








## ***Appendix A*** **Internet Resources**

This appendix provides a list of Internet resources that may be useful for the development of cost estimates of remedial alternatives during the FS. USEPA and USACE cannot endorse nor vouch for the content of any web site other than their own. All listed web site addresses were current at the time of appendix publication. In addition to description of content, the following icons are used next to resource listings to indicate what type of information each contains:

-  Policy
-  Technical
-  Cost
-  Software/Database
-  Publication

These identifiers are used separately or together, depending on the resource. Exhibit A-1 presents Internet resources that are sponsored and maintained by government agencies and organizations. Exhibit A-2 presents private or non-government Internet resources. Major resource categories in Exhibit A-1 include:

- ◆ U.S. Environmental Protection Agency
- ◆ U.S. Army Corps of Engineers
- ◆ U.S. Department of Energy
- ◆ U.S. Department of Defense
- ◆ Other or Interagency

Major categories in Exhibit A-2 for non-government resources include:

- ◆ Private Firms/Companies
- ◆ Professional Societies/Organizations

## Exhibit A-1

### Internet Resources – Government

#### U.S. Environmental Protection Agency (USEPA)

<http://www.epa.gov/>

#### USEPA Superfund

<http://www.epa.gov/superfund/>

The USEPA administers the Superfund program through the Office of Solid Waste and Emergency Response (OSWER) in cooperation with individual states and tribal governments. Superfund locates, investigates and cleans up the nation's hazardous waste sites. The web site provides information on the technical resources, initiatives, programs, and accomplishments of the Superfund program. Resources include:

◆ **Rules of Thumb for Superfund Remedy Selection** 


<http://www.epa.gov/superfund/resources/rules/index.htm>

This guidance document outlines key principles and procedures that should be consulted during the Superfund remedy selection process.

◆ **Role of Cost in the Superfund Remedy Selection Process** 

[http://www.epa.gov/superfund/resources/cost\\_dir/index.htm](http://www.epa.gov/superfund/resources/cost_dir/index.htm)

This document outlines the role of costs in the Superfund remedy selection process as established in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and current EPA guidance documents.

◆ **A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Documents** 

<http://www.epa.gov/superfund/resources/remedy/rods/index.htm>

This document provides recommended formats and content for Superfund remedial action decision documents, clarifies roles and responsibilities of regulatory agencies and stakeholders in the remedy selection process, and explains how to address changes made to proposed and selected remedies.

◆ **Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis (OSWER Directive 9355.3-20)**  

<http://www.epa.gov/superfund/>

Contains USEPA policy on the use of discount rates for RI/FS cost analyses.

◆ **Presumptive Remedies**   






<http://www.epa.gov/superfund/resources/presump/index.htm>

In an effort to streamline investigations and remedy selection, presumptive remedy guidance has been or will be developed for volatile organic compounds in soil, municipal landfills, metals in soils, wood treaters, and contaminated groundwater.

◆ **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**  

<http://www.epa.gov/docs/epacfr40/chapt-I.info/subch-J/>

Contains regulatory requirements for the RI/FS process (Title 40 Code of Federal Regulations, Part 300, Subpart E, Section 300.430).

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication

## ***Exhibit A-1 (cont.)***

### **Internet Resources – Government**

#### **USEPA OSWER** ✕

<http://www.epa.gov/swerrims/>

The Office of Solid Waste and Emergency Response (OSWER) develops guidelines and standards for the land disposal of hazardous wastes and for underground storage tanks. OSWER furnishes technical assistance in the development, management and operation of solid waste activities and analyzes the recovery of useful energy from solid waste. In addition, OSWER has undertaken the development and implementation of a program to respond to abandoned and active hazardous waste sites and accidental release (including some oil spills) as well as the encouragement of innovative technologies for contaminated soil and groundwater. OSWER resources include:

#### ◆ **Federal Facilities Restoration and Reuse** ✕

<http://www.epa.gov/swerffrr/>

#### ◆ **Solid and Hazardous Waste** ✕

<http://www.epa.gov/epaoswer/osw/index.htm>

#### ◆ **Brownfields** ✕

<http://www.epa.gov/swerosps/bf/>

#### ◆ **Superfund** ✕

<http://www.epa.gov/superfund/index.htm>

#### ◆ **Technology Innovation** ✕

<http://www.epa.gov/swertio1/index.htm>

#### ◆ **Underground Storage Tanks** ✕

<http://www.epa.gov/swerust1/>

#### **USEPA – Publications**

<http://www.epa.gov/epahome/publications.htm>

Provides access to USEPA technical and public information. Resources include:

#### ◆ **USEPA – National Service Center for Environmental Publications (NSCEP)**

<http://www.epa.gov/ncepihom>

Formerly known as NCEPI, NSCEP is a central repository for all EPA documents with over 5,500 titles in paper and/or electronic format, available for free distribution. The web site contains the National EPA Publications Catalog where documents can be browsed and ordered online.

#### ◆ **National Environmental Publications Internet Site (NEPIS)**

<http://www.epa.gov/ncepihom/nepishom>

EPA's largest electronic documents site allows you to search view and print, including full images of all original pages and full-text, from a collection of over 7,000 archival and current documents. This collection may include documents that are no longer available in print form.

#### **USEPA SITE Program** ✕






<http://www.epa.gov/ORD/SITE>

USEPA's Superfund Innovative Technology Evaluation (SITE) Program encourages the development and implementation of innovative treatment technologies for hazardous waste site monitoring and remediation. The SITE program gathers engineering and cost data to assess the performance of treatment technologies. The information provided is intended to assist in evaluating and screening potential remediation technologies and in selecting a remedial alternative.

