation:

$$\sum_{i=1}^n \$200 + (\$34.15/\text{gal} * \text{gals}) + \sum_{i=1}^m \left[(\text{labor}^a * \text{rate}) + 2(\text{labor}^b * \$467)^d + (\text{area} * \$13.50) + (\# \text{pallet} * 50 + \text{cost of skids}) + (\text{cost of sale}) - (\text{sale price}) \right] +$$

$$\$1,352,000^c + \$480,000^e + \$65,000^h$$

Example Item 72: Bullard Vertical Turret Lathe, Crew Type D

$$\$200 + (\$34.15/\text{gal} * 130) + [(24 * \$1,472) + 2(60 * \$467) + (166 * \$13.50) + (\$12,100) + (\$4284) - (\$23800)]$$

Item 72 Unrestricted Release Cost only = \$117,764.5

Note:

n = equipment with hydraulic fluid
m = all other equipment
f: sample/survey fixed price
g: doubled for disassemble & reassemble
a: labor rate for removal crew rate dependent (i.e. A,B,C, or D)
b: labor rate of crew E (miscellaneous labor crew)
c: fixed management price for entire option
d: capital cost of decon equipment

The Multiplier Data Base Screen is included below:

Utility Calculation Values			
<Help> <Find> <Edit> <Add> <Dele> <Top> <Last> <Next> <Prev> <Quit>			
Option Key: PUBLIC			
Landfill Fees/Surcharges:		Work Crew Rates:	
Government Rate:	\$12800.00	Crew A Rate:	\$233.00
Commercial Rate:	\$512000.00	Crew B Rate:	\$865.00
		Crew C Rate:	\$1175.00
		Crew D Rate:	\$1472.00
		Crew E Rate:	\$467.00
Regulatory Costs Fee:		3384000.00	
Decontamination:		Oil Drain & Flush:	
Wipe:	\$100.00	Cost Per Gallon:	\$34.15
Per Square Foot:	\$13.50	Fixed Labor Chg:	\$200.00
Melting Costs Per Pound:		Slag Costs Per Ft3:	
Cast Iron:	\$1.15		\$16.00
Steel:	\$1.25	Shipping Cost Per	
		Sealand:	\$7650.00
<OKAY>			
Theta Technologies, Inc.			

B.1 General Equipment Data

Rocky Flats General Equipment Data includes pertinent information for each piece of equipment. This information includes: Item number, manufacturer, model and serial numbers, room number, approximate size in cubic feet, map location, Rocky Flats Plant property number, purchase price, and condition code. The condition codes for the equipment were evaluated and assigned based on the procedure outlined in 41 CFR 101. The condition codes as found in 41 CFR 10143.4803 are included below.

§ 101—43.4801

41 CFR Ch. 101 (7-1-90 Edition)

(e) The appropriate disposal condition code from the table below shall be assigned to each item record, report, or listing of excess personal property:

Disposal Condition Code	Brief Definition	Expanded Definition
1	Unused—good	Unused property that is usable without repairs and identical or interchangeable with new items from normal supply sources.
2	Unused—fair	Unused property that is usable without repairs, but is deteriorated or damaged to the extent that utility is somewhat impaired.
3	Unused—poor	Unused property that is usable without repairs, but is considerably deteriorated or damaged. Enough utility remains to classify the property better than salvage.
4	Used—good	Used property that is usable without repairs and most of its useful life remains.
5	Used—fair	Used property that is usable without repairs, but is somewhat worn or deteriorated and may soon require repairs.
6	Used—poor	Used property that may be used without repairs, but is considerably worn or deteriorated to the degree that remaining utility is limited or major repairs will soon be required.
7	Repairs required—good	Required repairs are minor and should not exceed 15 percent of original acquisition cost.
8	Repairs required—fair	Required repairs are considerable and are estimated to range from 16 percent to 40 percent of original acquisition cost.
9	Repairs required—poor	Required repairs are major because property is badly damaged, worn, or deteriorated, and are estimated to range from 41 percent to 65 percent of original acquisition cost.

Disposal Condition Code	Brief Definition	Expanded Definition
X	Salvage	Property has some value in excess of its basic material content, but repair or rehabilitation to use for the originally intended purpose is clearly impractical. Repair for any use would exceed 65 percent of the original acquisition cost.
S	Scrap	Material that has no value except for its basic material content.

(f) In addition to the appropriate disposal condition code from the table in paragraph (e) of this section, each item record, report, or listing of Department of Defense excess personal property shall also contain the appropriate supply condition code assigned before or at the time the item was declared excess, except item records, reports, or listings of contractor inventory when a determination is made that inclusion of the supply condition code is impractical. When available, civil agencies shall include the appropriate supply condition code in each item record, report, or listing of excess personal property. These codes, which provide additional material condition information for screening purposes, follow:

Supply Condition Code	Brief Definition	Expanded Definition
A	Serviceable (issuable without qualification)	New, used, repaired, or reconditioned material that is serviceable and issuable to all customers without limitation or restriction. Includes material with more than six months shelf-life remaining.
B	Serviceable (issuable with qualification)	New, used, repaired, or reconditioned material that is serviceable and issuable for its intended purpose but is restricted from issue to specific units, activities, or geographical areas by reason of its limited usefulness or short service-life expectancy. Includes material with three through six months shelf-life remaining.
C	Serviceable (priority issued)	Items that are serviceable and issuable to selected customers, but must be issued before Conditions A and B material to avoid loss as a usable asset. Includes material with less than three months shelf-life remaining.
D	Serviceable (test/modification)	Serviceable material that requires test, alteration, modification, conversion, or disassembly. (This does not include items that must be inspected or tested immediately before issue.)
E	Unserviceable (limited restoration)	Material that involves only limited expense or effort to restore to serviceable condition and that is accomplished in the storage activity where the stock is located.

Supply Condition Code	Brief Definition	Expanded Definition
F	Unserviceable (reparable)	Economically reparable material that requires repair, overhaul, or reconditioning, including reparable items which are radioactively contaminated.
G	Unserviceable (incomplete)	Material requiring additional parts or components to complete the end item before issue.
H	Unserviceable (condemned)	Material that has been determined to be unserviceable and does not meet repair criteria, including condemned items that are radioactively contaminated.
S	Unserviceable (scrap)	Material that has no value except for its basic material content. No stock will be recorded as onhand in Condition Code S. This code is used only on transactions involving shipments to DPDOs. Material will not be transferred to Condition Code S before being turned in to PDOs if material is recorded in Condition Code A through H at the time material is determined excess. Material identified by NSN will not be identified by this Condition Code.

[30 FR 5823, Apr. 27, 1965. Redesignated at 42 FR 40849, Aug. 12, 1977, and amended at 45 FR 28113, Apr. 28, 1980; 47 FR 8192, Feb. 25, 1982; 47 FR 15797, Apr. 13, 1982; 53 FR 16103, May 5, 1988]

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
2	Nikon	Camera		102	0.00	AB-6		6500	5
3	Polaroid	Camera and Light Table	MP-4 Land	102	0.00	AB-6	38187-00	1336	5
4	Vickers	Projection Microscope		102	0.00	AB-6	18970-00	4555	5
5	Busch & Lomb	Metallograph	Research II w/ Xenon 450	103	0.00	AB-6	44707-00,19326-0	18863	5
6	Leco	Metallograph	Model 300	103	0.00	AB-6	38147-00	2595	5
7	Wilson	Microhardness Tester	Model MO/Serial 1979	103	0.00	AB-6	39080-00	6439	5
8	Buehler	Microhardness Tester	Micromet 3	103	0.00	AB-6	38412-00	14382	5
9	Wilson	Microhardness Tester	Model MO/Serial 1173	106	0.00	AB-5	19251-00	2722	5
10	Theta	Dilatometer	Dilatronic Model 1600C	106	0.00	AB-5	38274-00	114832	4
11	Automet	Automet/Evromet Polisher		106	0.00	AB-5	38415-00	975	4
12	Leco	Diamond saws (2 each)	Vari/Cut Mod. VC-50	106	0.00	AB-5	38304-00,38371-0	2925	5
13	Newage	Rockwell Hardness Tester	Versitron	106	0.00	AB-5	38259-00	2578	5
14	Riehle	Rockwell Hardness Tester	Mod J, Ser # RA26464	106	0.00	AB-5	19243-00	2253	5
15	Clark Instr. Co	Rockwell Hardness Tester	Model 88A, Ser # 1785	106	0.00	AB-5		950	5
16	Wilson/Rockwell	Rockwell Hardness Tester	Mod B503T, S# 82088710	106	0.00	AB-5	33219-00	4549	5
17		Hoods (2 each)		106	0.00	AB-5	38301-00	0	5
18	Jarrett	Jarrett Polisher		106	0.00	AB-5	38279-00	7218	5
19	Leco	Grinder w/ Load Controller	Mod VP-50 w/ AP-50 Cont.	106	0.00	AB-5	36719-00	2150	5
20	Buehler	Maximet Grinder		106	0.00	AB-5	38300-00	22798	5
21		Polimet (3 each) grinding wh	Sink Mounted	108	0.00	AB-5	38352-00,38286-0	1940	5
22		120 Polimet Grinder		108	0.00	AB-5	38205-00	1250	5
23	Buehler	Abrasimet saw		108	0.00	AB-5	38228-00	5730	6
24	Instron	Test Machine and Controller	Model TTDL / Ser. 1787	108	0.00	AB-5	38277-00,38346-0	4894	4
25	Buehler	Pneumat Mounting Press	Pneumat 3	108	58.00	AB-5	19330-00	3369	5
26		Sink Mounted Press (2)		108	0.00	AB-5	38286-00,38352-0	1875	5
27	MTS	Test Machine		108	2.00	AB-5		1850	4
28	MTS	Test Machine		108	2.00	AB-5	38350-00	1850	4
29	Buehler	Polimet grinders	Polimet 1	108	3.00	AB-5	38352-00,38286-0	1831	5
30	Buehler	Vibromet Polisher	TY LP01C, S/N 333582	108	0.00	AB-5	38369-00	950	5

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
31	Buehler	Ultramet IV	Ultrasonic Cleaner	108	0.00	AB-5		650	5
32	Buehler	Vibromet I	Polisher	108	0.00	AB-5	38370-00	3060	5
33	Lepel	RF Generator	Model T-5-5-KC-SW	108	0.00	AB-5		0	S
34	Powermatic	Band Saw	Model 87, Ser # 987450	135	31.00	BC-6	38155-00	3458	5
35		Bridgeport Mill	Ser # J-51763	135	37.00	BC-6	13194-00	2638	4
36	Rockwell	Hardness Tester	Mod. 4JR, Ser 4JR-4014	135	5.00	BC-6	18955-00	1053	5
37	Buehler	Grinder Polisher	Ecomet 4	135	5.00	BC-6	38415-00	8020	5
38	Rockwell/Delta	Drill Press	Mod 15-120, Ser. 1456521	135	58.00	BC-6	19249-00	1203	5
39		Grinder		135	137.00	BC-6	19157-00	650	5
40	Pratt & Whitney	12" Lathe	Mod C M1694, Ser 677-552	135	100.00	C-5	18942-00	11387	4
41	Pexto Beverly	Hand Operated Shear	Model 142-H, Serial 5/54	135	13.00	BC-6		1100	4
42	Dreis & Krump	Sheet Metal Bender - 36"		135	20.00	BC-6	38195-00	2437	4
43		Tool Crib		135	50.00	BC-6		0	S
44	Sureweld	Welder		135	20.00	BC-6	35584-00	1901	4
45	Do-All	Band Saw	2613-3, S/N 198-72400	136	358.00	C-4.	38172-00	14618	4
46	Rockwell	Belt Sander	Cat. # 31-501, S/N DR119	136	20.00	C-3.		650	4
47	Bridgeport	Milling Machine	Mod #113044	136	80.00	C-3.	19273-00	4563	4
48	Bridgeport	Milling Machine	Mod #141619	136	80.00	C-4C	38196-00	4565	4
49	Bridgeport	Milling Machine	Mod #75339, S/N J145767	136	80.00	C-3.	19182-00	3966	4
50	Bridgeport	Milling Machine	Mod 105532, S/N J105041	136	80.00	B-4	38664-00	5035	4
51	Bridgeport	Milling Machine	Series II	136	190.00	B-3.	38260-00	44847	4
52	Cincinnati	Milling Machine	Mod#3M1, S/N 2J3U1Y-36	136	198.00	B-4	18941-00	23942	4
53	Aberboga Maskin	Drill Press	Mod# B1304, S/N 186632	136	6.00	B-5		4500	5
54	ALZ Metall	Drill Press	Type AB4HST, S/N 648	136	30.00	BC-4	19330-00	3369	4
55	Walker-Turner	Drill Press	S/N 52E3A3	136	30.00	BC-4	44-85-343	900	4
56	Darex	Drill Sharpener	S/N 41391-F	136	5.00		None	750	4
57	LeBlond	Engine Lathe	S/N 12C 1631	136	72.00		38261-00	32311	4
58	Monarch	Engine Lathe, 16 " x 30"	S/N 36933	136	140.00	BC-5	18936-00	21349	4
59	Monarch	Engine Lathe, 16 inch	S/N 40437	136	143.00	BC-5	19005-00	17442	4

