



OFFICE OF INSPECTOR GENERAL

*Catalyst for Improving the Environment*

## Evaluation Report

# **EPA Practices for Identifying and Inventorying Hazardous Sites Could Assist Similar Department of the Interior Efforts**

Report No. 2005-P-00020

August 22, 2005

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### **Abbreviations**

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
DOI	Department of the Interior
EPA	Environmental Protection Agency
HRS	Hazard Ranking System
IGCE	Independent Government Cost Estimate
NPL	National Priorities List
NFRAP	No Further Remedial Action Planned
OIG	Office of Inspector General
PA	Preliminary Assessment
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
SI	Site Inspection



# At a Glance

*Catalyst for Improving the Environment*

## Why We Did This Review

Recent audits criticized the Department of the Interior for weaknesses in its controls over environmental liabilities resulting from hazardous waste sites. For example, the Department has not developed policies or procedures for estimating environmental liabilities, and does not have a prioritized list of cleanup activities. The Department initiated an effort to develop a database to capture uniform information for financial reporting purposes.

The Department of the Interior Inspector General initiated an audit to evaluate the Department's processes to identify, track, and prioritize potential hazardous waste sites. Since, the Environmental Protection Agency (EPA) has over 20 years experience with information systems and processes to identify, assess, prioritize, and cost estimate Superfund hazardous waste sites, we worked with the Interior Department's Inspector General to identify relevant promising practices for the Department to consider to improve its processes.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:

[www.epa.gov/oig/reports/2005/20050822-2005-P-00020.pdf](http://www.epa.gov/oig/reports/2005/20050822-2005-P-00020.pdf)

## ***EPA Practices for Identifying and Inventorying Hazardous Sites Could Assist Similar Department of the Interior Efforts***

### **What We Found**

EPA has several mechanisms in place to discover new sites, including having strong relationships with State offices to obtain new site information. EPA screens sites before including them in its inventory or priority list of sites requiring further action. After identifying a site, EPA performs a preliminary assessment to determine the eligibility for a response action and to prioritize sites for further action. EPA also offers automated screening tools to assist regional staff in assessing and inspecting sites. EPA's Hazard Ranking System scores sites based on the likelihood of release or potential release, the characteristics of site waste, and the people or sensitive environments affected by the release. Following selection of the cleanup remedy, EPA uses a panel of experts to evaluate risks and establish funding priorities for new cleanups. EPA estimates changing project costs throughout the process of prioritizing sites, and balances cost as one of several criteria to choose suitable cleanup options.

The Department of the Interior, as a Federal land manager responsible for addressing hazardous sites on its lands, could apply several practices used by EPA to ensure that the Department addresses its highest priority sites first, including:

#### **Site Discovery**

- Consult existing site inventories and work with States, Tribes, and communities to obtain information to identify potential sites.
- Develop and apply user-friendly checklists and templates to gather initial site information and generate consistency in reports by bureau field staff.
- Consult upcoming EPA guidance on preliminary assessments and site inspections at Federal facilities, as well as a web-based hazardous waste compliance assistance center.

#### **Site Assessment and Prioritization**

- Develop and apply automated tools to quickly assess sites and provide uniformity. Consider EPA's automated tools as a source of ideas.
- Develop a risk-based prioritization method that ranks health risks and considers land uses, ecological risks, and tribal factors.
- Develop a tracking mechanism for sites the Department sets aside as not requiring cleanup attention, and work with States, Tribes, and communities to stay aware of changing site conditions that warrant reprioritization.

#### **Cost Estimating**

- Create a web-based "cost estimating toolbox" as a one-stop resource for bureau field staff to document cost assumptions, and include EPA's sources of information on the costs associated with mining sites.
- Frequently reevaluate and adjust cost estimates throughout cleanups.



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AUG 22 2005

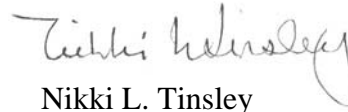
**MEMORANDUM**

SUBJECT: EPA Practices for Identifying and Inventorying Hazardous Sites  
Could Assist Similar Department of the Interior Efforts  
Report No. 2005-P-00020

TO: Thomas P. Dunne  
Acting Assistant Administrator  
Office of Solid Waste and Emergency Response

This memorandum transmits a final evaluation report entitled *EPA Practices for Identifying and Inventorying Hazardous Sites Could Assist Similar Department of the Interior Efforts* conducted by the Office of Inspector General (OIG) of the United States Environmental Protection Agency (EPA). We conducted this work as part of a joint effort with the Department of the Interior (DOI) OIG. DOI-OIG examined whether the Department has effective processes to identify and prioritize hazardous waste sites on DOI land. Given EPA's experience with related activities through the Agency's implementation of Superfund, we examined EPA's process for identifying, prioritizing, and tracking hazardous waste sites. Further, we identified several EPA practices that could benefit DOI's effort to inventory and assess hazardous sites.

We appreciate the cooperation and assistance provided by your staff in completing this work. Our final report incorporates the majority of changes suggested in your January 27, 2005 official comments. If you or your staff has any questions regarding this report, please contact me at (202) 566-0847, or Kwai Chan, Assistant Inspector General for Program Evaluation, at (202) 566-0827.

  
Nikki L. Tinsley

Attachment

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# Introduction

## Background

Citizen concern over the extent of abandoned hazardous waste sites led Congress to pass the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or “Superfund”) in 1980 to locate, investigate, and clean up the worst sites nationwide. The Environmental Protection Agency (EPA) has over 20 years experience with information systems and processes to identify, assess, prioritize, and estimate costs of hazardous waste sites through the Agency’s implementation of the Superfund program.

As part of accomplishing its objectives, EPA coordinates with other Federal land managers, such as the Department of the Interior (DOI). DOI manages one-fifth of the land mass in the United States, and DOI’s stewardship responsibilities include inventorying and assessing sites on its land that pose threats to human populations, wildlife, and sensitive environments. Recent financial audits criticized DOI for weaknesses in its controls over environmental liabilities resulting from hazardous waste sites. DOI’s Office of Inspector General (OIG) initiated an audit of DOI’s efforts to identify, track, and prioritize hazardous sites on its lands, and reviewed DOI’s efforts to develop a database for reporting financial liabilities.