#### ◆ **SITE Reports** ✕

<http://www.epa.gov/ORD/SITE/reports>

This page provides links to SITE Reports including general reports, demonstration program reports, and emerging technology program reports.

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication

## Exhibit A-1 (cont.)

### Internet Resources – Government

#### USEPA Office of Research and Development

<http://www.epa.gov/ORD>

The USEPA's web site for research and development provides information pertaining to environmental and human health problems. The Office of Research and Development (ORD) focuses on the advancement of scientific research and the implementation of cost-effective technologies. ORD labs include the National Risk Management Research Lab, which includes:

#### ◆ **Technology Transfer**

<http://www.epa.gov/tbnrmrl/>

Technology Transfer contains publications including guides, handbooks, summary reports and seminars on pollution prevention, monitoring, and treatment technologies.

#### USEPA – Office of Underground Storage Tanks

<http://www.epa.gov/swerust1/index.htm>

EPA's Office of Underground Storage Tank's (OUST) web site. OUST's goal is to provide current information relevant to the Federal underground storage tank (UST) program. The web site offers compliance assistance, UST publications, law/regulation information, and cleanup information. Resources include:

#### ◆ **USEPA – Cleanup of UST System Releases**

<http://www.epa.gov/swerust1/cat/index.htm>

This page contains UST cleanup resources, including general information, site characterization, remediation technologies, sampling, and monitoring.

#### U.S. Army Corp of Engineers (USACE)

<http://www.usace.army.mil/>

#### USACE - HTRW Center of Expertise

<http://www.environmental.usace.army.mil/>

The Hazardous, Toxic, and Radioactive Waste Center of Expertise (HTRW CX) provides general information regarding numerous technical areas including environmental regulations and laws, innovative technologies, environmental risk assessments, and environmental engineering. HTRW CX also provides general assistance to U.S. Army Corp of Engineer offices involved in environmental programs. The HTRW CX homepage contains technical information and guidance for cleaning up sites contaminated with hazardous, toxic, or radioactive waste. Technical resources include innovative technologies, process engineering, and costs. Resources include:

#### ◆ **The TSDF Report** \$

<http://www.environmental.usace.army.mil/library/pubs/tsdf/tsdf.html>

The Report on Treatment, Storage & Disposal Facilities (TSDF) for Hazardous, Toxic, and Radioactive Waste is designed to provide information, including costs, regarding the disposal of RCRA Subtitle C hazardous wastes and recycling of selected solid wastes.

#### ◆ **Environmental Lessons Learned Program**

<http://www.environmental.usace.army.mil/library/lessons/lessons.html>

The Lessons Learned program was created to provide a means of identifying problem areas in the HTRW program; collect ideas on solutions, new technology and better methods; and to distribute those lessons learned.

#### ◆ **Environmental Guidance Documents**






<http://www.environmental.usace.army.mil/library/guide/guide.html>

This page provides a link to environmental guidance documents including engineering manuals, pamphlets, technical letters, regulations, and guidance specifications.

#### ◆ **Cost Engineering Resources**

<http://www.environmental.usace.army.mil/info/technical/cost/cost.html>

This page contains information regarding cost engineering resources of the HTRW CX. Links are provided to guidance, training materials, tools and databases, etc.

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication

## ***Exhibit A-1 (cont.)***

### **Internet Resources – Government**

**USACE – Cost Engineering Branch**      [http://www.hq.usace.army.mil/cemp/e/ec/ec\\_new.htm](http://www.hq.usace.army.mil/cemp/e/ec/ec_new.htm)

This is the home web site for the Cost Engineering and Programs Formulation Branch of the USACE. This branch is responsible for all aspects of cost engineering for the USACE. Links to various web sites related to cost information and other initiatives can be found on this web page. Resources include:

- ◆ **Economic Analysis for Military Construction**     
<http://www.hq.usace.army.mil/cemp/e/ec/econ/econ.htm>

This page contains links to economic analysis information including updated inflation and discount rates.

- ◆ **Regulations and Guidance Documents**    <http://www.hq.usace.army.mil/cemp/e/ec/ec-regs.htm>

This page contains links to regulation and guidance documents including:

- Engineering and Design Cost Engineering Policy and General Requirements
- Area Cost Factor Index
- Military Construction Cost Index
- Programming Cost Estimates for Military Construction
- Economic Studies for Military Construction Design Applications

**USACE – TRACES**    

<http://www.hnd.usace.army.mil/traces/>

TRACES is the Tri-Services umbrella linking all automated cost engineering systems and their associated databases. Contained within this web site are links to information on various modules and other sources of cost information. Check the following sites for more specific information:

- ◆ **Micro Computer Assisted Cost Engineering System (MCACES)**     
<http://www.hnd.usace.army.mil/traces/mcaces.asp>

MCACES is a multi-user software program used for the preparation of detailed construction cost estimates for military, civil works, and HTRW programs.

- ◆ **Historical Analysis Generator (HAG)**    <http://www.hnd.usace.army.mil/traces/hag.asp>

The Historical Analysis Generator (HAG) is a software tool for analyzing and reporting historical cost data of past construction projects. The tool was developed by Building Systems Design, Inc. for the Tri-Service Cost Engineer Committee.

- ◆ **Life Cycle Cost (LCC)**   <http://www.hnd.usace.army.mil/traces/lcc.asp>






The Life Cycle Cost (LCC) module is a DOS-based stand-alone program that provides cost engineers with the capability of developing life cycle cost analyses.