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
60	Monarch	Engine Lathe, 20 inch	S/N 35447	136	192.00	BC-5	18994-00	21723	4
61	Monarch	Engine Lathe, 60 inch	S/N 41584	136	143.00	BC-5	38544-00	19673	4
62	Racine	Hack Saw, 14 inch	Oilcut	136	26.00	BC-4	13164-00	1896	5
63	Black & Decker	Pedestal Grinder	#5934644	136	10.00			650	5
64	Hammond	Pedestal Grinder	MD 12-A, S/N 6914	136	25.00		38182-00	1562	5
65	Baldor	Pedestal Grinder-Buffer	S/N F983	136	10.00			950	5
66	Brown & Sharpe	Surface Grinder #618 Micro	S/N 523-6181-1742	136	137.00	C-3	19157-00	11787	5
67	Cutter Master	Tool Grinder	MDT-30, S/N 016	136	8.00		38429-00	2612	5
68	Hardinge	Tool Room Lathe	HLV-H	136	52.00	BC-3	19261-00	10073	4
69	Hardinge	Tool Room Lathe	HLV-H	136	52.00	BC-3	38153-00	13993	4
70	Hardinge	Tool Room Lathe	HLV-H	136	52.00	BC-4	38368-00	36337	4
71	Hardinge	Tool Room Lathe	HLV-H	136	52.00	BC-4	43904-00	20272	4
72	Bullard	Vertical Turret Lathe	64" Cutmaster, A.F. #261	145	2160.00	E-5	38189-00	67032	0
73		Air Compressor		140	0.00			0	5
74		Power Switches		140	0.00			0	S
75		Pumps		140	0.00			0	S
76		Steam Supply		140	0.00			0	S
77		Water Header		140	0.00			0	S
78		Water Recirculator		140	0.00			0	S
79		RPT Office		143	0.00			0	S
80	Buehler	Abrasive Cutoff Saw (Small)	12"	144	50.00	F-2	19299-00	1143	S
81	None	Be Preparation (BU) Box	None	144	144.00	E-1.	N/A	0	
82	Detrex	Degreaser	WS800S	144	325.00	EF-1	19197-00	4347	S
83	Milwaukee	Grinder	S/N LR 14683	144	10.00			0	S
84		Sinks (2 each)		144	0.00			0	S
85	Lindberg	Tube Furnace & Evac. Ass'y.	54752-S, S/N 819172	144	100.00	E-2	38230-00,31-00	4768	S
86	Continental	Abrasive Cut-off Saw, 34 inc	Ulticut Mod# 34W75-3	145	819.00	F-3.	38158-00	32014	5
87	Hobart	Battery Charger (3 each)	3T18-960	145	0.00			0	S
88	None	Be Glovebox, inert	none	145	864.00	E-2.	N/A	0	S

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
89	Diversified Met	Be Preparation Box	None	145	348.00		38404-00	10358	S
90	Milwaukee	Bench Grinder	S/N LR 15562	145	10.00			0	S
91	Thermolyne	Box Furnace	3F-1856 S/N 16430	145	72.00	D-4	D-083-0451-00000	0	S
92	Thermolyne	Box Furnace	3F-1886 S/N 16446	145	72.00	DE-3	D-444-4223-37367	0	S
93	Lindberg	Box Furnace, Sola Basic 6" x	Mod 59545, Ser 777319	145	18.00	DE-3		6500	5
94	Pexto	Circle Shear	535-D S/N 673032	145	32.00	E-3	45088-00	2400	4
95	Barrett Powerox	Die Stacker	MPG-40-DP S/N 12-70112	145	157.00		38148-00	7001	4
96	Fenn	Draw Bench		145	706.00	F-2	38202-00	43490	4
97	Leland Gifford	Drill Press	Mod/Ser 14A959	145	128.00	GH-5	23154-00	1078	5
98	Rockwell "Mil.	Drill Press	DP225 S/N 123-6866	145	16.00			900	5
99	Leybold-Heraeus	Electron Beam Furnace	EB 447	145	3625.00	C-4	20741-00	185056	0
100	Sutton	2000 Ton Extrusion Press	S/N 1825	145	15670.00	F-4	38267-00	3895340	4
101	Automatic	Fork Truck	EF-80 S/N C71502	145	184.00		38142-00	15174	4
102	Lewis-Shepard	2000 Lb Cap Fork Truck	HFFTT-2 S/N H-398	145	90.00		20733-00	5941	4
103	Allis Chalmers	4000 Lb Cap Fork Truck	ACE 40 CR S/N DBB0142	145	143.00		38190-00	14372	4
104	Lindberg	Furnace	Type 11-5C-364836-29AS,	145	1395.00	DE-4	38213-00	180746	5
105	Lindberg	Furnace	Type 11-3C-364836-29AS,	145	1395.00	G-4	38212-00	201069	5
106	Despatch	1450 F Furnace, 20 KW	S/N 81542	145	231.00	E-3	38161-00	20221	S
107	Freas	Furnace	845-A	145	40.00		19323-00	1725	S
108	Harper Pit Furn	1500 C Electric Furnace	M4S-36060-P-28-8P S/N V-	145	565.00	E-4	38177-00	125455	S
109	Vacuum Industri	Furnace		145	663.00	CD-2	43792-00, 38201-	114124	5
110	Lindberg	1370 C, 95 KW, Furnace	Type 11-SC-364824-25AS	145	1080.00	DE-2	38178-00	37034	5
111	Norton	Furnace, Hi-temp.	Roll around	145	315.00	D-2	43803-00	19948	5
112	A Bar	1200 C, Furnace, High Vacuum	NR-50L S/N NR-50L-302	145	1752.00	D-3	38192-00, 93, 94, 1	16112	5
113	A Bar	1600 C, Vacuum Furnace	Model 90	145	223.00	D-3.	19284-00	18122	5
114	Lindberg	Glass Tube Furnace	MD, 59544, S/N 114813	145	30.00	F-2	F-2	0	S
115	Satec Systems,	Gradient Bar Furnace	Model GF, S/N 1009	145	45.00	F-2	38206-00	9975	S
116	Liquid Honing	Grit Balster, liquid	4836, S/N 5993	145	112.00	H-5	38226-00	3907	4
117	Peerless	Hack Saw	LHM 450 S/N P5015	145	90.00	G-3	38400-00	9485	5

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
118	Racine	Power Hack Saw	66W4	145	270.00	C-5	19186-00	5233	5
119	Racine	Hack Saw	66W4	145	270.00	G-3.		1969	5
120	Autoclave	Hot Isostatic Press		145	960.00	DE-5	38360-00	524175	4
121	Cincinatti	Hydrospin		145	4695.00	DE-1	38141-00	68000	4
122	Lepel	Induction Coil	T-2.5-1-KC-8W S/N 7158-A	145	22.00	C-2	44739-00	2702	5
123	Heraeus-Engleha	Induction Furnace	LW50/111	145	100.00			1972	S
124	Continental	34" Abrasive Cutoff Saw			819.00			0	S
125	CEC	Leak Detector	Mod. # 24-120A	145	16.00	CD-2	13226-00	4317	4
126	Varian	Leak Detector	938-41	145	7.00		40332-00	13570	4
127	Lift-A- Loft	500 Lb Capacity Lifter	Mod. # 25.0-3-1,S/N LA42	145	370.00	FG-3	38169-00	18823	4
128	GE of Canada	Manmate	#47151881, KT-3275	145	683.00	F-4	38203-00	127614	4
129		Material Storage		145	0.00			0	
130	Blue M Elec. Co	Oil Bath Heater	Magni-Whirl	145	27.00	G-5	D-83-859-94756	0	S
131	Lindberg	Portable Box Furnace	59845-E1-B-D1, S/N 84916	145	97.00	GH-5	38334-00	6199	S
132	Tinius Olson	Press, 60,000 lbs.	?	145	216.00	F-5	18969-00	14571	5
133	None	Quench Tank	None	145	106.00		None	0	S
134	Peck, Stow, & W	Roller, Former- 20 Ga. Cap.	383-D, S/N 12/73	145	6.00	E-3		970	5
135	Starnet	Rolling Mill	Mod# TA315-5X8	145	148.00	E-3.	43804-00	37460	4
136	Fenn	7", 18.4 H.P. Rolling Mill	S/N H-8219	145	168.00	E-3	N/A	2500	4
137	United	Rolling Mill	24 inch	145	1700.00	DE-4	38145-00 through	160597	4
138	Molden	Salt Bath	#362	145	336.00	EF-3	38191-00	5563	S
139	Lindberg	Salt Bath	59344-B-E1 S/N 800707	145	56.00	EF-4	02100-00	3725	S
140	Diacro	Shear, #4	S/N 2001	145	4.00			2500	5
141	Lodge & Shipley	Shear, 5/8 inch square x 6'	#1006, S/N 48180, series	145	648.00	E-3.	38159-00	44881	4
142	Miller	Spot Welder, Resistance	MPS-20 S/N JE768552	145	8.00			1200	5
143	Vidmar	Stacker-Retriever	1000 lbs	145	20.00	E-5.	38184-00	16515	4
144	Erie	Steam Forging Hammer	5000 lbs.	145	5432.00	G-6	38160-00	152060	5
145	Fenn	Swager	Mod# 5F	145	144.00	FG-3	19038-00	14239	5
146	Fenn	Swager, Large	Mod# 8F, S/N 105	145	864.00	G-3	38180-00	20000	5

Rocky Flats Equipment Data

Item	Manufacturer	Description	Model No./Serial No.	Room	Cubic Feet	Map Location	RFP Property Number	Purchase Price	Condition
147		Tooling Storage		145	0.00			0	
148	Erie	Triple Action Press, 150 Ton	Mod# 1678, S/N 4011	145	1716.00	F-5	38167-00	157663	4
149	Brew	Vacuum Furnace	6" Mod 1052, S/N 434	145	972.00		00263-00	1310	5
150	Ajax Northrup	Vacuum Induction Furnace		145	1648.00	FG-1	19014-00, 36283-	24858	4
151		Waste Box Storage		145	0.00			0	
152		Stepoff Pad		146	0.00			0	
153	Coulter Electro	Coulter Counter	TA II	147	25.00		38237-00, Multip	28567	4
154	Vacuum Specialt	Vacuum Arc Melt Furnace		148	8000.00		12551-00	77751	S
155	Conway Pressure	Hot Isostatic Press		148	56.00		38242-00	22382	4
156	Spencer Turbine	House Vacuum System	Centrifugal Separator	149	365.00	BC-2		1969	S
157	None	Be Electorefining	Rms 151,151A,152		0.00	GH-1	DPA-0369-93432	0	S
158	Harwood	Cold Isostatic Press	SA-7-6, 9388, 100K	153	540.00	D-5.	43799-00	151227	4
159		Gas Bottle Racks		171	0.00			0	
160		Inside Dock		171	0.00			0	
161	Colmonoy	Flame Spray & Hood	D-3	172	128.00	E-6	N/A	1970	4
162	Empire	Grit Blaster (Dual)	PF-3696	172	200.00	DE-6	38353-00	10307	4
163					0.00			0	
164					0.00			0	
165					0.00			0	
166					0.00			0

6A

MIC

MIC

SAFE

SAFE

5A

TR

3)

D.8

E.3

E.8

ERIE
TOOLING

(S.P.)

PUMP
F.H.

METALS
RACK

129

OIL
BATH
HTR

COOLING

TONGS

143

FORGING HAMMER

96

DRILL

52
00
00

TE

PRE

TABL

GRINDER BENCH

5A

4A

3A

71

131

147

145A

CONTROL

CONTROL

ERIE
FORMING
PRESS

CONTROL
ROOM

TABLE

TOOLS

TABLE

1750 TON EXT. PRESS.

99

RUN OUT

AIR EXHAUST

AIR EXHAUST

138

LINDBERG
SALT BATH

MAN-MATE
CONTROL

MAN-MATE

127

TH
FUR

#2 LINDBERG
FURNACE

104

137

HOLDEN
SALT BATH

85

34"
ABRASIVE
CUT-OFF

SP

144

FENN
5F
SWAGER

145

FENN
8F
SWAGER

116

PEERLESS
HACK SAW

RACINE
POWER
HACK
SAW

118

COUNTER
TOP

TABLE

SCALE

DRAW
BENCH

GLASS FUR.