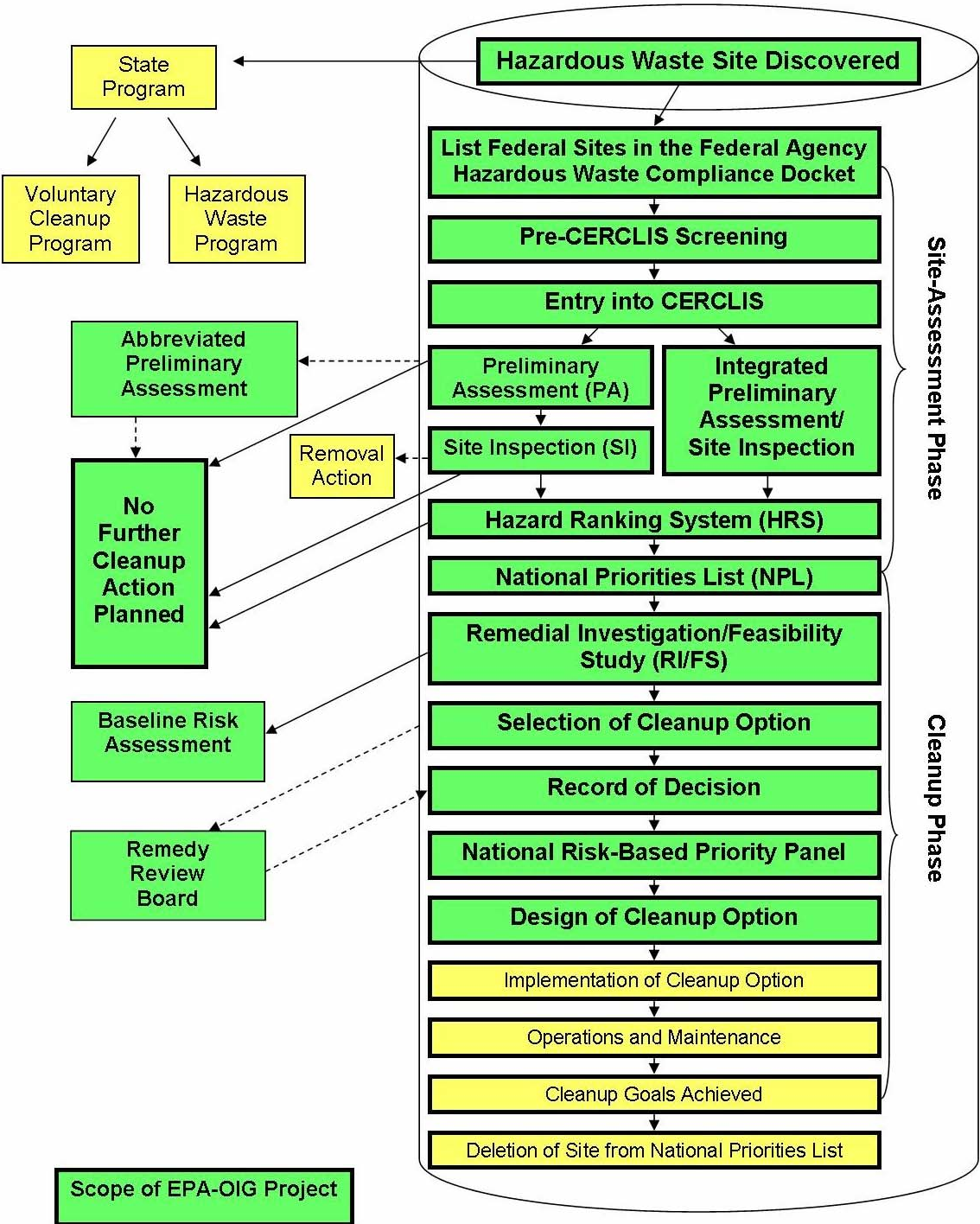
Given the maturity of EPA’s hazardous waste program and the Agency’s experience and lessons learned, we worked jointly with DOI-OIG to review and summarize EPA’s Superfund process and identify promising practices for DOI related to site discovery, assessment and prioritization, and cost estimating. While DOI does not seek to create its own Superfund program, similarities exist between EPA’s process of designating priority sites for Federal action and the processes DOI should use to identify, assess, and prioritize hazardous sites on its land. Like in EPA Regions, DOI field staff conduct initial site activities and prepare initial cost estimates.

## Purpose

DOI-OIG’s objective asked, “Does the Department have effective processes to identify, track, and prioritize hazardous sites?” EPA-OIG’s objective under this joint effort asked, “What is EPA’s process for identifying, prioritizing, and tracking hazardous waste sites, and what practices do EPA staff apply that could benefit DOI’s effort to inventory hazardous sites?”

The body of the report contains summary information on EPA practices, as well as promising practices that DOI can use. The flowchart on page 2 depicts EPA’s Superfund process as well as the scope of our evaluation, and Appendix A provides additional details on our scope and methodology. Appendices B through D provide further details on EPA’s process, and include various website links that DOI and others may find useful.

# The Superfund Process





# EPA's Site Discovery, Assessment and Prioritization, and Cost Estimating Processes Under Superfund

## Site Discovery

The core of EPA's Superfund process includes a system of prioritization that allows EPA to address the most dangerous sites and releases. Identifying abandoned or uncontrolled hazardous waste sites represents the first step in the process. EPA identifies sites through a variety of methods, including reviewing information provided by concerned citizens and records maintained by State and local agencies. States usually discover and report new sites to EPA. EPA regional staff conducts prescreening, often in conjunction with a State agency, to verify the presence of hazardous substances and evaluate whether the site falls under an existing EPA or State program. Citizens interested in referring a site may submit a formal petition available on EPA's website. Regional Remedial Decision Teams meet monthly to discuss emergency removal sites, and the monthly discussions often include new site information.

Regions screen new sites to assure that they place only appropriate sites into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), the Agency's database of sites that may require Federal cleanup action under Superfund. Pre-CERCLIS screening varies among Regions, but typically involves reviewing existing facility files at State agencies or county health departments, and conducting site visits to visually determine the proximity of sites to residential population centers and a site's draining, fencing, and unique characteristics. Pre-CERCLIS screening helps determine whether a site warrants evaluation through the site assessment and priority listing process. While CERCLIS contains approximately 50,000 sites, roughly 1,500 appear on EPA's priority list for Superfund action. CERCLIS generates a one-page decision form that regional reviewers sign, date, and file.

For Federal facilities, site discovery represents the date EPA formally adds the site to the Federal Agency Hazardous Waste Compliance Docket indicating the site requires Federal involvement. To document new Federal facility site information, Regions maintain pre-remedial file rooms that house CERCLIS decision forms, assessments, and other documents submitted by Federal facilities, such as required Resource Conservation and Recovery Act (RCRA) release notification forms for those agencies that generate, transport, treat, store, or dispose of hazardous waste.