**USACE – Publications**  

<http://www.usace.army.mil/inet/usace-docs/>

The collection of publications on this web site is the repository for all official USACE engineering regulations, circulars, manuals, and other documents originating from USACE headquarters. Many of the publications can be downloaded in electronic format. These include:

- ◆ **Engineering Instructions EI 01D010: Construction Cost Estimates**  
<http://www.hnd.usace.army.mil/techinfo/ei.htm>

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication

## Exhibit A-1 (cont.)

### Internet Resources – Government

#### U.S. Department of Energy (USDOE)

<http://www.doe.gov/>

#### USDOE – Environmental Management (EM)

<http://www.em.doe.gov>

In 1989, the Office of Environmental Restoration (ER) was created within the newly established Office of Environmental Management (EM) to consolidate, centralize and promote the cleanup of contaminated waste sites and surplus facilities within the DOE Complex. The DOE Environmental Restoration Program is involved in assessment and cleanup activities at 132 sites throughout the United States and in Puerto Rico. Check the following sites for more specific information:




- ◆ **Pollution Prevention in the Environmental Restoration Program**  

<http://www.em.doe.gov/p2/index.html>

This web site offers tools, resources, and guidance to assist in environmental cleanup projects.

- ◆ **Environmental Restoration Lessons Learned**   <http://www.em.doe.gov/lessons/index.html>

The EM Lessons Learned program evaluates the lessons learned relevant to environmental management business and functional areas to improve efficiencies and effectiveness, reduce risk and waste, and accelerate remediation project closure.

- ◆ **Decommissioning of Facilities**   

<http://www.em.doe.gov/dd/index.html>

This page provides information on policy and guidance, a downloadable version of the Decommissioning Benchmarking Study, and links to site-specific decommissioning pages and lessons learned.

- ◆ **Cost & Performance Document**  

<http://www.em.doe.gov/costperf/index.html>

The purpose of this DOE document is to facilitate the use of consistent procedures to document cost and performance information for environmental cleanup projects.

#### USDOE – EM – Applied Cost Engineering

<http://www.em.doe.gov/aceteam/>

The Environmental Restoration (ER) Applied Cost Engineering (ACE) Team was established to promote continuous cost improvements through dissemination of cost engineering tools, methods, techniques, best practices, and lessons learned. Resources include:

- ◆ **Cost Engineering Links**  


<http://www.em.doe.gov/aceteam/links.html>

This page provides links to cost engineering resources on the Internet.

#### USDOE – EM – Remedial Action Program Information Center (RAPIC)






<http://www.em.doe.gov/rapic>

RAPIC provides technical information support to the DOE Environmental Restoration (ER) Program. Information includes decontamination and decommissioning (D&D) and remedial action (RA) activities, technology development, and research at sites and facilities contaminated with radioactive and/or hazardous materials. Resources include:

- ◆ **Environmental Restoration Document Information System (ERDIS)** 

<http://www.em.doe.gov/rapic/6erdis.html>

The Environmental Restoration Document Information System (ERDIS), is an online document locator resource sponsored by the USDOE Office of Environmental Restoration.

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication

## ***Exhibit A-1 (cont.)***

### **Internet Resources – Government**

#### **USDOE –EM – Preferred Alternatives Matrices (PAMs)**

<http://www.em.doe.gov/define>

The DOE's Preferred Alternatives Matrices provide information, background and descriptions of commercially available soil and groundwater remediation technologies. PAMs evaluate the available technologies ranking them on the basis of performance, risk of technology failure, and cost. The goal of this effort is to implement "the right technology, at the right time, at the right site."

#### **USDOE – Environmental Technology Cost-Savings Analysis Plan**

<http://www.lanl.gov/projects/etcap/home.html>

This web site contains information about the Environmental Technology Cost-Savings Analysis Project (ETCAP), sponsored by Los Alamos National Laboratory (LANL). This compendium provides a representative sample of cost information for environmental remediation technologies used in the treatment of hazardous, radioactive, and mixed waste. Data was gathered from a variety of sources and summarized herein to provide actual cost summaries or engineering cost estimates, site characteristics, and comments detailing remedial projects.

#### **USDOE – National Energy Technical Laboratory**

<http://www.netl.doe.gov/>

The National Energy Technical Laboratory (NETL) performs, procures, and sponsors technical research, development, and demonstration to advance technology into the commercial marketplace, thereby benefiting the environment. Their web site contains links to information on environmental projects and innovative technologies. The NETL was formerly known as the Federal Energy Technology Center (FETC).

### **U.S. Department of Defense**

#### **U.S. Air Force Civil Engineer Support Agency (AFCESA)**






<http://www.afcesa.af.mil/>

The Air Force Civil Engineer Support Agency provides tools, practices and professional support to maximize Air Force civil engineer capabilities in base and contingency operations. AFCESA consists of four directorates: Operations Support, Technical Support, Contingency Support; and Civil Engineer Maintenance, Inspection and Repair Team - Field Support. The Civil Engineering division of the Technical Support Directorate provides expertise in cost estimating; structural, water, wastewater, drainage and pavement systems; as well as in airfield marking, arresting and barrier systems. Resources include:

##### **◆ Cost Engineering Program**

<http://www.afcesa.af.mil/Directorate/CES/Civil/CostEngr/CostEngr.htm>

The AFCESA Cost Engineering Program develops and maintains methodologies, cost models, and associated databases to estimate and analyze construction, environmental, and life cycle costs of Air Force facilities. Links to automated tools and guides/handbooks are provided on the web site.