EAT. CHG.

A

1A

2

129

130

WOMANS RESTROOM

131

JANITOR CLOSET

132

MENS RESTROOM

133

RECIRCULATION WATER

PUMP

VAC.

SEPARATORS

149

TB

DESK

ST

POWER SWITCH

LOCKER

POW SWI

LOC

140

AIR COMPRESSOR

AIR COMPRESSOR

PUMP

POWER SWITCH
480V

B

KEY

1) FILLED NUMBERS INDICATE THE REFERENCE NUMBER OF EQUIPMENT.

2) FILLED NUMBERS INDICATE ROOM NUMBERS.

INDUCTION FURNACE
149

151A

151

BE ELECTRO
REFINE AREA

156

(F)

(G)

LOCATION OF ASSESSED
BUILDING 865 EQUIPMENT
THETA TECHNOLOGIES, INC.

SCALE: 1/8"=1'-0"

DATE: MARCH 11, 1993

REV. 1

B.2 Baseline Cost Data Output

Baseline cost data, generated by the system based on input parameters, includes pertinent cost information for each piece of equipment. This information includes: Item number, manufacturer, description, oil drain and flush cost, removal labor cost, sealand cost, and landfill fees, both commercial and government.

Cost Elements for Burial Only Items (BASELINE OPTION)

Page: 1

<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u> \$0.00	<u>Removal Labor Cost</u> \$0.00	<u>Sealand Cost</u> \$0.00	<u>Landfill Fees</u>	
0						<u>Govt</u> \$0.00	<u>Comm</u> \$0.00
2	Nikon	Camera	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00
3	Polaroid	Camera and Light Table	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00
4	Vickers	Projection Microscope	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
5	Bausch & Lomb	Metallograph	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00
6	Leco	Metallograph	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00
7	Wilson	Microhardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
8	Buehler	Microhardness Tester	\$0.00	\$466.00	\$114.75	\$192.00	\$7680.00
9	Wilson	Microhardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
10	Theta	Dilatometer	\$0.00	\$699.00	\$306.00	\$512.00	\$20480.00
11	Automet	Automet/Evromet Polisher	\$0.00	\$466.00	\$229.50	\$384.00	\$15360.00
11	Lepel	RF Generator	\$0.00	\$2944.00	\$0.00	\$0.00	\$0.00
12	Leco	Diamond saws (2 each)	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00
13	Newage	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
14	Riehle	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
15	Clark Instr. Co	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
16	Wilson/Rockwell	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
17		Hoods (2 each)	\$0.00	\$932.00	\$1147.50	\$1920.00	\$76800.00
18	Jarrett	Jarrett Polisher	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00
19	Leco	Grinder w/ Load Controller	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00
20	Buehler	Maximet Grinder	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
21		Polimet (3 each) grinding wh	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
22		12u Polimet Grinder	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
23	Buehler	Abrasimet saw	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
24	Instron	Test Machine and Controller	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00
25	Buehler	Pneumat Mounting Press	\$0.00	\$466.00	\$344.25	\$576.00	\$23040.00
26		Sink Mounted Press (2)	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00
27	MTS	Test Machine	\$0.00	\$233.00	\$15.30	\$25.60	\$1024.00

Cost Elements for Burial Only Items (BASELINE OPTION)

Page: 2

Item	Manufacturer	Description	Oil Drain/ Flush	Removal Labor Cost	Sealand Cost	Landfill Fees Govt	Comm
28	MTS	Test Machine	\$0.00	\$233.00	\$15.30	\$25.60	\$1024.00
29	Buehler	Polimet grinders	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
30	Buehler	Vibromet Polisher	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
31	Buehler	Ultramet IV	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
32	Buehler	Vibromet I	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
33	Lepel	RF Generator	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
34	Powermatic	Band Saw	\$0.00	\$233.00	\$229.50	\$384.00	\$15360.00
35		Bridgeport Mill	\$404.90	\$1730.00	\$1644.75	\$2752.00	\$110080.00
36	Rockwell	Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00
37	Buehler	Grinder Polisher	\$0.00	\$432.50	\$114.75	\$192.00	\$7680.00
38	Rockwell/Delta	Drill Press	\$0.00	\$216.25	\$344.25	\$576.00	\$23040.00
39		Grinder	\$0.00	\$216.25	\$841.50	\$1408.00	\$56320.00
40	Pratt & Whitney	12" Lathe	\$609.80	\$1730.00	\$612.00	\$1024.00	\$40960.00
41	Pexto Beverly	Hand Operated Shear	\$0.00	\$233.00	\$45.90	\$76.80	\$3072.00
42	Dreis & Krump	Sheet Metal Bender - 36"	\$0.00	\$466.00	\$61.20	\$102.40	\$4096.00
43		Tool Crib	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
44	Sureweld	Welder	\$0.00	\$466.00	\$122.40	\$204.80	\$8192.00
45	Do-All	Band Saw	\$643.95	\$865.00	\$1530.00	\$2560.00	\$102400.00
46	Rockwell	Belt Sander	\$268.30	\$1730.00	\$114.75	\$192.00	\$7680.00
47	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00
48	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00
49	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00
50	Bridgeport	Milling Machine	\$917.15	\$1730.00	\$1683.00	\$2816.00	\$112640.00
51	Bridgeport	Milling Machine	\$404.90	\$1730.00	\$1912.50	\$3200.00	\$128000.00
52	Cincinnati	Milling Machine	\$678.10	\$1730.00	\$2754.00	\$4608.00	\$184320.00
53	Abarboga Maskim	Drill Press	\$0.00	\$233.00	\$30.60	\$51.20	\$2048.00
54	ALZ Metall	Drill Press	\$473.20	\$466.00	\$344.25	\$576.00	\$23040.00
55	Walker-Turner	Drill Press	\$2658.80	\$466.00	\$175.95	\$294.40	\$11776.00

Cost Elements for Burial Only Items (BASELINE OPTION)

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<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Fees</u>	
						<u>Govt</u>	<u>Comm</u>
56	Darex	Drill Sharpener	\$0.00	\$233.00	\$30.60	\$51.20	\$2048.00
57	LeBlond	Engine Lathe	\$746.40	\$1730.00	\$1025.10	\$1715.20	\$68608.00
58	Monarch	Engine Lathe, 16 " x 30"	\$746.40	\$1730.00	\$833.85	\$1395.20	\$55808.00
59	Monarch	Engine Lathe, 16 inch	\$1566.00	\$1730.00	\$841.50	\$1408.00	\$56320.00
60	Monarch	Engine Lathe, 20 inch	\$1429.40	\$1730.00	\$1147.50	\$1920.00	\$76800.00
61	Monarch	Engine Lathe, 60 inch	\$1087.90	\$1730.00	\$841.50	\$1408.00	\$56320.00
62	Racine	Hack Saw, 14 inch	\$404.90	\$865.00	\$153.00	\$256.00	\$10240.00
63	Black & Decker	Pedestal Grinder	\$404.90	\$233.00	\$61.20	\$102.40	\$4096.00
64	Hammond	Pedestal Grinder	\$234.15	\$233.00	\$153.00	\$256.00	\$10240.00
65	Baldor	Pedestal Grinder-Buffer	\$0.00	\$233.00	\$53.55	\$89.60	\$3584.00
66	Brown & Sharpe	Surface Grinder #618 Micro	\$712.25	\$865.00	\$818.55	\$1369.60	\$54784.00
67	Cutter Master	Tool Grinder	\$0.00	\$233.00	\$45.90	\$76.80	\$3072.00
68	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00
69	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00
70	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00
71	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00
72	Bullard	Vertical Turret Lathe	\$4639.50	\$35328.00	\$16830.00	\$28160.00	1126400.00
73		Air Compressor	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
74		Power Switches	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
75		Pumps	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
76		Steam Supply	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
77		Water Header	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
78		Water Recirculator	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
79		RPT Office	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
80	Buehler	Abrasive Cutoff Saw (Small)	\$0.00	\$865.00	\$306.00	\$512.00	\$20480.00
81	None	Be Preparation 680 Box	\$0.00	\$736.00	\$864.45	\$1446.40	\$57856.00
82	Detrex	Degreaser	\$0.00	\$736.00	\$1912.50	\$3200.00	\$128000.00
83	Milwaukee	Grinder	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00

Cost Elements for Burial Only Items (BASELINE OPTION)

Page: 4

<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Fees</u> <u>Govt</u>	<u>Comm</u>
84		Sinks (2 each)	\$0.00	\$466.00	\$459.00	\$768.00	\$30720.00
85	Lindberg	Tube Furnace & Evac. Ass'y.	\$0.00	\$587.50	\$535.50	\$896.00	\$35840.00
86	Continental	Abrasive Cut-off Saw, 34 inc	\$0.00	\$1730.00	\$4819.50	\$8064.00	\$322560.00
87	Hobart	Battery Charger (3 each)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
88	None	Be Glovebox, inert	\$0.00	\$736.00	\$5125.50	\$8576.00	\$343040.00
89	Diversified Met	Be Preparation Box	\$0.00	\$736.00	\$2065.50	\$3456.00	\$138240.00
90	Milwaukee	Bench Grinder	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00
91	Thermolyne	Box Furnace	\$0.00	\$1730.00	\$382.50	\$640.00	\$25600.00
92	Thermolyne	Box Furnace	\$0.00	\$1730.00	\$382.50	\$640.00	\$25600.00
93	Lindberg	Box Furnace, Sola Basic 6" x	\$0.00	\$865.00	\$76.50	\$128.00	\$5120.00
94	Pexto	Circle Shear	\$234.15	\$432.50	\$153.00	\$256.00	\$10240.00
95	Barrett Powerox	Die Stacker	\$336.60	\$865.00	\$918.00	\$1536.00	\$61440.00
96	Fenn	Draw Bench	\$3615.00	\$2350.00	\$4207.50	\$7040.00	\$281600.00
97	Leland Gifford	Drill Press	\$302.45	\$865.00	\$765.00	\$1280.00	\$51200.00
98	Rockwell "Mil.	Drill Press	\$0.00	\$233.00	\$76.50	\$128.00	\$5120.00
99	Leybold-Heraeus	Electron Beam Furnace	\$1634.30	\$23500.00	\$21420.00	\$35840.00	1433600.00
100	Sutton	2000 Ton Extrusion Press	\$75330.00	\$29440.00	\$93636.00	\$156672.00	6266880.00
101	Automatic	Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
102	Lewis-Shepard	2000 Lb Cap Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
103	Allis Chalmers	4000 Lb Cap Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
104	Lindberg	Furnace	\$234.15	\$14100.00	\$8262.00	\$13824.00	\$552960.00
105	Lindberg	Furnace	\$234.15	\$14100.00	\$8262.00	\$13824.00	\$552960.00
106	Despatch	1450 F Furnace, 20 KW	\$234.15	\$11750.00	\$1377.00	\$2304.00	\$92160.00
107	Freas	Furnace	\$0.00	\$9400.00	\$229.50	\$384.00	\$15360.00
108	Harper Pit Furn	1500 C Electric Furnace	\$234.15	\$9400.00	\$3366.00	\$5632.00	\$225280.00
109	Vacuum Industri	Furnace	\$643.95	\$7050.00	\$3901.50	\$6528.00	\$261120.00
110	Lindberg	1370 C, 95 KW, Furnace	\$234.15	\$11750.00	\$6426.00	\$10752.00	\$430080.00
111	Norton	Furnace, Hi-temp.	\$0.00	\$466.00	\$1836.00	\$3072.00	\$122880.00

Cost Elements for Burial Only Items (BASELINE OPTION)