While EPA continues to discover new sites, its heavy reliance on States for site discovery information could lead to "blind spots." To account for this limitation, EPA applies innovative target- and industry-based approaches to more proactively identify potential sites, such as by examining ground water sources and industrial sectors.

See Appendix B for more information on site discovery.

## Site Assessment and Prioritization

When EPA identifies a site, it performs a preliminary assessment to distinguish between sites that pose little or no threat to human health and the environment and those that require further investigation. Preliminary assessments (PAs) and site inspections (SIs) identify sites qualified to enter the priority listing process. EPA scores sites for priority listing based on the likelihood of release or potential release, the characteristics of site waste, and the people or sensitive environments affected by the release. Once EPA designates a site as a priority for Federal action and funding, EPA conducts a remedial investigation to determine the nature and extent of contamination through sampling analysis and risk assessment. Specifically:

- The PA represents the first phase of the cleanup process following site discovery. Regions should attempt to complete PAs at non-Federal facility sites within 1 year of site discovery. Federal facility sites listed on EPA's Federal Agency Hazardous Waste Compliance Docket must complete a PA within a "reasonable schedule" and submit the PA to EPA for review. While EPA requires certain information to complete a PA, the Agency recognizes the need for flexibility to tailor information gathering to site-specific needs.
- EPA's determinations often require a more detailed SI. Investigators conducting SIs typically collect samples to determine the presence of hazardous substances.

EPA encourages Regions to combine PA and SI activities, or conduct integrated assessments, to reduce costs and repetitive tasks. To assist other Federal agencies, EPA plans to issue succinct Federal facility PA and SI summary guides in early 2005, and launch a web-based Federal facilities compliance assistance center on hazardous site cleanup. While the PA and SI guides will not replace specific statutory requirements, they could serve as one-stop guides to assist other Federal agencies and help focus their site activities.

The PA/SI process identifies sites qualified to enter the priority listing process and enables EPA to gather data needed to score the site according to the Hazard Ranking System (HRS). The HRS is a numerically-based screening system to assess the relative potential of sites to pose a threat to human health or the environment. Through HRS screening, EPA scores sites from 0 to 100 based on the likelihood that a site has released or has the potential to release contaminants into the environment, the characteristics of the waste, and the people or sensitive environments affected by the release. Sites with an HRS score of 28.5 or greater are eligible for EPA's priority list of sites requiring action.

EPA scores four pathways under the HRS: groundwater; surface water; soil exposure; and air migration. Site teams may use electronic scoring systems that provide user-friendly methods of documenting scores, minimizing mathematical scoring errors, and facilitating decision-making.

Once EPA designates a site as a priority for Federal action and funding, EPA conducts a Remedial Investigation and Feasibility Study (RI/FS) to determine the nature and extent of contamination through site characterization and risk assessment, and to determine cleanup options. The RI serves as the mechanism for collecting data to:

- Characterize site conditions;
- Determine the nature of the waste;
- Assess risk to human health and the environment; and
- Conduct testing to evaluate the potential performance and cost of the treatment technologies under consideration.

The FS serves as the mechanism for the development, screening, and detailed evaluation of alternative cleanup actions. EPA conducts the RI/FS process concurrently – RI data influence the development of cleanup alternatives in the FS, which in turn affects the scope of additional studies and field investigations. According to EPA, this phased approach encourages the continual scoping of site characterization, minimizes the collection of unnecessary data, and maximizes data quality. EPA requires a baseline risk assessment for all listed sites that identifies the existing or potential risks that sites may pose to human health and the environment. Because the baseline risk assessment identifies the primary health and environmental threats at a site, it also provides valuable input to the development and evaluation of alternatives during the FS.

Once EPA develops potential cleanup alternatives, the Agency screens certain options to reduce the number of alternatives for analysis. EPA evaluates cleanup alternatives with respect to nine criteria. EPA considers the first two criteria as “threshold” criteria; the next five as “balancing” criteria; and the last two as “modifying” criteria. Specifically:

<b>Nine Criteria for Evaluating Cleanup Alternatives</b>	
<b>Threshold Criteria</b>	<ol style="list-style-type: none"> <li>1. Overall protection of human health and the environment</li> <li>2. Compliance with applicable or relevant and appropriate requirements</li> </ol>
<b>Balancing Criteria</b>	<ol style="list-style-type: none"> <li>3. Long-term effectiveness and permanence</li> <li>4. Reduction of toxicity, mobility, or volume</li> <li>5. Short-term effectiveness</li> <li>6. Implementability</li> <li>7. Cost</li> </ol>
<b>Modifying Criteria</b>	<ol style="list-style-type: none"> <li>8. State acceptance</li> <li>9. Community acceptance</li> </ol>

EPA analyzes cleanup alternatives individually against each criterion and then compares each alternative against the others to determine each alternative’s strengths and weaknesses. After EPA selects a cleanup option for sites listed in the Superfund National Priorities List (NPL), EPA’s National Risk-Based Priority Panel evaluates the risk posed at listed sites to establish funding priorities for new cleanups. The Priority Panel applies

five criteria and associated weighting factors to classify threats at a site and to compare sites based on common criteria. The five criteria are:

Five Criteria for Classifying Threats
1. Risks to human population exposed
2. Contaminant stability
3. Contaminant characteristics
4. Threat to a significant environment
5. Program management considerations

EPA also uses its National Remedy Review Board, comprised of Headquarters and regional staff, to review cleanup options to ensure consistency with hazardous waste regulations.

See Appendix C for more information on site assessment and prioritization.

## Cost Estimating

Recognizing that unique and changing site circumstances require flexibility in estimating costs for cleanup, EPA estimates costs throughout the cleanup process. Very little cost estimating occurs during the site discovery phase; rather, EPA's cost estimating process begins during the RI/FS phase, after EPA adds a site to its prioritized list for action but prior to actual cleanup. For most cost estimates developed during this phase, EPA relies on anecdotal and empirical data from past sites. Regional project managers do not document historic project costs; rather, they estimate initial costs and ask other site teams about their cost experiences.

When selecting the most suitable cleanup option, EPA uses screening-level cost estimates to screen out disproportionately expensive alternatives. The screening process evaluates cleanup alternatives with respect to their effectiveness, implementability, and cost; EPA does not carry forward higher cost alternatives. Cost functions as one of five "balancing" criteria used to assess cleanup alternatives. While EPA balances the reasonableness of the cost when evaluating cleanup options, cost does not predominate over other factors, such as long-term reliability. EPA's National Remedy Review Board helps to control response costs and promote nationally consistent and cost-effective cleanup decisions. This Board reviews proposed cleanup actions expected to cost more than \$30 million (\$75 million for Department of Energy sites with radioactive waste as the primary contaminant). The Agency estimates a +50% to -30% accuracy rate for cost estimates performed during EPA's detailed analysis of cleanup alternatives. Once EPA completes the final cleanup design, cost estimate accuracy narrows to a +15% to -10% range, as costs still change along the tail end of the process.