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication

## Exhibit A-1 (cont.)

### Internet Resources – Government

#### Other or Interagency

##### **Federal Remediation Technologies Roundtable (FRTR)**

<http://www.frtr.gov/>

The Federal Remediation Technologies Roundtable (FRTR) is an interagency working group seeking to build a more collaborative atmosphere among the federal agencies involved in hazardous waste site remediation. By providing such opportunities, the Roundtable hopes to identify and publicize more efficient, cost-effective solutions to the Federal government's hazardous waste challenges. Members include major developers and users of these technologies: Department of Defense, U.S. Army, U.S. Army Corps of Engineers, U.S. Navy, U.S. Air Force, U.S. Department of Energy, Department of the Interior, and the U.S. Environmental Protection Agency. Check the following sites for more specific information:

##### ◆ **Cost and Performance Reports**

<http://www.frtr.gov/cost/>

This page presents case studies and abstracts containing available cost and performance information for full-scale remediation efforts and numerous large-scale demonstration projects.

##### ◆ **Environmental Cost Engineering Committee (EC2)** <http://www.frtr.gov/cost/info/ec2.html>

This page provides information on the work of the interagency EC2 group, including newsletters, listing of projects, and work products. Includes links to the Historical Cost Analysis System (HCAS) and the HTRW remedial action (RA) and operation and maintenance (O&M) work breakdown structures:

HCAS

[http://www.frtr.gov/cost/ec2/HCAS\\_OVERVIEW.htm](http://www.frtr.gov/cost/ec2/HCAS_OVERVIEW.htm)

HTRW RA and O&M WBS

<http://www.frtr.gov/cost/ec2/wbs1.html>

##### ◆ **Remediation Technology Infobase**

<http://www.frtr.gov/publications/infobase98.html>

This page contains a list of resources for information on Federal cleanup programs and remediation technologies.

##### ◆ **Technology Demonstration**

<http://www.frtr.gov/demonstration.html>

This page contains links to various technology demonstration projects.

##### ◆ **Technology Development**

<http://www.frtr.gov/techdev/index.html>

This page contains links to environmental technology resources on the Internet.

##### ◆ **Remediation Screening Matrix**

[http://www.frtr.gov/matrix2/top\\_page.html](http://www.frtr.gov/matrix2/top_page.html)

The Treatment Technologies Screening Matrix is a comprehensive guide intended to screen and evaluate candidate technologies for environmental cleanup projects and used to assist in selecting a remedial alternative. The guide incorporates performance and cost data allowing the user to screen for potential treatment technologies and to assign a relative probability of success. The guide can be accessed using a table of contents, screening matrix, or a search engine.

##### ◆ **Sampling & Analysis Matrix**






<http://www.frtr.gov/site/>

The sampling and analysis matrix assists in choosing cost-effective site characterization technologies so that the impact on human health and the environment can be properly evaluated.

##### ◆ **Publications**

<http://www.frtr.gov/pubs.html>

This page provides a list of FRTR publications.

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication



## Exhibit A-1 (cont.)

### Internet Resources – Government

#### Groundwater Remediation Technologies Analysis Center (GWR TAC) \$ <http://www.gwrtac.org>

The Groundwater Remediation Technologies Analysis Center (GWR TAC) compiles, analyzes, and disseminates information on innovative groundwater remediation technologies. The data contains information on past performance, cost, and applicability. The information provided is intended to assist in evaluating and screening potential remediation technologies and in selecting a remedial alternative. Resources include:

◆ **Vendor Information**   <http://www.gwrtac.org/html/vendors.html>

This page provides vendor information for groundwater remediation technologies.

◆ **Technical Reports**   \$ <http://www.gwrtac.org/html/techdocs.html>

This page contains groundwater and environmental technical reports available online.

#### Remedial Technologies Development Forum (RTDF) <http://www.rtdf.org>

The purpose of the RTDF is to “identify what government and industry can do together to develop and improve the environmental technologies needed to address their mutual cleanup problems in the safest, most cost-effective manner.” The RTDF consists of several action teams including:

- The Bioremediation Consortium
- The Lasagna Partnership
- INERT Soils – Metal Team
- Phytoremediation of Organics Team
- Permeable Reactive Barriers Team
- In-Situ Flushing Team
- Sediments Remediation Team

Detailed information on each of these teams can be found on this web site, including technical documents, processes, and other resources.

#### Global Network of Environment and Technology (GNET) <http://www.gnet.org>






GNET provides daily news and up-to-date information on current environment and technology issues. Resources include:

◆ **TechKnow**    \$ <http://www.techknow.org>

TechKnow is GNET’s free interactive database of innovative remediation and environmentally sustainable technologies.

#### Johnson Space Center - Cost Estimating Group <http://www.jsc.nasa.gov/bu2/index.html>

This is NASA’s cost estimating web site, containing resources, publications, software and tools pertaining to cost estimating.