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<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Fees</u> <u>Govt</u>	<u>Comm</u>
112	A Bar	1200 C, Furnace, High Vacuum	\$746.40	\$9400.00	\$10404.00	\$17408.00	\$696320.00
113	A Bar	1600 C, Vacuum Furnace	\$473.20	\$7050.00	\$1300.50	\$2176.00	\$87040.00
114	Lindberg	Glass Tube Furnace	\$0.00	\$1175.00	\$153.00	\$256.00	\$10240.00
115	Satec Systems,	Gradient Bar Furnace	\$0.00	\$1175.00	\$229.50	\$384.00	\$15360.00
116	Liquid Moning	Grit Balster, liquid	\$0.00	\$1175.00	\$612.00	\$1024.00	\$40960.00
117	Peerless	Hack Saw	\$917.15	\$865.00	\$535.50	\$896.00	\$35840.00
118	Racine	Power Hack Saw	\$473.20	\$865.00	\$1606.50	\$2688.00	\$107520.00
119	Racine	Hack Saw	\$473.20	\$865.00	\$1606.50	\$2688.00	\$107520.00
120	Autoclave	Hot Isostatic Press	\$33871.90	\$35328.00	\$15300.00	\$25600.00	1024000.00
121	Cincinatti	Hydrospin	\$3615.00	\$26496.00	\$30600.00	\$51200.00	2048000.00
122	Lepel	Induction Coil	\$0.00	\$865.00	\$130.05	\$217.60	\$8704.00
123	Heraeus-Engleha	Induction Furnace	\$0.00	\$1175.00	\$4590.00	\$7680.00	\$307200.00
124	Continental	34" Abrasive Cutoff Saw	\$0.00	\$1730.00	\$4819.50	\$8064.00	\$322560.00
125	CEC	Leak Detector	\$234.15	\$865.00	\$91.80	\$153.60	\$6144.00
126	Varian	Leak Detector	\$234.15	\$865.00	\$38.25	\$64.00	\$2560.00
127	Lift-A- Loft	500 Lb Capacity Lifter	\$336.60	\$233.00	\$2210.85	\$3699.20	\$147968.00
128	GE of Canada	Marmate	\$2078.25	\$865.00	\$4054.50	\$6784.00	\$271360.00
129		Material Storage	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
130	Blue M Elec. Co	Oil Bath Heater	\$814.70	\$865.00	\$160.65	\$268.80	\$10752.00
131	Lindberg	Portable Box Furnace	\$0.00	\$233.00	\$581.40	\$972.80	\$38912.00
132	Tinius Olson	Press, 60,000 lbs.	\$609.80	\$865.00	\$1285.20	\$2150.40	\$86016.00
133	None	Quench Tank	\$0.00	\$865.00	\$627.30	\$1049.60	\$41984.00
134	Peck, Stow, & W	Roller, Former- 20 Ga. Cap.	\$0.00	\$865.00	\$30.60	\$51.20	\$2048.00
135	Stannet	Rolling Mill	\$541.50	\$6920.00	\$887.40	\$1484.80	\$59392.00
136	Fenn	7", 18.4 H.P. Rolling Mill	\$234.15	\$6920.00	\$1002.15	\$1676.80	\$67072.00
137	United	Rolling Mill	\$3615.00	\$58880.00	\$11475.00	\$19200.00	\$768000.00
138	Holden	Salt Bath	\$0.00	\$865.00	\$1989.00	\$3328.00	\$133120.00
139	Lindberg	Salt Bath	\$0.00	\$865.00	\$336.60	\$563.20	\$22528.00

Cost Elements for Burial Only Items (BASELINE OPTION)

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<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Fees</u>
						<u>Govt</u> <u>Comm</u>
140	Diacro	Shear, #4	\$0.00	\$466.00	\$22.95	\$38.40 \$1536.00
141	Lodge & Shipley	Shear, 5/8 inch square x 6'	\$575.65	\$1730.00	\$3870.90	\$6476.80 \$259072.00
142	Miller	Spot Welder, Resistance	\$0.00	\$865.00	\$45.90	\$76.80 \$3072.00
143	Vidmar	Stacker-Retriever	\$234.15	\$1730.00	\$122.40	\$204.80 \$8192.00
144	Erie	Steam Forging Hammer	\$917.15	\$35328.00	\$32436.00	\$54272.00 2170880.00
145	Fenn	Swager	\$0.00	\$865.00	\$864.45	\$1446.40 \$57856.00
146	Fenn	Swager, Large	\$0.00	\$865.00	\$5163.75	\$8640.00 \$345600.00
147		Tooling Storage	\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
148	Erie	Triple Action Press, 150 Ton	\$10445.00	\$17664.00	\$11475.00	\$19200.00 \$768000.00
149	Brew	Vacuum Furnace	\$2385.60	\$1730.00	\$5806.35	\$9715.20 \$388608.00
150	Ajax Northrup	Vacuum Induction Furnace	\$1258.65	\$9400.00	\$2195.55	\$3673.60 \$146944.00
151		Waste Box Storage	\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
152		Stepoff Pad	\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
153	Coulter Electro	Coulter Counter	\$234.15	\$466.00	\$145.35	\$243.20 \$9728.00
154	Vacuum Specialt	Vacuum Arc Melt Furnace	\$370.75	\$14100.00	\$47812.50	\$80000.00 3200000.00
155	Conway Pressure	Hot Isostatic Press	\$234.15	\$3460.00	\$328.95	\$550.40 \$22016.00
156	Spencer Turbine	House Vacuum System	\$0.00	\$865.00	\$0.00	\$0.00 \$0.00
157	None	Be Electorefining	\$0.00	\$2595.00	\$535.50	\$896.00 \$35840.00
158	Harwood	Cold Isostatic Press	\$1600.15	\$41216.00	\$3213.00	\$5376.00 \$215040.00
159		Gas Bottle Racks	\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
160		Inside Dock	\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
161	Colmonoy	Flame Spray & Hood	\$0.00	\$2350.00	\$765.00	\$1280.00 \$51200.00
162	Empire	Grit Blaster (Dual)	\$234.15	\$1730.00	\$1193.40	\$1996.80 \$79872.00
163			\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
164			\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
165			\$0.00	\$0.00	\$0.00	\$0.00 \$0.00
166			\$0.00	\$0.00	\$0.00	\$0.00 \$0.00

B.3 Recycle/Reuse Cost Data Output

Recycle/reuse cost data, generated by the system based on input parameters, includes pertinent cost information for each piece of equipment. This information includes: Item number, manufacturer, description, oil drain and flush cost, removal labor cost, sealand cost, landfill fees (both commercial and government), decon cost, sales price, metal value, and processing cost.

Cost Elements for Recycle/Reuse Alternatives

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<u>Item</u> 0	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u> \$0.00	<u>Removal Labor Cost</u> \$0.00	<u>Sealand Cost</u> \$0.00	<u>Landfill Costs</u> <u>Govt</u> \$0.00	<u>Comm</u> \$0.00	<u>Decon. Costs</u> \$0.00	<u>Sale Price</u> \$0.00	<u>Metal Value</u> \$0.00	<u>Processing Cost</u> \$0.00
2	Nikon	Camera	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00	\$100.00	\$1030.00	\$0.00	\$0.00
3	Polaroid	Camera and Light Table	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00	\$100.00	\$850.00	\$0.00	\$0.00
4	Vickers	Projection Microscope	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$7780.00	\$0.00	\$0.00
5	Bausch & Lomb	Metallograph	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00	\$200.00	\$11340.00	\$0.00	\$0.00
6	Leco	Metallograph	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00	\$100.00	\$1750.00	\$0.00	\$0.00
7	Wilson	Microhardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$4340.00	\$0.00	\$0.00
8	Buehler	Microhardness Tester	\$0.00	\$466.00	\$114.75	\$192.00	\$7680.00	\$200.00	\$9690.00	\$0.00	\$0.00
9	Wilson	Microhardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$4485.00	\$0.00	\$0.00
10	Theta	Dilatometer	\$0.00	\$699.00	\$306.00	\$512.00	\$20480.00	\$300.00	\$77370.00	\$0.00	\$0.00
11	Automet	Automet/Evromet Polisher	\$0.00	\$466.00	\$229.50	\$384.00	\$15360.00	\$200.00	\$600.00	\$0.00	\$0.00
11	Lepel	RF Generator	\$0.00	\$2944.00	\$0.00	\$0.00	\$0.00	\$200.00	\$0.00	\$0.00	\$0.00
12	Leco	Diamond saws (2 each)	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00	\$200.00	\$1970.00	\$0.00	\$0.00
13	Newage	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$1740.00	\$0.00	\$0.00
14	Riehle	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$3710.00	\$0.00	\$0.00
15	Clark Instr. Co	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$660.00	\$0.00	\$0.00
16	Wilson/Rockwell	Rockwell Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$7490.00	\$0.00	\$0.00
17		Hoods (2 each)	\$0.00	\$932.00	\$1147.50	\$1920.00	\$76800.00	\$400.00	\$0.00	\$0.00	\$0.00
18	Jarrett	Jarrett Polisher	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00	\$200.00	\$4860.00	\$0.00	\$0.00
19	Leco	Grinder w/ Load Controller	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00	\$200.00	\$1490.00	\$0.00	\$0.00
20	Buehler	Maximet Grinder	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$15360.00	\$0.00	\$0.00
21		Polimet (3 each) grinding wh	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$1300.00	\$0.00	\$0.00
22		12u Polimet Grinder	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$870.00	\$0.00	\$0.00
23	Buehler	Abrasimet saw	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$3860.00	\$0.00	\$0.00
24	Instron	Test Machine and Controller	\$0.00	\$466.00	\$153.00	\$256.00	\$10240.00	\$200.00	\$3300.00	\$0.00	\$0.00
25	Buehler	Pneumat Mounting Press	\$0.00	\$466.00	\$344.25	\$576.00	\$23040.00	\$200.00	\$5550.00	\$0.00	\$0.00
26		Sink Mounted Press (2)	\$0.00	\$233.00	\$153.00	\$256.00	\$10240.00	\$100.00	\$1260.00	\$0.00	\$0.00
27	MTS	Test Machine	\$0.00	\$233.00	\$15.30	\$25.60	\$1024.00	\$100.00	\$1250.00	\$0.00	\$0.00

Cost Elements for Recycle/Reuse Alternatives

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Item	Manufacturer	Description	Oil Drain/ Flush	Removal Labor Cost	Sealand Cost	Landfill Costs		Decon. Costs	Sale Price	Metal Value	Processing Cost
28	NTS	Test Machine	\$0.00	\$233.00	\$15.30	Govt	Comm	\$100.00	\$1250.00	\$0.00	\$0.00
29	Buehler	Polimet grinders	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$1230.00	\$0.00	\$0.00
30	Buehler	Vibromet Polisher	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$640.00	\$0.00	\$0.00
31	Buehler	Ultramet IV	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$440.00	\$0.00	\$0.00
32	Buehler	Vibromet I	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$2060.00	\$0.00	\$0.00
33	Lepel	RF Generator	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$0.00	\$0.00	\$0.00
34	Powermatic	Band Saw	\$0.00	\$233.00	\$229.50	\$384.00	\$15360.00	\$708.75	\$5500.00	\$203.00	\$2313.00
35		Bridgeport Mill	\$404.90	\$1730.00	\$1644.75	\$2752.00	\$110080.00	\$945.00	\$2600.00	\$745.00	\$5474.00
36	Rockwell	Hardness Tester	\$0.00	\$233.00	\$114.75	\$192.00	\$7680.00	\$100.00	\$1500.00	\$0.00	\$0.00
37	Buehler	Grinder Polisher	\$0.00	\$432.50	\$114.75	\$192.00	\$7680.00	\$405.00	\$6000.00	\$146.00	\$1035.00
38	Rockwell/Delta	Drill Press	\$0.00	\$216.25	\$344.25	\$576.00	\$23040.00	\$156.60	\$1200.00	\$138.00	\$1125.00
39		Grinder	\$0.00	\$216.25	\$841.50	\$1408.00	\$56320.00	\$369.90	\$800.00	\$472.00	\$3570.00
40	Pratt & Whitney	12" Lathe	\$609.80	\$1730.00	\$612.00	\$1024.00	\$40960.00	\$337.50	\$14000.00	\$724.00	\$5520.00
41	Pexto Beverly	Hand Operated Shear	\$0.00	\$233.00	\$45.90	\$76.80	\$3072.00	\$100.00	\$1600.00	\$81.00	\$625.00
42	Dreis & Krump	Sheet Metal Bender - 36"	\$0.00	\$466.00	\$61.20	\$102.40	\$4096.00	\$200.00	\$1500.00	\$81.00	\$625.00
43		Tool Crib	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
44	Sureweld	Welder	\$0.00	\$466.00	\$122.40	\$204.80	\$8192.00	\$200.00	\$1800.00	\$0.00	\$0.00
45	Do-All	Band Saw	\$643.95	\$865.00	\$1530.00	\$2560.00	\$102400.00	\$594.00	\$10140.00	\$783.00	\$5950.00
46	Rockwell	Belt Sander	\$268.30	\$1730.00	\$114.75	\$192.00	\$7680.00	\$945.00	\$1100.00	\$138.00	\$1125.00
47	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00	\$945.00	\$3900.00	\$745.00	\$5474.00
48	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00	\$945.00	\$2900.00	\$745.00	\$5474.00
49	Bridgeport	Milling Machine	\$268.30	\$1730.00	\$1683.00	\$2816.00	\$112640.00	\$945.00	\$3700.00	\$745.00	\$5474.00
50	Bridgeport	Milling Machine	\$917.15	\$1730.00	\$1683.00	\$2816.00	\$112640.00	\$945.00	\$3300.00	\$745.00	\$5474.00
51	Bridgeport	Milling Machine	\$404.90	\$1730.00	\$1912.50	\$3200.00	\$128000.00	\$945.00	\$30200.00	\$745.00	\$5474.00
52	Cincinnati	Milling Machine	\$678.10	\$1730.00	\$2754.00	\$4608.00	\$184320.00	\$540.00	\$28500.00	\$1726.00	\$12138.00
53	Abarboga Maskin	Drill Press	\$0.00	\$233.00	\$30.60	\$51.20	\$2048.00	\$100.00	\$5400.00	\$146.00	\$1125.00
54	ALZ Metall	Drill Press	\$473.20	\$466.00	\$344.25	\$576.00	\$23040.00	\$162.00	\$3500.00	\$329.00	\$2499.00
55	Walker-Turner	Drill Press	\$2658.80	\$466.00	\$175.95	\$294.40	\$11776.00	\$108.00	\$990.00	\$282.00	\$2142.00