When estimating the costs of cleanup options, EPA estimates technical and contractor costs, and also estimates the construction costs necessary to implement the selected cleanup option.

- **Technical and contractor costs:** First, EPA estimates the costs of technical support through an Independent Government Cost Estimate (IGCE) conducted in-house by EPA staff for each work assignment at a site. Work assignments represent a specific step, or several steps, in EPA's site prioritization process, such as PAs and SIs following site discovery, or work assignments pertaining to actual cleanups. The IGCE should represent a "fair and reasonable" cost of doing the work, and the IGCE provides the work assignment manager with information about how much it will cost for a contractor to complete a cleanup activity. Since most EPA Regions lack in-house cost estimators, EPA issued a memorandum in June 2004 to assist work assignment managers in the preparation of IGCEs. EPA also provides regional staff an Internet-based "Cost Estimating Toolbox" that includes guidance documents and worksheets to help project managers prepare site-specific IGCEs and document assumptions made in the preparation of cost estimates.
- **Construction costs:** EPA conducts the second type of cost estimate after the Agency selects a cleanup option that meets statutory and regulatory requirements. EPA uses outside contractors to prepare detailed estimates of the cost to construct the selected cleanup action. Contractors base construction cost estimates on the type and quantities of labor, equipment, and materials required to perform the work. EPA recommends that its project managers obtain third-party review of construction cost estimates prior to advertising for bids. EPA documents each cost estimate for the different cleanup phases in CERCLIS. EPA participates in an interagency cost estimating workgroup comprised of other Federal agencies that, with the exception of EPA, have in-house cost estimating expertise.

See Appendix D for more information on cost estimating.

# Promising Practices

## Promising Practices for the Department of the Interior

Based on DOI-OIG’s audit findings and its assessment of DOI’s capacity to implement EPA’s promising practices, we identified the following practical improvements for DOI’s effort to inventory hazardous waste sites. The tables below show DOI-OIG audit findings and our observations on areas for improvement on site discovery, site assessment and prioritization, and cost estimating.

<b>Site Discovery</b>	<b><i>DOI-OIG Audit Finding:</i></b>
	DOI does not have a proactive process to identify hazardous waste sites. Audit work conducted by the DOI-OIG team found that three of four bureaus lacked a proactive site identification program and often only recorded sites after the public identified them.
	<b><i>Promising Practices:</i></b>
	<ul style="list-style-type: none"> <li>✓ DOI should examine existing site inventories and work with States, Tribes, and communities to obtain information to identify potential sites. Also, existing DOI inspection programs (e.g., oil and gas; mining; natural resource damage assessments) can likely generate new site information. Working with States and communities would ensure that DOI utilizes local individuals who know the contamination problems and geography of an area. DOI staff should consider talking to community members – perhaps former employees of industries unique to certain areas – who may have information about potential sites.</li> <li>✓ DOI should develop and apply user-friendly checklists and templates to gather initial site information and generate consistency among field staff. DOI should consider EPA’s checklists and templates as a source of ideas for developing its own forms. Samples of EPA templates include Internet-based public petitions for new site information, and site screening checklists and decision forms.</li> <li>✓ DOI should examine upcoming EPA guidance, including succinct guides on PAs and SIs, and a web-based hazardous waste compliance assistance center for Federal facilities, as DOI develops its own procedures to ensure the procedures meet minimum requirements for PAs and SIs at Federal facilities. See <a href="http://www.epa.gov/compliance/about/offices/ffeo.html">http://www.epa.gov/compliance/about/offices/ffeo.html</a>.</li> </ul>

<b>Site Assessment and Prioritization</b>	<b>DOI-OIG Audit Finding:</b>
	DOI does not have a proactive process to evaluate the risks posed by hazardous waste sites to human health, wildlife, and the environment. The Department does not prioritize and rank all of its hazardous waste sites. The four DOI bureaus audited maintain some information regarding prioritization of hazardous waste sites on bureau land, but the information is not complete or comparable. The DOI-OIG team found that bureaus developed varying methods for establishing priorities and making funding decisions for contaminated site mitigation.
	<b>Promising Practices:</b>
	<ul style="list-style-type: none"> <li>✓ DOI should develop and apply easy-to-follow automated tools to quickly assess potential sites and provide uniformity across bureaus. DOI should consider EPA's automated tools as a source of ideas. EPA's automated tools include: <ul style="list-style-type: none"> <li>• <a href="#">HRS Superscreen</a> – Allows users to enter and evaluate site-specific information, including sampling data, waste quantities, physical parameters, and target data; enter descriptive narrative text and reference citations; and select specific HRS factor values.</li> <li>• <a href="#">HRS Quickscore</a> – Provides users pathway and site score calculations; HRS score sheet preparation and printing; identification of data gaps; and scratchpad capability for note-taking.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>✓ DOI should develop a risk-based method to prioritize sites and apply an approach that ranks sites based on current and future land uses, ecological risks, and tribal factors/cultural considerations. <ul style="list-style-type: none"> <li>• DOI sites on Bureau of Indian Affairs land should focus on ecological risks such as food chain contamination, bioaccumulation, and fish consumption/utilization for tribal cultures.</li> <li>• DOI should consider obtaining site assessment information from States and Tribes regarding sites DOI holds in trust.</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>✓ DOI should develop a tracking mechanism for sites DOI sets aside as not requiring cleanup attention. DOI should work with States, Tribes, and communities to stay aware of changing site conditions that warrant reprioritization of already screened sites.</li> </ul>	

<b>Cost Estimating</b>	<b>DOI-OIG Audit Finding:</b>
	Four DOI bureaus did not adequately support cost estimates for 108 of the 125 (or 86 percent) site files reviewed. Some bureaus reported estimates that officials could not explain. Additionally, for the 125 site files evaluated by the DOI-OIG team, 103 (or 82 percent) did not have supporting documentation to justify the financial liability code selected. As a result, DOI and its bureaus may not have reliable data for management purposes or financial reporting.
	<b>Promising Practices:</b>
	<ul style="list-style-type: none"> <li>✓ DOI should create a web-based “cost estimating toolbox” as a one-stop resource of guidance and worksheets for staff to document assumptions. This could include EPA’s information on the <a href="#">costs and environmental liabilities related to mining</a>.</li> <li>✓ DOI should reevaluate and adjust cost estimates at each stage of the cleanup process. Cost estimating should include flexibility to account for uncertainty in changing site conditions between discovery and actual cleanup. DOI’s cost estimating process should include a feedback loop to adjust the first round of cost estimates.</li> </ul>



## Scope and Methodology

In collaboration with the DOI-OIG, we summarized EPA’s process of discovering, assessing, and prioritizing hazardous waste sites for cleanup to identify promising practices for DOI’s effort to inventory hazardous sites on land it manages. We conducted our evaluation of EPA’s Superfund remedial program (we omitted from our scope processes related to EPA’s emergency removal program) between April 2004 and December 2004. We performed our evaluation in accordance with *Government Auditing Standards* issued by the Comptroller General of the United States.