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication















## Exhibit A-1 (cont.)

### Internet Resources – Government

#### Hazardous Waste Cleanup Information

<http://www.clu-in.org/>


This web site, maintained by the USEPA Technology Innovation Office (TIO), provides information on hazardous waste innovative treatment technologies. It contains links to available products, software, remediation technology descriptions, regulatory information, vendor information, and other online resources for hazardous waste remediation. Check the following sites for more specific information:






- ◆ **Site Remediation Technologies**   <http://www.clu-in.org/remed1.htm>  
This page contains technical data, publications, and resources for site remediation technologies.
- ◆ **TechDirect**   <http://www.clu-in.org/techdrct/default.htm>  
TechDirect is a free information service providing information, new publications, and events of interest for site remediation and site assessment professionals.
- ◆ **Bioremediation in the Field Search System**   <http://www.clu-in.org/products/moreinfo/bfss.htm>  
The Bioremediation in the Field Search System is a database of information of waste sites where bioremediation is being tested, implemented or has been completed.
- ◆ **Site Characterization**   <http://www.clu-in.org/char1.htm>  
This page contains technical data, publications, and resources for site characterization techniques.
- ◆ **Regulatory Information**   <http://www.clu-in.org/reg1.htm>  
This page contains technical data, publication, and resources on environmental regulatory information.
- ◆ **Vendor Support**   <http://www.clu-in.org/supply1.htm>  
Vendor support contains information to direct technology vendors and developers to the appropriate funding sources and to provide technical support for all stages of development.
- ◆ **Internet and Online Resources**   <http://www.clu-in.org/resourc1.htm>  
This page contains links to technical resources available on the Internet.

#### U.S. Office of Management and Budget (OMB)

<http://www.whitehouse.gov/OMB>

OMB's predominant mission is to assist the President in overseeing the preparation of the Federal budget and to supervise its administration in Executive Branch agencies. OMB ensures that agency reports, rules, testimony, and proposed legislation are consistent with the President's budget and with Administration policies. In addition, OMB oversees and coordinates the Administration's procurement, financial management, information, and regulatory policies. Resources include:

- ◆ **OMB Circular No. A-94**   <http://www.whitehouse.gov/omb/circulars/a094/a094.html>  
OMB Circular No. A-94 presents guidelines on discount rates to be used in evaluating time-distributed costs and benefits.

Symbol Key:  Policy  Technical  Cost  Software/Database  Publication

**Exhibit A-2**  
**Internet Resources – Non-Government**

**Private Firms/Companies**

**Building Systems Design (BSD), Inc.** \$ 

<http://www.bsdssoftlink.com/>

BSD is a firm that develops software for the architectural, engineering, and construction industry. Links and information are provided on BSD CostLink software, as well as products developed for government use such as MCACES for Windows and the Life Cycle Cost (LCC) module.

**Craftsman Book Company**  

<http://www.craftsman-book.com/>

Craftsman Book Company publishes estimator costbooks that include: National Construction Estimator, National Repair & Remodeling Estimator, National Electrical Estimator, National Plumbing & HVAC Estimator, National Painting Cost Estimator, and National Renovation & Insurance Estimator. Information about their National Estimator software is also available.

**D4Cost 2000**  

<http://www.d4cost.com/>

This web page provides a description, online demonstrations, and other information for the D4Cost 2001 Building Cost Modeling Tool.

**Decisioneering - Crystal Ball**  

[http://www.decisioneering.com/crystal\\_ball/index.html](http://www.decisioneering.com/crystal_ball/index.html)

This web page provides information and demonstrations of Crystal Ball, an advanced modeling tool for risk analysis.

**Engineering News Record**  \$

<http://www.enr.com/>

This is the online resource for the Engineering News Record periodical. This site provides various information related to engineering, costs, and a comprehensive listing of companies, affiliated with ENR, and their profiles. Check the following sites for more specific information:

◆ **ENR's Cost Indexes**  \$

<http://www.enr.com/cost/cost1.asp>

ENR publishes both a Construction Cost Index and Building Cost index that are used in the construction industry. This web site contains an explanation of the index methodology.

**GLOBALtechs**  

<http://www.globaltechs.com/index.html>

GLOBALtechs is an online remediation technologies directory containing information on over 650 remediation technologies available worldwide.

**National Technology Transfer Center Web Site (Environmental)**  

<http://www.nttc.edu/environmental.html>

The National Technology Transfer Center web site provides online resource for technology summaries. This web site offers links to environmental resources.

◆ **Envirotrade** 






<http://www.nttc.edu/env/>

Envirotrade provides detailed summaries for numerous environmental technologies.

**Estimating Systems Inc.**  

<http://www.estimatingsystems.com/>

Estimating Systems Inc. manufactures Pulsar, a PC-based construction cost-estimating package. Pulsar uses R.S. Means Cost Data.

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication

**Exhibit A-2 (cont.)****Internet Resources – Non-Government****G2 Estimator**  <http://www.g2estimator.com/>

G2 Estimator is a Windows-based estimating software package, produced by Valli Information Systems, Inc. Information on G2 Estimator and other G2 products are found on this web site.

**Independent Project Analysis, Inc.**  <http://www.ipaglobal.com/>

Independent Project Analysis, Inc. (IPA) provides project evaluation and project system benchmarking services. IPA has developed detailed, carefully normalized databases of projects executed around the world. The databases cover the project life cycle from business idea through early production. IPA has used these databases to develop statistical tools that allow for performance comparisons among projects.

**Marshall & Swift**   \$<http://www.marshallswift.com/>

Marshall & Swift publishes various cost books for construction, remodeling, and renovation. Information on their products can be found on their web site.

**Project Time and Cost, Inc.** ✕<http://www.ptcinc.com/>

Project Time and Cost, Inc. (PT&C) is a national cost management firm, providing services to the design and construction industry. Environmental cost management services offered by PT&C include feasibility studies, activity-based cost estimating, risk analysis, and cost engineering.