Cost Elements for Recycle/Reuse Alternatives

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Item	Manufacturer	Description	Oil Drain/ Flush	Removal Labor Cost	Sealand Cost	Landfill Costs		Decon. Costs	Sale Price	Metal Value	Processing Cost
56	Darex	Drill Sharpener	\$0.00	\$233.00	\$30.60	Govt \$51.20	Comm \$2048.00	\$100.00	\$850.00	\$32.00	\$250.10
57	LeBlond	Engine Lathe	\$746.40	\$1730.00	\$1025.10	\$1715.20	\$68608.00	\$472.50	\$20600.00	\$425.00	\$2890.99
58	Monarch	Engine Lathe, 16 " x 30"	\$746.40	\$1730.00	\$833.85	\$1395.20	\$55808.00	\$472.50	\$23600.00	\$345.00	\$2618.00
59	Monarch	Engine Lathe, 16 inch	\$1566.00	\$1730.00	\$841.50	\$1408.00	\$56320.00	\$486.00	\$15700.00	\$376.00	\$2856.00
60	Monarch	Engine Lathe, 20 inch	\$1429.40	\$1730.00	\$1147.50	\$1920.00	\$76800.00	\$648.00	\$19600.00	\$438.00	\$3332.00
61	Monarch	Engine Lathe, 60 inch	\$1087.90	\$1730.00	\$841.50	\$1408.00	\$56320.00	\$486.00	\$12500.00	\$469.00	\$3570.00
62	Racine	Hack Saw, 14 inch	\$404.90	\$865.00	\$153.00	\$256.00	\$10240.00	\$175.50	\$2400.00	\$295.00	\$2178.00
63	Black & Decker	Pedestal Grinder	\$404.90	\$233.00	\$61.20	\$102.40	\$4096.00	\$54.00	\$840.00	\$118.00	\$893.00
64	Hammond	Pedestal Grinder	\$234.15	\$233.00	\$153.00	\$256.00	\$10240.00	\$121.50	\$1020.00	\$150.00	\$1131.00
65	Baldor	Pedestal Grinder-Buffer	\$0.00	\$233.00	\$53.55	\$89.60	\$3584.00	\$54.00	\$600.00	\$94.00	\$1170.00
66	Brown & Sharpe	Surface Grinder #618 Micro	\$712.25	\$865.00	\$818.55	\$1369.60	\$54784.00	\$459.00	\$10900.00	\$1018.00	\$7735.00
67	Cutter Master	Tool Grinder	\$0.00	\$233.00	\$45.90	\$76.80	\$3072.00	\$100.00	\$1700.00	\$150.00	\$1131.00
68	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00	\$243.00	\$11100.00	\$266.00	\$2023.00
69	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00	\$243.00	\$8900.00	\$266.00	\$2023.00
70	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00	\$243.00	\$23100.00	\$266.00	\$2023.00
71	Hardinge	Tool Room Lathe	\$507.35	\$1730.00	\$459.00	\$768.00	\$30720.00	\$243.00	\$12900.00	\$266.00	\$2023.00
72	Bullard	Vertical Turret Lathe	\$4639.50	\$35328.00	\$16830.00	\$28160.00	1126400.00	\$2241.00	\$86500.00	\$10682.00	\$131920.00
73		Air Compressor	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
74		Power Switches	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
75		Pumps	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
76		Steam Supply	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
77		Water Header	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
78		Water Recirculator	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
79		RPT Office	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
80	Buehler	Abrasive Cutoff Saw (Small)	\$0.00	\$865.00	\$306.00	\$512.00	\$20480.00	\$216.00	\$0.00	\$47.00	\$357.00
81	None	Be Preparation 0B0 Box	\$0.00	\$736.00	\$864.45	\$1446.40	\$57856.00	\$648.00	\$0.00	\$46.00	\$344.00
82	Detrex	Degreaser	\$0.00	\$736.00	\$1912.50	\$3200.00	\$128000.00	\$1458.00	\$0.00	\$55.00	\$469.00
83	Milwaukee	Grinder	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00	\$135.00	\$0.00	\$149.00	\$1131.00

Cost Elements for Recycle/Reuse Alternatives

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Item	Manufacturer	Description	Oil Drain/ Flush	Removal Labor Cost	Sealand Cost	Landfill Costs Govt	Comm	Decon. Costs	Sale Price	Metal Value	Processing Cost
84		Sinks (2 each)	\$0.00	\$466.00	\$459.00	\$768.00	\$30720.00	\$1458.00	\$0.00	\$39.00	\$300.00
85	Lindberg	Tube Furnace & Evac. Ass'y.	\$0.00	\$587.50	\$535.50	\$896.00	\$35840.00	\$405.00	\$0.00	\$729.00	\$5625.00
86	Continental	Abrasive Cut-off Saw, 34 inc	\$0.00	\$1730.00	\$4819.50	\$8064.00	\$322560.00	\$1890.00	\$20400.00	\$1018.00	\$7497.00
87	Robert	Battery Charger (3 each)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
88	None	Be Glovebox, inert	\$0.00	\$736.00	\$5125.50	\$8576.00	\$343040.00	\$1944.00	\$0.00	\$194.00	\$1500.00
89	Diversified Met	Be Preparation Box	\$0.00	\$736.00	\$2065.50	\$3456.00	\$138240.00	\$783.00	\$0.00	\$130.00	\$1000.00
90	Milwaukee	Bench Grinder	\$0.00	\$233.00	\$306.00	\$512.00	\$20480.00	\$135.00	\$0.00	\$149.00	\$1131.00
93	Lindberg	Box Furnace, Sola Basic 6" x	\$0.00	\$865.00	\$76.50	\$128.00	\$5120.00	\$135.00	\$4100.00	\$32.00	\$250.00
94	Pexto	Circle Shear	\$234.15	\$432.50	\$153.00	\$256.00	\$10240.00	\$216.00	\$1500.00	\$196.00	\$1486.99
95	Barrett Powerox	Die Stackers	\$336.60	\$865.00	\$918.00	\$1536.00	\$61440.00	\$216.00	\$4450.00	\$548.00	\$4130.00
96	Fenn	Draw Bench	\$3615.00	\$2350.00	\$4207.50	\$7040.00	\$281600.00	\$2727.00	\$27700.00	\$4384.00	\$33320.00
97	Leland Gifford	Drill Press	\$302.45	\$865.00	\$765.00	\$1280.00	\$51200.00	\$283.50	\$1030.00	\$481.00	\$3808.00
98	Rockwell "Mil.	Drill Press	\$0.00	\$233.00	\$76.50	\$128.00	\$5120.00	\$121.50	\$900.00	\$196.00	\$1488.00
99	Leybold-Heraeus	Electron Beam Furnace	\$1634.30	\$23500.00	\$21420.00	\$35840.00	1433600.00	\$8154.00	\$204000.00	\$4050.00	\$31250.00
100	Sutton	2000 Ton Extrusion Press	\$75330.00	\$29440.00	\$93636.00	\$156672.00	6266880.00	\$35194.50	\$247700.00	\$10062.00	\$76050.00
101	Automatic	Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$9700.00	\$0.00	\$0.00
102	Lewis-Shepard	2000 Lb Cap Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$6500.00	\$0.00	\$0.00
103	Allis Chalmers	4000 Lb Cap Fork Truck	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$9100.00	\$0.00	\$0.00
104	Lindberg	Furnace	\$234.15	\$14100.00	\$8262.00	\$13824.00	\$552960.00	\$6277.50	\$0.00	\$972.00	\$7500.00
105	Lindberg	Furnace	\$234.15	\$14100.00	\$8262.00	\$13824.00	\$552960.00	\$6277.50	\$0.00	\$972.00	\$7500.00
109	Vacuum Industri	Furnace	\$643.95	\$7050.00	\$3901.50	\$6528.00	\$261120.00	\$2160.00	\$70500.00	\$1377.00	\$10625.00
110	Lindberg	1370 C, 95 KW, Furnace	\$234.15	\$11750.00	\$6426.00	\$10752.00	\$430080.00	\$2916.00	\$23600.00	\$940.00	\$7250.00
111	Morton	Furnace, Hi-temp.	\$0.00	\$466.00	\$1836.00	\$3072.00	\$122880.00	\$1404.00	\$14100.00	\$0.00	\$0.00
112	A Bar	1200 C, Furnace, High Vacuum	\$746.40	\$9400.00	\$10404.00	\$17408.00	\$696320.00	\$4725.00	\$17800.00	\$972.00	\$7500.00
113	A Bar	1600 C, Vacuum Furnace	\$473.20	\$7050.00	\$1300.50	\$2176.00	\$87040.00	\$810.00	\$17400.00	\$194.00	\$1500.00
116	Liquid Moning	Grit Balster, liquid	\$0.00	\$1175.00	\$612.00	\$1024.00	\$40960.00	\$756.00	\$2500.00	\$0.00	\$0.00
117	Peerless	Hack Saw	\$917.15	\$865.00	\$535.50	\$896.00	\$35840.00	\$405.00	\$5900.00	\$57.00	\$438.00
118	Racine	Power Hack Saw	\$473.20	\$865.00	\$1606.50	\$2688.00	\$107520.00	\$1215.00	\$5800.00	\$88.00	\$669.99