### Evaluation Methodology

To gain an understanding of EPA’s Superfund site discovery, site assessment and prioritization, and cost estimating processes, and to identify promising practices for DOI, we reviewed policies and guidance documents available on EPA’s Superfund website, including:

- |  |   |
|--|---|
| ❑ Preliminary Assessment and Site Inspection Information   | ❑ “Introduction to the HRS” and the “HRS Toolbox”   |
| ❑ Site Assessment Fact Sheets  | ❑ HRS Superscreen and Quickscore  |
| ❑ Quick Reference Guidance “Improving Site Assessment: Abbreviated Preliminary Assessments” (October 1999)             | ❑ Quick Reference Fact Sheet “The Revised Hazardous Ranking System Qs and As” (November 1990)                 |
| ❑ Quick Reference Guidance “Improving Site Assessment: Combined PA/SI Assessments” (October 1999)                      | ❑ January 9, 1996 Memorandum on “Remedial Action Priority Setting”  |
| ❑ Risk Assessment Task Force Staff Paper “An Examination of EPA Risk Assessment Principles and Practices” (March 2004) | ❑ Superfund Hotline Training Module “Introduction to: The Superfund Response Process” (updated February 1998) |
| ❑ Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (April 22, 1991)                        | ❑ Superfund Program Implementation Manual: Fiscal Year 2004/2005 (April 7, 2003)                              |
| ❑ Overview of the National Risk-Based Priority Panel   | ❑ Remedial Investigation and Feasibility Study Information  |
| ❑ A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (July 2000)                        | ❑ Fact Sheet “The Role of Cost in the Superfund Remedy Selection Process” (September 10, 1996)                |
| ❑ Superfund: Building on the Past, Looking to the Future (“120-Day Study”) (April 22, 2004)                            | ❑ Memorandum “Cost Estimating Resources for the Superfund Program” (June 1, 2004)                             |
| ❑ Superfund Reforms Initiative   |   |

We conducted literature searches on EPA and DOI hazardous waste activities and related promising practices. We reviewed prior audits and evaluations on each agency’s hazardous waste programs written by our office and the Government Accountability Office, as well as reports written by:

- ❑ Resources for the Future
- ❑ National Advisory Council for Environmental Policy and Technology
- ❑ Environmental Law Institute
- ❑ Association of State and Territorial Solid Waste Management Officials

We interviewed officials from EPA Headquarters and regional offices for policy implementation information and to identify promising practices for DOI. In Headquarters, we met with:

- ❑ Associate Chiefs with EPA’s lead office for managing the Superfund program and for providing regional support from site discovery through site prioritization
- ❑ Two members, including the Chairperson, of EPA’s National Risk-Based Priority Panel responsible for prioritizing new site funding based on the risks posed by sites
- ❑ Directors of EPA’s offices responsible for restoration, reuse, enforcement, and compliance at Federal facility hazardous waste sites
- ❑ Member of EPA’s Environmental Response Team responsible for ecological risk assessment
- ❑ Two members of EPA’s National Remedy Review Board that reviews cleanup options, helps control costs, and promotes consistent and cost-effective cleanup decisions
- ❑ Contract Manager and U.S. Army Corps of Engineers Liaison within EPA’s lead Superfund office
- ❑ Staff responsible for science policy within EPA’s lead Superfund office
- ❑ Chief overseeing EPA’s automated inventory of hazardous waste sites

To obtain a regional perspective of Superfund implementation and identify practices relevant for the DOI field staff who conduct hazardous site activities, we interviewed staff in Regions 2, 8, 9, and 10 responsible for initial site discovery; site assessment and risk assessment; HRS scoring and the NPL process; and Federal facilities coordination. We judgmentally selected Regions 2, 8, 9, and 10 based on discussions with EPA staff. We also met with one of the co-chairs of EPA’s National Mining Team, who described the team’s involvement with DOI.

### ***Limitations***

We did not comprehensively evaluate EPA’s Superfund program implementation; rather, we identified useful practices – if implemented effectively – for DOI’s effort to inventory hazardous waste sites on land the Department manages. Because we could not determine whether the Superfund processes described in our report work exceptionally well or are widely recognized over other approaches, we refer to them as promising practices rather than best practices.

## ***DOI-OIG Work***

Concurrent with our evaluation, DOI-OIG staff audited DOI's processes to identify, track, and prioritize hazardous sites. DOI-OIG identified and evaluated the policies and procedures used by DOI and its bureaus to inventory and prioritize hazardous sites. DOI-OIG also conducted field visits to evaluate supporting documentation for reported financial liability codes and cost estimates for hazardous sites. DOI-OIG interviewed officials at the Department and bureau levels, and at field and regional offices. DOI-OIG attempted to reconcile the Department's list of contaminated sites to the Federal Agency Hazardous Waste Compliance Docket, maintained by EPA, to determine whether the Docket contained sites that the bureaus had not reported to the Department. DOI-OIG conducted its review from February 2004 to March 2005. DOI-OIG used fiscal 2003 data as the baseline for its review. The scope of DOI-OIG's audit covered Federal lands under the management of the Department and excluded physical hazards, currently operating sanitary landfills, transportation, storing, and handling of hazardous materials, current operations at Department facilities, and identification of actual or potential contamination on lands newly acquired or to be acquired.

## ***EPA's Site Discovery Process***

EPA has several mechanisms in place to discover new hazardous waste sites. EPA's relationships with both State officials and regional Remedial Decision Teams have proven useful in obtaining new site information. Consistent definitions of "hazardous substances" helps EPA staff communicate with these groups to obtain information on new sites that might pose a threat to human health or the environment. EPA extensively screens new sites before including them in the Agency's automated inventory and priority list of sites that require further Federal action. EPA's screening efforts include coordinating with other EPA and State program offices to determine their level of awareness and activity at a certain facility. EPA also applies automated screening tools and templates to assist regional staff in assessing and inspecting sites for further action. Additionally, regional EPA offices apply innovative approaches to identifying hazardous waste sites in certain industrial sectors.