**Remedial Technologies Network**  ✕  \$<http://www.enviroglobe.com/>

RTN's web site, EnviroGlobe, contains information, news, support, and databases on environmental technologies, including the RIMS2000 database. RIMS2000 is a large database of environmental technology information. The information provided is intended to assist in evaluating and screening potential remediation technologies and in selecting a remedial alternative.

**R.S. Means, Inc.**   \$<http://www.rsmeans.com/>





R.S. Means offers construction cost estimating and management resources. More information and links to cost information and software is available on their web page.

**Saylor Publications, Inc.**   \$<http://www.saylor.com/>

The web page includes descriptions and ordering information for Saylor's Cost Manuals and software. Additionally, a labor cost index is presented online.

**Sweet's Group**  <http://www.sweets.com/>

The Sweet's system consists of a variety of print and electronic products for architect, engineering and construction (AEC) professionals. Does not contain cost data, but does list specific vendors of building products that can be used to obtain quotes.

Symbol Key:  Policy  Technical \$ Cost  Software/Database  Publication

**Exhibit A-2 (cont.)**  
**Internet Resources – Non-Government**

**Talisman Partners, Limited**  

<http://www.talpart.com/>

Talisman Partners, Limited is a consulting firm that provides services in the areas of facility management, construction, operations and maintenance, and environmental restoration. Products include proprietary data, tools and systems for analysis and decision making, management consulting services, and training. Check the following sites for specific information:

◆ **RACER Environmental Remediation Cost Estimating Software**  \$

<http://www.talpart.com/products/racer/index.html>

Remedial Action Cost Engineering and Requirements (RACER) is a Windows-based environmental remediation cost estimating system.

◆ **ECHOS Environmental Remediation Cost Data Books**   \$

<http://www.talpart.com/products/echos/index.html>

ECHOS Cost Data Books provide assemblies costs data and unit cost data for environmental remediation projects.

◆ **Environmental Remediation Estimating Procedures Handbook** 

<http://www.talpart.com/products/handbook/index.html>

Environmental Remediation Estimating Procedures Handbook is a step by step guide for estimating environmental remediation cost.

◆ **Tank RACER**  \$

<http://www.talpart.com/products/tankracer/index.html>

Tank RACER is a Windows-based cost estimating system that was developed specifically to address storage tank and petroleum-related assessment and remediation.

**Tecolote Research, Inc.**  

<http://www.tecolote.com/>

The Tecolote Research web page contains useful links to the software and services they provide. Links to detailed information on numerous software programs, including ACEIT, COETS, IFTS, PC-DATS, and SCANS, are also included.

**Thomas Register of American Manufacturers**  

<http://www.thomasregister.com/>

The Thomas Register is a series of manuals containing information for companies in the U.S. The Online Catalog contains detailed buying information about a company's products or services. This site requires the a membership to obtain information.

**Timberline Software Corporation**  






<http://www.timberline.com/>

Timberline Software Corporation is an international supplier of accounting and cost estimating software for the construction and property management industries. Their web site provides information about Timberline's products, training, support and upcoming events.

**TSD Central** \$

<http://www.tsdcentral.com/>




TSD Central is an online source of direct pricing for waste management, cleanup, and transportation services from vendors across the country.

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication

**Exhibit A-2 (cont.)****Internet Resources – Non-Government****U.S. Cost, Inc.**  <http://www.uscost.com/>

U.S. COST has developed the estimating software Success. Success is US Cost's integrate estimating and cost management program. Technical and ordering information is available on the following page:

◆ **Success - Integrated Estimating & Cost Management** 

<http://www.uscost.com/success4.htm>**Professional Societies/Organizations****Association for the Advancement of Cost Engineering (AACE)**   <http://www.aacei.org/>

The AACE International web page contains links to publications, online forums, software/data vendors, professional organizations and other information for the cost engineer.





**American Society of Professional Estimators (ASPE)**   <http://www.cmpi.com/aspe/>

The American Society of Professional Estimators serves construction estimators by providing education, fellowship, and professional development opportunities. Links to more information can be found on their web site.

**Environmental Technology Council (ETC)**   <http://www.etc.org/index.cfm>

The ETC is a trade organization of commercial environmental firms that recycle, treat and dispose of industrial and hazardous wastes; and firms involved in cleanup of contaminated sites. A compilation of low, average, and high landfill and incinerator cost data for different types of wastes, based on a survey of ETC members, can be found at:






◆ **Incinerator and Landfill Cost Data (January 2000)** 

<http://www.etc.org/costsurvey3.cfm>**International Cost Engineering Council (ICEC)**    <http://www.icoste.org/>

International Cost Engineering Council (ICEC) is a worldwide confederation of cost engineering, quantity surveying, and project management societies. The web page provides links to many international resources for cost and project management information and other technical papers.

**The Society of Cost Estimating and Analysis (SCEA)**    <http://www.erols.com/scea/>

SCEA is an organization dedicated to improving cost estimating and analysis in government and industry, and enhancing the professional competence and achievements of its members. The web page contains links to various cost resources.

**Symbol Key:**  Policy  Technical  Cost  Software/Database  Publication



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## Appendix B Cost Adjustment Factors

This appendix provides information on how to calculate and apply cost adjustment factors, including those for escalation, area cost, and health and safety productivity.

### Escalation

Costs that have been derived from sources that are one year old or more should be updated or escalated to the base year. This can be done using the following equation:

$$C_b = C_o ( F_b / F_o )$$

where  $C_b$  is the base year or current cost,  $C_o$  is the old cost,  $F_b$  is the base year or current index factor, and  $F_o$  is the index factor for the old cost.