Cost Elements for Recycle/Reuse Alternatives

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<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Costs</u>	<u>Decon. Costs</u>	<u>Sale Price</u>	<u>Metal Value</u>	<u>Processing Cost</u>
119	Racine	Hack Saw	\$473.20	\$865.00	\$1606.50	\$2688.00	\$107520.00	\$1215.00	\$2200.00	\$88.00
120	Autoclave	Hot Isostatic Press	\$33871.90	\$35328.00	\$15300.00	\$25600.00	1024000.00	\$10570.50	\$333400.00	\$8500.00
121	Cincinnati	Hydrospin	\$3615.00	\$26496.00	\$30600.00	\$51200.00	2048000.00	\$10570.50	\$118600.00	\$21420.00
122	Lepel	Induction Coil	\$0.00	\$865.00	\$130.05	\$217.60	\$8704.00	\$148.50	\$1700.00	\$0.00
125	CEC	Leak Detector	\$234.15	\$865.00	\$91.80	\$153.60	\$6144.00	\$216.00	\$5500.00	\$0.00
126	Varian	Leak Detector	\$234.15	\$865.00	\$38.25	\$64.00	\$2560.00	\$216.00	\$8600.00	\$0.00
127	Lift-A-Loft	500 Lb Capacity Lifter	\$336.60	\$233.00	\$2210.85	\$3699.20	\$147968.00	\$999.00	\$12000.00	\$203.00
128	GE of Canada	Marmate	\$2078.25	\$865.00	\$4054.50	\$6784.00	\$271360.00	\$1026.00	\$107400.00	\$1215.00
129		Material Storage	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
132	Tinius Olson	Press, 60,000 lbs.	\$609.80	\$865.00	\$1285.20	\$2150.40	\$86016.00	\$580.50	\$13100.00	\$405.00
134	Peck, Stow, & W	Roller, Former- 20 Ga. Cap.	\$0.00	\$865.00	\$30.60	\$51.20	\$2048.00	\$40.50	\$870.00	\$146.00
135	Stannet	Rolling Mill	\$541.50	\$6920.00	\$887.40	\$1484.80	\$59392.00	\$499.50	\$23800.00	\$2916.00
136	Fenn	7", 18.4 H.P. Rolling Mill	\$234.15	\$6920.00	\$1002.15	\$1676.80	\$67072.00	\$567.00	\$1600.00	\$2592.00
137	United	Rolling Mill	\$3615.00	\$58880.00	\$11475.00	\$19200.00	\$768000.00	\$2875.50	\$102100.00	\$14580.00
140	Diacro	Shear, #4	\$0.00	\$466.00	\$22.95	\$38.40	\$1536.00	\$54.00	\$1600.00	\$49.00
141	Lodge & Shipley	Shear, 5/8 inch square x 6'	\$575.65	\$1730.00	\$3870.90	\$6476.80	\$259072.00	\$1458.00	\$28500.00	\$1053.00
142	Miller	Spot Welder, Resistance	\$0.00	\$865.00	\$45.90	\$76.80	\$3072.00	\$54.00	\$760.00	\$0.00
143	Vidmar	Stacker-Retriever	\$234.15	\$1730.00	\$122.40	\$204.80	\$8192.00	\$216.00	\$10500.00	\$405.00
144	Erie	Steam Forging Hammer	\$917.15	\$35328.00	\$32436.00	\$54272.00	2170880.00	\$6358.50	\$96700.00	\$38700.00
145	Fenn	Swager	\$0.00	\$865.00	\$864.45	\$1446.40	\$57856.00	\$486.00	\$15700.00	\$1394.00
146	Fenn	Swager, Large	\$0.00	\$865.00	\$5163.75	\$8640.00	\$345600.00	\$1944.00	\$17000.00	\$2476.00
147		Tooling Storage	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
148	Erie	Triple Action Press, 150 Ton	\$10445.00	\$17664.00	\$11475.00	\$19200.00	\$768000.00	\$1107.00	\$112700.00	\$12040.00
149	Brew	Vacuum Furnace	\$2385.60	\$1730.00	\$5806.35	\$9715.20	\$388608.00	\$3510.00	\$1500.00	\$194.00
150	Ajax Northrup	Vacuum Induction Furnace	\$1258.65	\$9400.00	\$2195.55	\$3673.60	\$146944.00	\$4455.00	\$17700.00	\$4860.00
151		Waste Box Storage	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
152		Stepoff Pad	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
153	Coulter Electro	Coulter Counter	\$234.15	\$466.00	\$145.35	\$243.20	\$9728.00	\$200.00	\$0.00	\$0.00

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<u>Item</u>	<u>Manufacturer</u>	<u>Description</u>	<u>Oil Drain/ Flush</u>	<u>Removal Labor Cost</u>	<u>Sealand Cost</u>	<u>Landfill Costs</u>	<u>Govt</u>	<u>Comm</u>	<u>Decon. Costs</u>	<u>Sale Price</u>	<u>Metal Value</u>	<u>Processing Cost</u>
155	Conway Pressure	Hot Isostatic Press	\$234.15	\$3460.00	\$328.95		\$550.40	\$22016.00	\$756.00	\$14200.00	\$1944.00	\$15000.00
158	Narwood	Cold Isostatic Press	\$1600.15	\$41216.00	\$3213.00		\$5376.00	\$215040.00	\$972.00	\$148700.00	\$4860.00	\$37500.00
159		Gas Bottle Racks	\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
160		Inside Dock	\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
161	Colmonoy	Flame Spray & Hood	\$0.00	\$2350.00	\$765.00		\$1280.00	\$51200.00	\$432.00	\$1940.00	\$97.00	\$750.00
162	Empire	Grit Blaster (Dual)	\$234.15	\$1730.00	\$1193.40		\$1996.80	\$79872.00	\$1080.00	\$6600.00	\$122.00	\$938.00
163			\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
164			\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
165			\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
166			\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

STAGING & DECONTAMINATION AREA COST

The cost estimate is based on the description below, and assumes construction by a fixed-price contractor within Building 865. Pricing and labor costs (with the exception of the CO₂ Blaster and its auxiliaries) are derived from R. S. Means' "Building Construction Cost Data," 1989 edition, escalated to current (1993) dollars using DOE escalators. Pricing for the CO₂ Blaster was taken from a manufacturer's quotation to EG&G in August 1992.

The estimate covers the installation of a dry CO₂ decon system, that can be converted to a conventional wet system by changing the dry filters in the booth to a water wall and adding a much larger RCRA Treatment System. If future conditions warrant this conversion, the overall cost differential should be very small.

BUILDING 865 D&D NEEDS

DECON STAGING AREA

Approximately 31 ft x 62 ft (two bays) adjacent to Decon Staging.

Floor to be 10-gal. stainless steel with 4-in. curbing four sides, and sloped approximately 2 in. to a collection point for easy cleanup.

A 4-in. (curb high) ramp will be at the entry and exit points to the Staging Area.

No walls required, roping-off or fencing optional.

Parts racks to be installed with shelves approximately 4 ft x 4 ft x 6 in. off floor and 3 ft off floor. 28 ft of racks against the wall, built of 10-gal. steel.

DECON STATION (ROOM)

Approximately 30 ft x 30 ft (one bay)

Room to be walled four sides with metal paneling Epoxy coated.

Floor to be 10-gal. stainless steel with 4-in. curbing four sides.

The floor shall slope approximately 2 in. toward a floor collection point for easy cleanup.

The one Main Entry/Exit door will be 10 ft wide x 10 ft high vertically operated, normally closed, entry from within Building 865. Two 10 ft x 10 ft doors optional.

A 4-in. (curb high) ramp will be at the Main Entry/Exit door.

Two pedestrian doors will be installed; one next to the main door and the other in the adjacent wall.

The ceiling shall be 12 ft high, of metal construction, and epoxy coated. Adequate lighting shall be installed in the ceiling. Industrial standard fire protection sprinkler system will be required.

Exhaust air outlets shall be in or near the room ceiling.

The exhaust air system shall be provided with a blower capable of one air change per two minutes for the Decon Station Room.

The system shall be equipped with a Demister and Air Heater for intercepting any moisture-laden exhaust air.

The exhaust system shall be of stainless steel ductwork equipped with MEPA and HEPA filter banks in series to remove decontamination from the exhaust air.

Differential Pressure Indicators/Alarms shall be installed on each side of the MEPA/HEPA filter banks to alert to need of filter change-out or indicate filter rupture.

A structural steel equipment platform shall be erected above the Decon Room to support the MEPA/HEPA filter banks, exhaust blower, and other exhaust-related equipment. The platform shall be designed to accommodate filter change-out and equipment maintenance. The platform shall also support the exhaust stack, which would protrude through or above the roof of Building 865.

The stainless steel stack will accommodate the exhaust from the Decon Room. In the stack, an Isokinetic Stack Flow Indicator and Alarm will be installed to alert to malfunctions of the system, blower, or filter bank. A Radioactive Particulate Monitor/Alarm will be installed in the stack or stack entry to alert to excessive radioactive conditions in the exhaust stack emissions. Alarms from the above monitors and indicators will be in the Staging Area and Decon Room to alert the operators.

Make-up air to the Decon Room will come from the Building (856) proper, via vents in the Decon Room walls.

Flexible exhaust drop ducts (elephant trunks) from the overhead exhaust system will be available at two locations used for localized exhaust.

The Decon Room will house the necessary equipment for the decontaminated operations, as listed below.

CO₂ Cleaning Equipment of either or both an Alpheus Model 250 by Environmental Alternatives, Inc., or a Cold Jet Model RDS 1000J by Environmental Control Division, Inc., and including the CO₂ supply equipment.

ADDITIONAL NEEDS IF HIGH PRESSURE WATER JET CLEANING PROCESSES ARE CONTEMPLATED (Not recommended for Building 865 equipment decontamination)

- 1) The floor collection point in the Decon Room would be a sump with sump pump to handle up to 1,600 gal. of contaminated floor drainage per 8-hour shift.
- 2) The sump pump would deliver the contaminated water through two filter units in series. The first filter unit would be a three-bag filter and the second a single-bag filter.
- 3) The contaminated water from the filter units would NOT be recyclable and will require further decontamination processing. This water would contain non-filterable contaminants suspended and dissolved. Attempting to recycle-use would further contaminate any equipment.
- 4) A tank of approximately 500-gal. capacity would be required to supply the high pressure water jet systems. A water heater to heat the water from this tank would be required with water heating capability between 185°F to 200°F. Make-up water to the tank would be from the RFP system and controlled by a low-level control switch.
- 5) The Decon Room would house the following additional equipment:
 - a) A 35,000-psi Ultra High Pressure Water Jet Cleaning System, Model 103X Series JetPac from ADMAC, Inc., 4.2 gpm, 150 hp, with toolsets, lances, nozzles, etc., or equal.
 - b) A 2,500-psi High Pressure Water Jet Cleaning system, 4.5 gpm output, 7½ hp with necessary auxiliaries.

The 35,000-psi pump unit will require barricade shielding about 5 ft height of ½-in. Lexan polycarbonate. In the event of a pump rupture, the resulting missiles are extremely hazardous. (No standards or codes exist for the design of UHP pumps.)

Several portable shields of ½-in. Lexan will be necessary for high pressure jet protection.

The Decon Room would require water hose-down capability.

Staging & Decontamination Area Cost Estimate									
Item No.	Material and Description	Quantity	Unit	Unit Cost	Material Total	Unit	Rate	Cft.	Labor Total
1	Chip out concrete floor down to top of steel 6"W x 2" deep for curb	93	SF			0.10	22.71	B-9	211.20
2	Curb reinforced concrete including reinforcing, anchors in floor slab 12"OC, forms and finishing	186	LF	3.60	669.00	0.180	23.40	C-15	783.43
3	Floor topping 2" Nom. slope 12 x 12 x 12" sump at corner of each bay. (2-bays)	1922	SF	.60	1,153.00	.064	24.83	C-10	3,054.00
4	Sump Pump 1/2 HP stainless. Man. control	2	Ea	260	520	1.6	24.77	Q-1	80.00
5	Extend building RCRA waste drain to sump pumps. 1/2"SS line W/ check valve at the pumps	1	Lot	600	600	40	24.77	Q-1	990.00
6	16-gal. stainless steel floor overlay, ramset @ 12" OC to F1 slab, back welded & ground smooth. 4 x 8 sheets welded at seams	1922	SF	5.85	11,244.00	0.145	23.84	G-3	8,251.98

Staging & Decontamination Area Cost Estimate									
Item No.	Material and Description	Quantity	Unit	Unit Cost	Material Total	Unit	Rate	Cft.	Labor Total
7	Paint spray booth wet/dry w/dry MEPA/HEPA filters. 16 x 16 x 16 epoxy coated metal panels w/service & personnel doors. 3000 cfm exhauster inc. controls	1	Lot		19,800.00				5,000.00
8	Exhaust stack & monitor 12" dia SS with isokinetic monitor and alarm	1	Lot		20,000.00				4,000.00
9	Extend existing house vac sys into decon booth	1	Lot		1,200.00				800.00
10	CO ₂ Blaster Alpheus Model 250 w/gun and hose	1	Ea		107,000.00				
11	Air Compressor	1	Ea		81,000.00				
12	Air Dryer	1	Ea		21,000.00				
13	CO ₂ Storage Tank	1	Ea		46,000.00				
14	Increase building supply air capacity to offset decon exhaust. Roof mounted package unit	1	Lot		4,800.00	16	27.30	Q-9	437.00
15	Extend 480-V building power to new equipment	1	Lot		1,200.00	40	27.30	1-E	1,092.00

Staging & Decontamination Area Cost Estimate									
Item No.	Material and Description	Quantity	Unit	Unit Cost	Material Total	Unit	Rate	Cft.	Labor Total
16	Extend 125-V building power to booth lighting and sump pumps	1	Lot		600.00	20	27.30	1-E	546.00
	Subtotal				316,786.00				25,145.00
	OH&P 21% M 50% L				66,525.00				12,573.00
	Clothing Change 20% L								5,029.00
	Security Escort 3 men/3 mos.				77,850.00				
					138,348.00				12,824.00
	Contingency 30% M & L				599,509.00				55,571.00
	Total Cost								<u>655,000.00</u>

D.1 EQUIPMENT DECONTAMINATION AND CARBON DIOXIDE CLEANING

The EG&G White Paper describing the CO₂ decontaminating process expresses costs in terms of pounds of metal cleaned. This was done to illustrate the advantage of CO₂ decontamination vs. shipping and interment costs at the Nevada Test Site. The demonstration set-up exhibited an operating cost of about 300\$/hr. and an optimum production rate of 130 lbs/hr. This production rate is based on the cleaning of plate, structural shapes and ductwork all with few if any surface irregularities. We feel that a production rate of 100 lbs/hr. would be more realistic for cleaning machines and process equipment with the myriad of irregular surfaces. The correlation between area cleaned and pounds processed is derived below.

$$1/8'' \text{ plate } (20'' \times 48'') = 30 \text{ lbs}$$

$$\text{Thus } \frac{2[20 \times 48]}{144 \text{ in.}^2/\text{ft}^2 \times 30 \text{ lb}} = 0.44 \text{ SF/lb}$$

$$\text{Thus Clean Cost} = \frac{300\$/\text{hr}(1.5)*}{.44 \text{ SF/lb} \times 100 \text{ lb/hr}} = 10.23\$/\text{SF} - \text{With Monitoring } 12.00\$/\text{SF}$$

*An empirical factor was added to account for additional time needed to remove the paint from equipment.