Hazardous wastes and substances addressed by EPA possess at least one of the following four characteristics: ignitability, corrosivity, reactivity, or toxicity. The core of EPA's process to assess sites for Federal action includes a system of identification and prioritization that allows EPA to address the most dangerous sites and releases. Identifying abandoned or uncontrolled hazardous waste sites represents the first step in the process. EPA identifies sites through a variety of methods, including reviewing information provided by concerned citizens and records maintained by State and local agencies, such as facility bankruptcy filings with county tax assessor's offices, and insurance maps that show historical site information. Hazardous waste regulations require facilities to report releases of certain chemicals and provide information about hazardous substances used at facilities. EPA may discover releases of hazardous substances through various means, including:

- ❑ Mandatory notification under CERCLA §103(a) or (c);
- ❑ CERCLA §104(e) investigations for "information gathering and access" if there is a "reasonable basis to believe there may be a release or threat of release of a hazardous substance or pollutant or contaminant";
- ❑ Required RCRA §3005 and §3010 release notification, which mandates that any person generating, transporting, treating, storing, or disposing of hazardous waste notify EPA and describe the location, site activities, and hazardous waste handled at the facility;
- ❑ Inventory efforts or random observation by government agencies;
- ❑ Formal citizen petitions pursuant to 40 Code of Federal Regulations §300.420(b)(5), which reads, "Any person may petition the lead Federal agency to perform a preliminary assessment of a release when such person is, or may be, affected by a release of a hazardous substance, pollutant, or contaminant. Such petitions shall be addressed to the EPA Regional Administrator for the Region in which the release is located, except that petitions for preliminary assessments involving Federal facilities should be addressed to the head of the appropriate Federal agency";
- ❑ Review of State and Federal records to determine whether facilities fall under other environmental programs such as RCRA; and
- ❑ Informal community observation and notification.

Among all of these methods, States usually discover and report new site information to EPA. State hazardous waste site inventory lists have proven helpful for EPA's site discovery efforts. EPA regional staff conducts prescreening, often in conjunction with a State agency, to verify the presence of hazardous waste substances and to evaluate whether an existing EPA or State program covers the site. According to regional EPA staff, the Agency rarely receives new site information through informal referrals; rather, those citizens interested in referring a site may submit a [formal petition available on the Agency's website](#) and included as Example B-1 in this appendix. For example, Region 10 receives about 3 to 4 citizen petitions a year, although 1 petition can pertain to multiple sites (we noted 1 petition that pertained to 10 sites). Additionally, regional Remedial Decision Teams meet monthly to discuss emergency removal sites and often the monthly discussions include new site information. For example, Region 10 uses Remedial Decision Teams to decide how to proceed with a particularly sensitive site after regional staff internally review State reports on new sites. Region 9 applies an approach similar to the Remedial Decision Team meetings utilized in Regions 2, 8, and 10. As part of cooperative agreements, Region 9 staff meet with representatives from States and Tribes at least three times a year to discuss work plans, emerging high priority sites, and what programs would best address new sites.

Regions screen new sites to assure that they place only appropriate sites into the [Comprehensive Environmental Response, Compensation, and Liability Information System \(CERCLIS\)](#), the Agency's database of sites that may require Federal cleanup action. [Pre-CERCLIS screening](#) varies from Region to Region but typically involves reviewing existing facility files at State agencies or county health departments, and conducting site visits to visually determine the proximity of the site to residential population centers and the site's draining, fencing, and unique characteristics. Region 2 has found it useful to have its States complete the "NPL Data Characteristics Form" – a qualitative questionnaire created electronically through [HRS Superscreen](#) (available on EPA's [site assessment web page](#)) and included as Example B-2. HRS Superscreen provides a user-friendly, Windows-based method to facilitate site inspection reporting and decision-making. Often, Region 8 staff will collect topsoil samples as part of pre-CERCLIS screening, and one State in Region 8 prepares a pre-CERCLIS screening report complete with a site decision-making form, included as Example B-3. In Region 9, States and Tribes complete pre-CERCLIS screening checklists and submit the checklists to Region 9 staff as deliverables under cooperative agreements. Two Region 10 States (Oregon and Washington) complete site screening forms that include strategy recommendations for how best to address the site, and Oregon also uses a site assessment prioritization system to assess and score site threats.

Pre-CERCLIS screening helps EPA determine whether a site qualifies for a response action under Superfund and warrants evaluation through the site assessment and priority listing process. Prior to conducting pre-CERCLIS screening, EPA previously entered all sites – including emergency removals – into CERCLIS. According to EPA staff, States now attach the stigma previously associated with the Agency's priority list with listing sites in CERCLIS and the Federal Agency Hazardous Waste Compliance Docket. While EPA's CERCLIS inventory contains approximately 50,000 sites, roughly 1,500 sites appear on the Agency's priority list for Federal action.

EPA requires that CERCLIS data comply with standards established by the [Environmental Data Standards Council](#). The Council develops environmental data standards to promote the exchange of information among EPA, States, and Tribes. The Council creates documented agreements on representations, formats, and definitions of common data. The Council intends the data standards to improve the quality and share-ability of environmental data by increasing data compatibility, improving the consistency and efficiency of data collection, and reducing data redundancy by providing a “common vocabulary” for all interested stakeholders. EPA requires that any data submitted to the Agency comply with these standards.

For non-Federal facilities, the site discovery date in CERCLIS represents the date EPA regional staff complete pre-CERCLIS screening activities and documents the decision that the site warrants assessment and potential listing and cleanup attention. In addition to CERCLIS data entry, Region 2 documents new site information in a “Superfund New Site Assignment Form” (see Example B-4). One Region uses contractors to enter new site information into CERCLIS, while another has site assessment managers enter initial site discovery information into CERCLIS. CERCLIS generates a one-page printed decision form that regional reviewers sign, date, and file. For Federal facilities, the site discovery date represents the date EPA formally adds the site to the [Federal Agency Hazardous Waste Compliance Docket](#) indicating that the site requires Federal involvement. To document new Federal facility site information, Regions maintain pre-remedial file rooms that house CERCLIS decision forms, preliminary assessments, and other documents submitted by Federal facilities, such as required RCRA and CERCLA release notification forms for those Federal agencies that generate, transport, treat, store, or dispose of hazardous waste.