Escalation indexes are available from both private and public sources. Most are published on a monthly or annual basis. An example index is Engineering News Record's (ENR) building cost index, which is based on a 20-city average of labor rates for bricklayers, carpenters, and iron workers plus material costs for structural steel, portland cement, and lumber using a certain number of labor hours and material quantity. Monthly factors for this index, from January 1978 to July 2000, are shown in Exhibit B-1. The index is also available at <http://www.enr.com/cost/costbci.asp>.

<b>Exhibit B-1 ENR Building Cost Index</b>													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG.
1978	1609	1617	1620	1621	1652	1663	1696	1705	1720	1721	1732	1734	1674
1979	1740	1740	1750	1749	1753	1809	1829	1849	1900	1900	1901	1909	1819
1980	1895	1894	1915	1899	1888	1916	1950	1971	1976	1976	2000	2017	1941
1981	2015	2016	2014	2064	2076	2080	2106	2131	2154	2151	2181	2178	2097
1982	2184	2198	2192	2197	2199	2225	2258	2259	2263	2262	2268	2297	2234
1983	2311	2348	2352	2347	2351	2388	2414	2428	2430	2416	2419	2406	2384
1984	2402	2407	2412	2422	2419	2417	2418	2428	2430	2424	2421	2408	2417
1985	2410	2414	2406	2405	2411	2429	2448	2442	2441	2441	2446	2439	2428
1986	2440	2446	2447	2458	2479	2493	2499	2496	2504	2511	2511	2511	2483
1987	2515	2510	2518	2523	2524	2525	2538	2557	2564	2569	2564	2589	2541
1988	2574	2576	2586	2591	2592	2595	2598	2611	2612	2612	2616	2617	2598
1989	2615	2608	2612	2615	2616	2623	2627	2637	2660	2662	2665	2669	2634
1990	2664	2668	2673	2676	2691	2715	2716	2716	2730	2728	2730	2720	2702
1991	2720	2716	2715	2709	2723	2733	2757	2792	2785	2786	2791	2784	2751
1992	2784	2775	2799	2809	2828	2838	2845	2854	2857	2867	2873	2875	2834
1993	2886	2886	2915	2976	3071	3066	3038	3014	3009	3016	3029	3046	2996
1994	3071	3106	3116	3127	3125	3115	3107	3109	3116	3116	3109	3110	3111
1995	3112	3111	3109	3100	3096	3095	3114	3121	3109	3117	3131	3128	3112
1996	3127	3131	3135	3148	3161	3178	3190	3218	3246	3284	3304	3311	3203
1997	3332	3333	3323	3364	3377	3396	3392	3385	3378	3372	3350	3370	3364
1998	3363	3372	3368	3375	3374	3379	3382	3391	3414	3423	3424	3419	3391
1999	3425	3417	3411	3421	3422	3433	3460	3474	3504	3505	3498	3497	3456
2000	3503	3523	3536	3534	3558	3553	3545						

## Area Cost Factors

Costs that are based on national averages or on geographic locations other than the site should be adjusted for location using area cost factors (ACFs). This can be done using the following equation:

$$C_s = C_o ( F_s / F_o )$$

where  $C_s$  is the cost for the site location,  $C_o$  is the cost based on other location,  $F_s$  is the area cost factor for the site, and  $F_o$  is the area cost factor for other location.

ACFs are available from both private and public sources. Most are updated yearly for their publication. National and state averages for ACFs (current as of March 10, 2000), as maintained by the USACE for military construction use, are provided in Exhibit B-2 below, as an example. These factors are based on local construction costs of labor, material, and equipment, and other factors such as weather, climate, seismic, mobilization, overhead and profit, labor availability, and labor productivity. The most current ACFs can be downloaded through the USACE Cost Engineering Branch website at <http://www.hq.usace.army.mil/cemp/e/es/pax/321/321.pdf>.

<b>Exhibit B-2</b>			
<b>USACE Area Cost Factors as of March 10, 2000</b>			
<b>Location</b>	<b>Area Cost Factor</b>	<b>Location</b>	<b>Area Cost Factor</b>
Alabama	0.85	Nebraska	0.94
Alaska	1.61	Nevada	1.14
Arizona	0.98	New Hampshire	1.05
Arkansas	0.87	New Jersey	1.18
California	1.18	New Mexico	1.01
Colorado	1.03	New York	1.23
Connecticut	1.05	North Carolina	0.85
Delaware	1.02	North Dakota	1.04
Florida	0.87	Ohio	0.99
Georgia	0.85	Oklahoma	0.87
Hawaii	1.48	Oregon	1.10
Idaho	1.06	Pennsylvania	1.03
Illinois	1.15	Rhode Island	1.06
Indiana	0.99	South Carolina	0.87
Iowa	1.06	South Dakota	0.95
Kansas	0.93	Tennessee	0.87
Kentucky	0.94	Texas	0.82
Louisiana	0.89	Utah	1.03
Maine	1.06	Vermont	0.92
Maryland	0.89	Virginia	0.92
Massachusetts	1.12	Washington	1.07
Michigan	1.17	West Virginia	0.95
Minnesota	1.07	Wisconsin	1.14
Mississippi	0.87	Wyoming	0.99
Missouri	0.97	Washington, D.C.	0.95
Montana	1.13	National Average	1.00

## Health and Safety Productivity

Unless effects are already accounted for, factors that reflect decreased productivity due to required health and safety levels of protection should be applied to costs for labor and construction equipment used in a crew makeup. The levels of protection, which are determined based on the hazards to workers that might be present at a hazardous waste site, are classified as follows:

- ◆ Level A: Fully encapsulating vapor-tight suit with full-facepiece, self-contained breathing apparatus (SCBA) or supplied-air respirator.
- ◆ Level B: Totally encapsulating suit, not necessarily vapor-tight, with full-facepiece SCBA or supplied-air respirator.
- ◆ Level C: Chemical protective, full body suit with full-face, canister air-purifying respirator.
- ◆ Level D: Basic work uniform (i.e., coveralls, gloves, hardhat, boots, faceshield or goggles). Modified Level D adds a chemical protective, full body suit (i.e., Level C without respirator).