The surfaces cleaned by the CO₂ process will have to be immediately protected against rust and so the cost will include the application of a suitable primer and two coats of enamel @ 1.50 \$/SF.

$$\text{Total Decon Cost} = 13.50\$/\text{SF}$$

Decontamination for scrap metal was developed by adjusting the decon cost developed above (less the cost of painting) times a factor of 2 which accounts for the increased surface area due to additional equipment disassemble. The decontamination cost for scrap metal becomes \$24/ft².

The Capitol Cost for the CO₂ facility listed in Appendix C omits the blaster booth with HEPA filtered exhaust and a stack monitoring system. Adding these features at \$60,000 and \$20,000

respectively and estimating the cost for installation, gives a facility cost of 655,000 in Building 865. Assuming a fifteen-year write-off, the duration of this project would incur a cost of about \$65,000.

D.2 METHODOLOGY FOR ESTIMATING FAIR MARKET VALUE

The most straight forward method of determining the probable sale value of this equipment is: (1) determine the actual purchase date; (2) escalate to the present date using DOE generated escalators (replacement value); and (3) reduce the replacement value by an appropriate factor to arrive at a sale value.

Purchase Date: Derived from the RFP Property number and corrected by dates found on manufacturers data in the files. (Numerous items were transferred to the RFP from other agencies and entered into property records at the transfer date, not the manufacture date--thus implying much newer equipment than it actually is.)

Replacement Value: Original purchase price times the appropriate DOE-ORO Escalator.

Sale Value: Replacement Value times Used Equipment Discount. These discounts usually range from 25% on high demand equipment to as much as 75% on little used items. We have used a 40% discount primarily because this list of equipment has been screened and doubtful equipment eliminated. Thus, this listing includes only equipment that would be rated "good" or better commercially.

Cost of Sale: Commercial Dealers will charge approximately 15% of the sale value for brokerage, advertising, handling, and warehousing.

This scenario assumes that the equipment can be decontaminated to a level to permit public sale without doing irreparable harm to the equipment itself. The best overall return would be achieved if the equipment could be transferred to other DOE facilities where the relatively low level of contamination present would not be objectional.

D.3 EQUIPMENT REMOVAL ASSUMPTIONS & ESTIMATED REMOVAL COSTS

1. The equipment will be disconnected from all services and removed from the Building by an independent contractor specializing in handling machinery and process equipment. (The Operating Contractor would be unduly influenced by procedures, craft jurisdictions and customs that would adversely affect costs.)

2. Machines and process equipment will be dismantled only to the extent necessary for their removal as dictated by weight and dimensional restrictions. Any further tear-down for decontamination, volume reduction or smelting (material segregation or size limitations) will be addressed and their costs estimated for the specific scenarios.
3. All equipment is assumed to be transported to an onsite area (possibly within the building itself) for further processing, such as decontamination, refurbishing, packaging for interment, etc.
4. Several of the larger machines contain significant amounts of hydraulic oil which are assumed to be PCB based. Since the oil would have to be drained in order to remove the equipment, the cost of drumming, shipping and incineration (via commercial incinerator) will be included in the removal estimate.
5. Removal estimates are based on the use of an appropriate composite crew using BLS listed labor rates for the Denver Company area. Base estimates will be expressed in crew manhours times crew rate to give Subcontractor direct labor. Material will be limited to rigging, blocking, and equipment rental. Subcontractor (OH&P) is added @ 10% M -15% L & General Contractor (OH&P) added @ 15% M & 35% L.
6. The required "Fixed Price Personnel Training" is a one time cost for the Contractor and is assumed to be covered by the slightly higher than normal OH&P multipliers. Monitoring, both HP & HH, is assumed to be an Operating Contractor function and is not included in equipment removal costs.
7. Since no schedule for the equipment removal has been established, the estimates are presented in 2nd quarter 93 \$.
8. Since the estimates are conceptual in nature, a 30% Contingency is applied overall.

COMPOSITE CREWS

Crew A		Primarily Metallurgical Laboratory Equipment, Plug-in desk top mounted (Items 1 thru 32)			
		Labor Rate	Total Labor Cost	Material	Total Cost/Hr
	1 — Non-Working Foreman	19.63	\$19.63		
	4 — Building Laborers	19.13	76.52		
	Hand Truck Rental			17.5/hr	
	Sub-Total		96.15	17.50	
	OH&P (SUB & Gen.) 50% L 21% M		46.22	3.85	
	Clothing Change 20% L		19.23		
	Security Escort 1 mr/hr @ \$50/hr			50.00	
	TOTAL COST		161.60	71.35	232.95 (use 233)
Crew B		Self-contained machines requiring little or no disassembly for removal. Small milling machines, engine lathes, band saws, drill presses, pedestal grinders, and sheet metal machinery.			
	1 — Non-Working Foreman	23.03	\$28.03		
	2 — Electricians	27.53	55.06		
	2 — Millwrights	25.14	50.28		
	2 — Pipefitters	27.87	55.74		
	4 — Ironworkers (Riggers)	26.40	105.58		
	1 — Equipment Operator (Forklift)	24.57	24.57		
	Fork Lift Rental			21.96	
	Rigging Rental (Jacks, Come-alongs, etc.)			37.50	
	Sub-Total		319.26	59.46	
	OH&P 50% L 21% M		159.63	12.44	
	Clothing Change 20% L		63.85		
	Security Escort 5 mh/hr @ 50/hr			250.00	
	TOTAL COST		542.74	321.90	864.64 (use 865)

Crew C	Equipment composed of systems containing auxiliary equipment that must be dismantled and handled as separate entities. Vacuum Furnaces, Vacuum Arc Melter Atmosphere Furnaces and Electron Beam Furnace.				
	1 — Non-Working Foreman	28.03	\$28.03		
	2 — Electricians	27.53	55.06		
	2 — Millwrights	25.14	50.28		
	2 — Pipefitters	27.87	55.74		
	4 — Ironworkers (Riggers)	26.40	105.58		
	2 — Sheetmetal Workers	27.30	54.60		
	2 — Equipment Operators	24.57	49.14		
	Fork Lift Rental			21.96	
	Mobile Crane Rental 25T			77.21	
	Rigging Rental			64.50	
	Sub-Total		398.43	163.67	
	OHSP 50% L 21% M		199.21	34.37	
	Clothing Change 20% L		79.69		
	Security Escort 6 mh/hr @ 50/hr			300.00	
	TOTAL COST		677.33	498.04	1,175.37 (use 1,175)
Crew D	Equipment as in Crew C with an added weight or size requiring significant disassembly for removal. Isostatic Presses, Extrusion Press, 64" VTL and Forging Press.				
	1 — Non-Working Foreman	28.03	28.03		
	2 — Electricians	27.53	55.06		
	3 — Millwrights	25.14	75.42		
	2 — Pipefitters	27.87	55.74		
	6 — Ironworkers (Riggers)	26.40	158.40		
	2 — Sheetmetal Workers	27.30	54.60		
	2 — Equipment Operators	24.57	49.14		
	Fork Lift Rental			21.96	
	Mobil Crane Rental 25T			77.21	
	Rigging Rental			64.50	

COMPOSITE CREWS (cont.)

	Sub-Total	476.39	163.67	
	OH&P 50% L 21% M	238.19	34.37	
	Clothing Change 20% L	95.27		
	Security Escort 6 mh/hr @ 50		300.00	
	TOTAL COST	973.52	498.04	1,471.56 (use 1,472)
Crew E	Disassembly & size reduction			
	1 — Non-Working Foreman	28.03	\$28.03	
	4 — Millwrights	25.14	100.56	
	2 — Building Laborers	19.13	38.26	
	Abrasive Saw Rental		21.00	
	Sub-total	166.85	21.00	
	OH&P 50% L 21% M	83.43	4.41	
	Clothing Change 20% L	33.37		
	Security Escort 1 mr/hr @ 50		50.00	
	TOTAL COST	283.65	75.41	359.06 (use 359)
	Total Cost with Contingency			467.00

D.4 PCB OIL DISPOSAL

All oil (Hydraulic, Lub, & Way oil) will be drained from and the reservoirs flushed with mineral oil at a two volume rate. Both the original and flushing oil will be drummed and shipped to a licensed incinerator. Gear boxes and headstocks will be refilled with conventional oil. Hydraulic oil will not be replaced. The draining and flushing operation will be done while the machines are still operational so that gear boxes and headstocks can be operated with the flushing oil in them. This will require a pair of portable oil pumps with suitable pans and hoses @ \$300 each — \$600 total.

To develop a disposal cost for PCB oil, the cost of flushing, refilling, drumming, shipping, and incineration was calculated on a "per gallon basis" multiplied by the total number of gallons and added to a one-time set-up cost of \$200. The calculations are shown below:

$$\text{Total PCB Disposal Cost} = \text{Setup Cost @ } 200.00 + \\ \text{[[5.00/gal} \times 2 \text{ Flushing Oil} + \text{Refill @ } 7.50/\text{gal}]}$$

$$+ \text{Drum Cost } \frac{228}{55} + \frac{\text{Shipping Cost}^*}{55} + \text{Incineration Cost } 11/\text{gal}] \times \text{gal}] \\ = 200 + [(10 + 7.5 + 4.15 + 1.50 + 11) \times \text{gal}]$$

$$\text{PCB Disposal Cost} = 200 + [34.15/\text{gal} \times \text{gal}]$$

Incinerator cost for TSCA/LLW waste are \$92/gal based on costs from the K-25 TWCA Incinerator. The following equation represents the cost for removal and disposal of TSCA/LLW wastes. Replacing \$92/gal incineration cost with \$11/gal in the above equation results in a per-gallon cost of \$115.15. Therefore,

$$\text{Total PCB/LLW Disposal Cost} = 200 + (115.15/\text{gal} \times \text{gal})$$

*Ship to Little Rock, Arkansas

D.5 EQUIPMENT BURIAL

Equipment items in the inventory designated as scrap (codes 6 and above) will be disposed of by burial and the entire inventory so disposed of in one scenario. Packaging for burial is assumed to be Sea-Land (SL) containers with a purchase price of \$5000. Each SL container has a 8 x 8 x 20 = 1280 CF envelope and a weight limit of 40,000 lbs. Transportation to NTS is based on full 40K loads from Denver or 1250 per container. Interment cost is assumed to be either \$10/CF (the current NTS rate) or \$400/CF, the probable future rate. Loading and Blocking of an average SL is estimated to be \$500.

$$\text{Container and Transportation Cost} = \$5,000 \text{ (SL container cost)} + \$2,150 \text{ (transportation)} \\ + 500 = \$7,650/\text{SL}$$

$$\text{Disposal Cost (Commercial)} = 1,280 \text{ ft}^3 \times \$10/\text{ft}^3 = \$12,900/\text{SL}$$

$$\text{Disposal Cost (Government)} = 1,280 \text{ ft}^3 \times 400/\text{ft}^3 = \$512,000/\text{SL}$$

D.6 SMELTING OPTION

This option will require almost complete disassembly of the equipment and its auxiliaries for segregation of metals and reduction of component size to accommodate the charging opening in the smelter. For estimating purposes, the smelter is assumed to be an arc furnace with a 3000 lb. ingot mold and a 30-inch diameter charging opening. Segregation will be limited to cast iron and higher melting temperature alloys. The nonferrous metal content of the equipment is considered negligible. Disassembly and size reduction will be done by a crew of Millwrights. The estimates assume disassembly will involve the use of powered mechanical tools and size reduction will use portable abrasive saws with some sledge hammer work on larger castings. Costs are in terms of crew hours and dollars.