EPA continues to discover new sites; however, EPA’s heavy reliance on States for site discovery information could lead to “blind spots.” To account for this limitation, EPA Regions apply innovative target- and industry-based approaches to identifying new hazardous waste sites. For example, Regions 2 and 9 apply target-based approaches where they begin by sampling drinking water supplies or contaminated groundwater plumes and backtrack to locate the facility or source of contamination. This unique approach differs from the usual practice of tracking contamination from the source facility to the point of eventual release. Regions 2 and 8 also utilize industry-based site discovery programs that focus on certain industrial sectors. For example, one Region 8 State identifies potential sites by tracking groundwater releases of volatile organic compounds from the dry cleaning sector. Region 9 has site discovery initiatives on perchlorate, as well as vapor intrusion into homes from contaminated soils. One Region 10 State reviews lists and maps of impaired waters, applies overlay maps to identify industrial sectors, conducts sampling, and backtracks to identify sources of contamination.



## Example B-2

“NPL Data Characteristics Form” from [HRS Superscreen](#)

The screenshot shows a web browser window titled "HRS Superscreen". The menu bar includes "File", "Utilities", "Reports", "Calculator", and "Help". The breadcrumb trail is "View SCDM | Session NPL Form | Sources". The main heading is "Site Information" with a hard hat icon. Below the heading is the text "NPL Data Characteristics 3.0 (December 2001):". A vertical list of nine numbered items is displayed, each with a small icon: 1. Basic Identifying Information (info icon), 2. General Site Description (info icon), 3. Site Type (factory icon), 4. Waste Description (waste icon), 5. Demographics (people icon), 6. Water Use (water tap icon), 7. Sensitive Environment (plant icon), 8. Response Actions (warning icon), and 9. Headquarters QA Review (globe icon). The item "3. Site Type" is highlighted with a dotted border. At the bottom left, a small text label reads "Site: LPO Auto Parts (example), Rev: 1 NPL Characteristics Form".

HRS Superscreen

File Utilities Reports Calculator Help

View SCDM | Session NPL Form | Sources

### Site Information

NPL Data Characteristics 3.0 (December 2001):

1. Basic Identifying Information
2. General Site Description
3. Site Type
4. Waste Description
5. Demographics
6. Water Use
7. Sensitive Environment
8. Response Actions
9. Headquarters QA Review

Site: LPO Auto Parts (example), Rev: 1 NPL Characteristics Form



## Example B-3

### PRE-CERCLIS SCREENING ASSESSMENT CHECKLIST/DECISION FORM

This checklist can assist the site investigator during the Pre-CERCLIS screening. It will be used to determine whether further steps in the site investigation process are required under CERCLA. Use additional sheets, if necessary.

**Checklist Preparer:**

(Name/Title)	(Date)
(Address)	(Phone)
(E-Mail Address)	

**Site Name:**

\_\_\_\_\_

**Previous Names (if any):**

\_\_\_\_\_

**Site Location:**

\_\_\_\_\_ (Street)  
 \_\_\_\_\_ (City) \_\_\_\_\_ (ST) \_\_\_\_\_ (Zip)

**Latitude:** \_\_\_\_\_ **Longitude:** \_\_\_\_\_

Complete the following checklist. If "yes" is marked, please explain below.

	YES	NO
1. Does the site already appear in CERCLIS?	<input type="checkbox"/>	<input type="checkbox"/>
2. Is the release from products that are part of the structure of, and result in exposure within, residential buildings or businesses or community structures?	<input type="checkbox"/>	<input type="checkbox"/>
3. Does the site consist of a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the release into a public or private drinking water supply due to deterioration of the system through ordinary use?	<input type="checkbox"/>	<input type="checkbox"/>
5. Is some other program actively involved with the site (i.e., another Federal, State, or Tribal program)?	<input type="checkbox"/>	<input type="checkbox"/>
6. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?	<input type="checkbox"/>	<input type="checkbox"/>
7. Are the hazardous substances potentially released at the site excluded by policy considerations (e.g., deferral to RCRA Corrective Action)?	<input type="checkbox"/>	<input type="checkbox"/>
8. Is there sufficient documentation that clearly demonstrates that there is no potential for a release that could cause adverse environmental or human health impacts (e.g., comprehensive remedial investigation equivalent data showing no release above ARARs, completed removal action, documentation showing that no hazardous substance releases have occurred, EPA approved risk assessment completed)?	<input type="checkbox"/>	<input type="checkbox"/>

**Please explain all "yes" answer(s), attach additional sheets if necessary:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Site Determination:**

Enter the site into CERCLIS. Further assessment is recommended (explain below).

The site is not recommended for placement into CERCLIS (explain below).

**DECISION/DISCUSSION/RATIONALE:**

**Regional EPA Reviewer:**

\_\_\_\_\_

Print Name/Signature

\_\_\_\_\_

Date

**State Agency/Tribe:**

\_\_\_\_\_

Print Name/Signature

\_\_\_\_\_

Date

## Example B-4

### SUPERFUND NEW SITE ASSIGNMENT FORM

CERCLIS EPA I.D. NUMBER: \_\_\_\_\_ DISCOVERY DATE: \_\_\_\_\_  
NAME OF FACILITY: \_\_\_\_\_  
STREET: No street applicable \_\_\_\_\_ CITY: \_\_\_\_\_  
ZIP CODE: \_\_\_\_\_ COUNTY: \_\_\_\_\_ STATE : \_\_\_\_\_  
AVAILABLE SITE TYPE MAIN CATEGORIES \_\_\_\_\_  
AVAILABLE SITE TYPE MAIN SUBCATEGORIES \_\_\_\_\_

**Please record Latitude/Longitude in decimal degrees. See  
<http://www.fcc.gov/mmb/asd/bickel/DDDMSS-decimal.html> for conversions.**

LATITUDE: \_\_\_\_\_ **Indicate "+" for Northern Hemisphere**

LONGITUDE \_\_\_\_\_ **Indicate "-" for Western Hemisphere**

NPL IND: \_\_\_ FED FAC IND: \_\_\_ NO FURTHER ACTION: \_\_\_

SITE DESCRIPTION:

\*NOTE: PLEASE KEEP SITE DESCRIPTIONS DOWN TO 70 WORDS OR LESS.(500 CHARACTERS)

OPERABLE UNIT ID: \_\_\_ **EVENT LEAD:** \_\_\_ **EVENT TYPE:** \_\_\_\_\_

ACTUAL COMPLETION DATE: \_\_\_/\_\_\_/\_\_\_

ACTUAL START DATE: \_\_\_\_\_ **EVENT TYPE:** \_\_\_ \_\_\_ (3)

## ***EPA's Site Assessment and Prioritization Process***

EPA evaluates the release of hazardous substances from a site through various steps in the cleanup process. When EPA identifies a site, EPA performs a preliminary assessment to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation. Preliminary assessments (PAs) and site inspections (SIs) identify sites qualified to enter the priority listing process and provide the data needed for scoring according to EPA's Hazard Ranking System. EPA scores sites based on the likelihood of release or potential release, the characteristics of site waste, and the people or sensitive environments affected by the release. EPA uses a panel of experts to evaluate risks at sites on the Agency's priority list and to establish funding priorities for new cleanups. Once EPA designates a site as a priority for Federal action and funding, EPA conducts a remedial investigation to determine the nature and extent of contamination through sampling analysis and risk assessment.