Factors associated with decreased productivity due to protective equipment and clothing as described above include restricted mobility, heat stress requiring break time, and time for safety meetings, suit-up, suit-down, decontamination, and air tank changes. All of these factors reduce crew production rates.

As an example, the productivity factors used by the USACE for Hazardous, Toxic, and Radioactive Waste (HTRW) projects are shown in Exhibits B-3 and B-4, for light and heavy work, respectively, as published in *Construction Cost Estimates* (USACE 1997). The factors in these exhibits are based on a productivity study conducted in 1994 and are applied to crew production rates in the Unit Price Book (UPB), which are based on “clean” site conditions, to develop adjusted rates based on the health and safety level of protection. The decreased production rate has an impact on cost by either increasing the time required to complete the activity or prompting the cost engineer to add crews.

As an approximate method (e.g., development of cost estimate during FS), the inverse of these factors can be applied to the unadjusted cost of an element to reflect decreased productivity for that item. This can be done using the following equation:

$$C_l = C_o (1 / F_l)$$

where  $C_l$  is the cost for the assumed level of protection,  $C_o$  is the cost unadjusted for level of protection, and  $F_l$  is the productivity factor from Exhibit B-3 or B-4.

The productivity factors do not apply to material costs, treatment equipment costs, or other costs that do not include crew costs.









## *Appendix C* **Example Cost Templates**

The following pages provide example summary sheets for capital costs, annual O&M costs, periodic costs, present value analysis, and sensitivity analysis. Also provided is example cost worksheet that can be used to calculate and provide backup for cost element or sub-element unit costs used in an estimate.



















## **Appendix D** **Glossary**

**Capital Costs:** Expenditures required to construct a remedial action. They are exclusive of costs required to operation or maintain the action.

**Constant (Real) Dollars:** Observed dollar values that are not affected by general price inflation. Typically used during FS cost estimating to compare relative prices over time.

**Contingency:** An amount added to a cost estimate to cover costs associated with unknowns, unforeseen circumstances, or unanticipated conditions that are not possible to evaluate from the data on hand at the time the estimate is prepared. Can include both scope (design) contingency, to cover costs due to scope changes during design, and bid (construction) contingency, to cover unknown costs associated with constructing or implementing a given project scope.

**Cost Element:** An activity identified for a remedial alternative that is used to estimate both capital, annual O&M, or periodic costs and help define the project. Cost element categories include construction activities, O&M activities, professional/technical services, and institutional controls.

**Cost Engineering:** The practice of total cost management over the life cycle of a project, facility, or manufacturing operation. Components include cost estimation, cost control, project management, planning, scheduling, and profitability analysis.

**Cost Estimate:** An evaluation of all the costs of the elements of a project or effort as defined by an agreed-upon scope.

**Discount Rate:** The interest rate used in calculating the present value of expected future costs. A nominal discount rate is an interest rate that has not been adjusted for any change in the general price level (inflation). Nominal interest rates are those that usually may be observed in the market, such as the published rate on a savings account or a bond. Nominal interest rates should be used to discount costs that are in current, or nominal, dollars. A real discount rate is an interest rate that has been adjusted to account for the effect of expected or actual inflation. Real interest rates can be approximated by subtracting the expected or actual inflation rate from a nominal interest rate. Real interest rates should be used to discount costs that are in constant, or real, dollars, which is the typical situation for FS present value analyses.

**Life Cycle Cost:** The total cost across the life span of a project, including design, construction, operation and maintenance, and closeout activities. Includes initial capital costs plus any continuing costs of operation and maintenance. For the purposes of this guide, excludes costs prior to design, such as investigation and study costs, and excludes government or program management costs.

**Nominal (Current) Dollars:** Values as they are observed in the market when transactions occur. Nominal dollars are real dollars that have been escalated to reflect the effects of inflation.

**O&M Costs:** Post-construction costs necessary to ensure continued effectiveness of a remedial action. Includes both short-term O&M and long-term O&M costs. Most O&M costs are estimated on an annual basis.

**Periodic Costs:** Capital or O&M costs that occur only once every few years or only once during the entire project timeframe. Because of their periodic nature, these costs are usually considered separately in the estimating process from initial capital or annual O&M costs.

**Present Value:** The present value of a future investment or payment that is calculated using a particular discount or interest rate. Total present value is the amount of money, which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project.

**Sensitivity Analysis:** A type of uncertainty analysis that measures the project impact of changing one or more input values. For remedial alternative cost estimates, sensitivity analyses are typically completed for those factors that have a relatively high degree of uncertainty and that, with only a small change in their value, could significantly affect the overall cost of the alternative.

**Unit Cost:** A cost per unit of measure that is usually multiplied by a quantity to estimate the cost of an element or sub-element within the cost estimate of a remedial alternative. A unit cost is typically adjusted for decreased crew productivity, escalation to base year, geographic location, contractor markups (e.g., overhead, profit), and other factors, depending on the source of cost data (e.g., quotes, cost references, historical data).