Metal input is taken from manufacturers published weights with an appropriate ratio for cast iron and steel applied. Melting costs are taken as 1.15/lb & 1.25/lb, respectively. Slag is assumed to be 10% of metal input and is priced as burial waste @ \$16/ft³ (government) or \$640/ft³ (commercial). The bulk metal value was obtained from Metal Working News (June 10, 1993). The resale price of cast iron was 17¢/lb and stainless steel was 18¢/lb.

D.7 MANAGEMENT AND REGULATORY COMPLIANCE COST

To estimate the cost for management of the program, management of projects (including subcontractors), and resources to conduct compliance activities, the shaft necessary for each option are shown in the table below. Rates reflect fully burdened costs to the government.

Management Cost						
Overhead & GA factor ~ 3.5						
Alternative	Managers (\$105/hr)	Project Managers (\$78/hr)	Regulatory Compliance (\$60/hr)	Administrative Support (\$35/hr)	Duration (yr)	Total Cost \$
Land Disposal	1	2	6	2	2	2,764,000
Recycle	1	1	2	1	2	1,352,000
Sale to the Public	1	2	8	3	2	3,384,000
Transfer to Government	1	1	2	1	2	1,352,000

D.8 COST FOR SURVEYING

Some of the options will require additional surveying and documentation to verify meeting or free-release criteria. These options include the recycling, sale to the public, and transfer of

clean equipment within the government sector. The staff required to accomplish this includes two full-time EEG employees for two years. A fully burdened rate of \$60/hr. was used.

$$2 \text{ HP} \times 40 \text{ hr/wk} \times 50 \text{ wk/yr} \times 2 \text{ yr} \times \$60/\text{hr} = \$480,000$$

D.9 PACKAGING FOR REUSE OR RESALE

After decontamination and prior to painting, equipment to be transferred or to be offered for sale, will be provided with pallets or custom-built skids to facilitate handling and at the same time preserve basic alignments of machine tools. Pallets will be standard 4 x 4 forklift units with a 2,000 lb (125 lb/SF) load rating. After painting, individual items will be strapped to the pallet to provide stability. The pallet plus strapping is estimated to cost 50\$/unit. Skids will range from 50 to 500\$/unit depending on size, weight, and configuration of the item. Some items are actually systems that will require one or more pallets and one or more skids. Thus, the tabulation lists X Pallets + X Skids and total dollars.

SUMMARY OF APPLICABLE FEDERAL REGULATIONS FOR EQUIPMENT DISPOSITION

Rocky Flats is a government-owned installation and therefore must adhere to the federal regulations governing the reporting, redistribution, and disposing of surplus government property. This Appendix summarizes these policies and procedures regarding the economic and efficient utilization and disposition of property own by the Federal Government. There are two sets of regulations which apply:

41 CFR 101 — Federal Property Management Regulations

48 CFR 45.6 — Federal Acquisitions Regulations

Applicable sections from both are summarized here.

48 CFR 45.603 Disposal Methods

An agency may exercise its rights to require delivery of any contractor inventory. If the agency dose not exercise these rights, the contractor inventory shall be disposed of by one of the following methods in the priority indicated:

- (a) Purchase or retention at cost by prime contractor or subcontractor of contractor-acquired property (45.605-1).
- (b) Return of contractor-acquired property to suppliers (45.605-1).
- (c) Use within the Government through the use of prescribed screening procedures (45.608).
- (d) Donation to eligible donees (45.609).
- (e) Sale (including purchase or retention at less than cost by the prime contractor or subcontractor) (45.610)
- (f) Donation to public bodies in lieu of abandonment (45.611)
- (g) Abandonment or destruction (45.611)

48 CFR 45.607 Scrap

- (a) The contractor need not itemize scrap on inventory schedules if (1) the material is physically segregated in the contractor's plant, and (2) the contractor submits a statement

describing the material, estimating its cost, and providing other information necessary for the plant clearance officer to verify whether the property is scrap. The contractor shall sort the scrap to the extent economically feasible to assure the highest sale proceeds.

- (b) the plant clearance officer shall review the schedules of property reported as scrap and if necessary, physically inspect the property involved. If the plant clearance officer determines that any of the property is serviceable, usable, or salvageable, the contractor shall resubmit it on appropriate inventory schedules.

48 CFR 45.611 Destruction or Abandonment

- (a) Surplus property may be destroyed or abandoned only after every effort has been made to dispose of it by other authorized methods. Before authorization destruction or abandonment, the plant clearance officer shall determine in writing that:
 - (1) The property has no commercial value and no value to the government;
 - (2) The estimated cost of care and handling is greater than the probable sale price;
 - (3) Because of its nature, the property constitutes a danger to public health, safety, or welfare.
- (b) Unless permitted by the contract, no contractor inventory shall be abandoned on the contractor's premises without the contractor's written consent.
- (c) Surplus property for which a determination has been made under subparagraph (a)(1) or (2) above may, however, be donated to public bodies in lieu of abandonment or destruction. All costs incident to donation shall be borne by the donee.

48 CFR 45.613 Property Disposal Determination

Written determination supporting abandonment, destruction, or other appropriate disposition shall be made by the plant clearance officer and reviewed by an appropriate reviewing authority within the agency.

Sequence of Actions Concerning Utilization, Donation, and Sale of Government Property

1. The agency determines that the property is no longer needed by it. In the case of RFP, the agency is DOE. This property is now considered to be **EXCESS**.

2. The agency is then required to conduct such internal agency screening as they deem necessary to reutilize the property within their agency.
(Reference 101-43.001-6 and 7).
3. Upon completion of internal screening, the agency is obligated to conduct Federal Agency Screening. This is usually accomplished by reporting the property to the General Services Administration (GSA) on SF 120, Report of Excess Property, for a 60-day screening period.
(Reference 101-42.304-1, -2, -3, and -4, also sections 101-43.305 and 101-43.4801).
4. If the property is in the non-reportable category, it is still subject to local area screening.
(Reference 101-43.4801).
5. After Federal Agency screening, the property is subject to donation screening for a period of 21 days. (Reference 101-44--.102). This applies whether the property is in the reportable or non-reportable category. The purpose of donation screening is to provide eligible entities to obtain the property prior to any sales action. Eligible entities are usually tax exempt activities, such as state agencies for surplus property.
6. After such screenings are completed, the property becomes **SURPLUS** by definition.
(Reference 101-43.001-31).
7. At this point, the property is either sold or otherwise disposed of through the abandonment or destruction procedures.
(Reference 101-45.900).
8. These procedure contemplate the disposal of NRC property and other hazardous material through utilization, donation, or sale.
(Reference 101-42).

F.1 Equipment Selected for Government Use - Contaminated

Item	Manufacturer	Description	Item	Manufacturer	Description
40	Pratt & Whitney	12" Lathe	69	Hardinge	Tool Room Lathe
47	Bridgeport	Milling Machine	70	Hardinge	Tool Room Lathe
48	Bridgeport	Milling Machine	71	Hardinge	Tool Room Lathe
49	Bridgeport	Milling Machine	72	Bullard	Vertical Turret Lathe
50	Bridgeport	Milling Machine	100	Sutton	2000 T. Extrusion Press
51	Bridgeport	Milling Machine	120	Autoslave	hot Isostatic Press
52	Cincinnati	Milling Machine	121	Cincinnati	Hydorspin
55	Walker-Turner	Drill Press	135	Stannet	Rolling Mill
56	Darex	Drill Sharpener	136	Fenn	7", 18.4 H.P. Rolling Mill
57	LeBlond	Engine Lathe	137	United	Rolling Mill
58	Monarch	Engine Lathe, 16"x30"	144	Erie	Steam Forging Hammer
59	Monarch	Engine Lathe, 16"	145	Fenn	Swager
60	Monarch	Engine Lathe, 20"	146	Fenn	Swager, Large
61	Monarch	Engine Lathe, 60"	148	Erie	Triple Action Press 150 T.
68	Hardinge	Tool Room Lathe	158	Harwood	Cold Isostatic Press

F.2 Equipment Selected for Government Use - Decontaminated

Item	Manufacturer	Description	Item	Manufacturer	Description
2	Nikon	Camera	78		Water Recirculator
3	Polaroid	Camera and Light Table	79		RPT Office
4	Vickers	Projection Microscope	80	Buehler	Abrasive Cutoff Saw (Small)
5	Bausch & Lomb	Metallograph	81	None	Be Preparation uBu Box
6	Leco	metallograph	82	Detrex	Degreaser
7	Wilson	Microhardness Tester	83	Milwaukee	Grinder
8	Buehler	Microhardness Tester	84		Sinks (2 each)
9	Wilson	Microhardness Tester	85	Lindberg	Tube Furnace & Evac. Ass'y
10	Theta	Dilatometer	86	Continental	Abrasive Cut-off Saw, 34"
11	Automet	Automet/Evromet Polisher	87	Hobart	Battery Charger (3 each)
11	Leper	RF Generator	88	None	Be Glovebox, inert
112	Leco	Diamond Saws (2 each)	89	Diversified Met	Be Preparation Box
13	Newage	Rockwell Hardness Tester	90	Milwaukee	Bench Grinder
14	Riehle	Rockwell Hardness Tester	93	Lindberg	Box Furnace, Sola Basic 6"
15	Clark Instr. Co	Rockwell Hardness Tester	94	Pexto	Circle Shear
16	Wilson/Rockwell	Rockwell Hardness Tester	95	Barrett Powerox	Die Stacker
17		Hoods (2 each)	96	Fenn	Draw Bench
18	Jarrett	Jarrett Polisher	97	Leland Gifford	Drill Press
19	Leco	Grinder w/ Load Controller	98	Rockwell "Mil.	Drill Press
20	Buehler	Abrasimet Saw	99	Leybold-Heraeus	Electron Beam Furnace
21		Polimet (3 each) grinding wh	101	Automatic	Fork Truck
22		120 Polimet Grinder	102	Lewis-Shepard	2000lb Cap Fork Truck
23	Buehler	Abrasimet saw	103	Allis Chalmers	4000lb Cap Fork Truck
24	Instron Test	Test Machine and Controller	104	Lindberg	Furnace
25	Buehler	Pacumet Mounting Press	105	Lindberg	Furnace
26		Sink Mounted Press (2)	109	Vacuum Industri	Furnace
27	MTS	Test Machine	110	Lindberg	1370 C, 95 KW, Furnace
28	MTS	Test Machine	111	Norton	Furnace, Hi-temp
29	Buehler	Polimet Grinder	112	A Bar	1200 C, Furnace High Vacuum
30	Buehler	Vibromet Polisher	113	A Bar	1600 C, Vacuum Furnace
31	Buehler	Ultramet IV	116	Liquid Honing	Grit Balster, liquid
32	Buehler	Vibromet	117	Peerless	Hack Saw
33	Lepel	RF Generator	118	Racine	Power Hack Saw

34	Powermatic	Band Saw	119	Racine	Hack Saw
35		Bridgeport Mill	122	Lepel	Induction Coil
36	Rockwell	Hardness Tester	125	CEC	Leak Detector
37	Buehler	Grinder Polisher	126	Varian	Leak Detector
38	Rockwell/Delta	Drill Press	127	Lift-A-Loft	500lb Capacity lifter
39		Grinder	128	GE of Canada	Manmate
41	Pexto Beverly	Hand Operated Shear	129		Material Storage
42	Dreis & Krump	Sheet Metal Bender - 36"	132	Tinius Olson	Press, 60,00 lbs
43		Tool Crib	134	Peck, Stow, & W	Roller Former - 20 Ga. Cap.
44	Sureweld	Welder	140	Diacro	Shear, #4
45	Do-All	Band Saw	141	Lodge & Shipley	Shear, 5/8 inch sq x 6'
46	Rockwell	Belt Sander	142	Miller	Spot Welder, Resistance
53	Abarboga Maskim	Drill Press	143	Vidmar	Stacker-retriever
54	ALZ Metal	Drill Press	147		Tooling Storage
62	Racine	Hack Saw, 14"	149	Brew	Vacuum Furnace
63	Black & Decker	Pedestal Grinder	150	Ajax Northrup	Vacuum Induction Furnace
64	Hammond	Pedestal Grinder	151		Waste Box Storage
65	Baldor	Pedestal Grinder-Buffer	152		Stepoff Pad
66	Brown & Sharpe	Surface Grinder # 618 Micro	153	Coulter Electro	Coulter Counter
67	Cutter Master	Tool Grinder	155	Conway Pressure	Hot Isostatic Press
73		Air Compressor	159		Gas Bottle Racks
74		Power Switches	161	Colmonoy	Flame Spray & Hood
75		Pumps	162	Empire	Grit Blaster (Dual)
76		Steam Supply			
77		Water Heater			

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