EPA's formal site assessment process begins when the Agency first enters information about a release or potential release into its national inventory of hazardous waste sites, and continues through PAs, SIs, removal actions, and other activities. EPA's site assessment process ends either when the Agency determines No Further Remedial Action Planned (NFRAP), at which point site assessment stops and EPA archives site information, or when EPA decides to propose a site for listing on the [National Priorities List \(NPL\)](#), at which point the site assessment phase ends and the listing process begins. EPA does not track sites the Agency codes as "NFRAP"; rather, those sites fall to the responsibility of State agencies, and EPA places the onus on States to alert EPA to new information that can change the "NFRAP" status. Each of the following steps helps the Agency assess and prioritize hazardous waste sites. Throughout the process, EPA uses its [community involvement program](#), as appropriate, to advocate and strengthen early and meaningful community participation during cleanups.

### [Preliminary Assessment/Site Inspection \(PA/SI\)](#)

The PA represents the first phase of the site assessment process following site discovery. Regions should attempt to complete PAs at non-Federal facility sites within 1 year of site discovery. Regions usually conduct an abbreviated PA for sites entered into the CERCLIS inventory via site discovery at which no work has started and, based on limited review, do not warrant any type of additional activity. PAs consist of limited-scope investigations of readily available information about a site and its surrounding area. PAs generally include a review of Federal, State, and local government files, including facility bankruptcy documents, county tax assessor's records, permits required under RCRA, insurance maps with historic site information, and geological and hydrological data. Although not required, the process may include site visits to observe characteristics such as drainage patterns and proximity to residences, and institutional controls such as fencing.

According to EPA regional staff, while EPA requires certain information to complete a PA, the Agency recognizes the need for flexibility in the process to tailor information gathering to site-

specific needs. Often, regional EPA staff will conduct an abbreviated preliminary assessment when regional staffs have enough information to decide whether the site warrants further Federal action. Abbreviated preliminary assessments use the same information as the conventional PA approach, but rely on the professional judgment and past site assessment experience of regional staff to make decisions at earlier stages of the process.

To determine the types of threats the site might pose, EPA staff conduct detailed reviews or SIs. The SI process provides the data needed to score sites through the [Hazard Ranking System \(HRS\)](#) and identify potential sites for EPA's priority list of sites requiring Federal action and funding. SI investigators typically collect environmental release and potential source samples to determine the presence or migration of hazardous substances. Investigators conduct SIs in one stage or two. The first stage, or focused SI, tests hypotheses developed during the PA and can yield information sufficient to prepare an HRS scoring package. If investigators require further information to document an HRS score, they move to the second stage and conduct an expanded SI. EPA encourages Regions to combine PA and SI activities, or conduct integrated assessments, to reduce costs and repetitive tasks. Region 8 performs integrated assessments on a case-by-case basis for those sites that pose time-critical threats to nearby populations. Under cooperative agreements, Region 9 staff collectively work with States and Tribes to decide whether a site requires further assessment based on any indications that a release could impact human populations or sensitive environments. Region 9 staff said that Tribal cultural values often come into play when assessing sites, particularly with new routes of exposure not typically expected in suburban environments.

To assist the PA and SI efforts at other Federal agencies, EPA plans to issue succinct PA and SI summary guides specific to Federal facilities in early 2005, as well as launch a web-based [Federal facilities compliance assistance center](#) on hazardous site cleanup. While the PA and SI guides will not replace specific statutory requirements, they could serve as one-stop guides to assist other Federal agencies and help focus their site activities. Also, EPA conducts an annual [national site assessment symposium](#) as a forum for EPA, States, Tribes, and other Federal agencies to discuss recent and pending changes in legislation, funding, policies, and guidance. Speakers representing a broad site assessment spectrum share ideas and expertise on how to address evolving site assessment needs.

### [HRS Scoring](#)

EPA applies information collected during the PA/SI process to calculate an HRS score, and EPA uses HRS scoring as the principal mechanism to place uncontrolled waste sites on its priority list for funding and action. The HRS consists of a numerically based screening system to assess the relative potential of sites to pose a threat to human health or the environment. The HRS assigns each site a score ranging from 0 to 100 based on: the likelihood that a site has released or has the potential to release contaminants into the environment; the characteristics of the waste; and the people or sensitive environments affected by the release. Though not a risk assessment tool, the HRS uses a structured approach to assign numerical values to risk-based factors and conditions. EPA scores four pathways under the HRS:

1. Groundwater migration (drinking water);
2. Surface water migration (drinking water, human food chain, sensitive environments);
3. Soil exposure (resident population, nearby population, sensitive environments); and
4. Air migration (population, sensitive environments).

After calculating scores for one or more pathways, EPA combines the scores into an overall site score. Sites with an HRS score of 28.5 or greater are eligible for EPA's priority list of sites requiring Federal action. Site teams may use electronic scoring systems, such as [HRS Superscreen](#) and [Quickscore](#), to calculate scores. Both systems provide user-friendly, electronic methods of documenting site scores, minimizing mathematical scoring errors, and facilitating decision-making. [HRS Superscreen](#) allows users to: enter and evaluate site-specific information, including sampling data, waste quantities, physical parameters, and target data; enter descriptive narrative text and reference citations; and select specific HRS factor values. Similar key functions in [Quickscore](#) include: pathway and site score calculations; HRS score sheet preparation and printing; easy identification of data gaps in a conceptual site model; and scratchpad capability for note-taking.

If all HRS pathways score low, the site scores low. However, the site can score relatively high even if only one pathway scores high. This demonstrates an important consideration for HRS scoring because some extremely dangerous sites pose threats through only one pathway. Also, HRS scores do not determine funding priorities because the information collected to develop HRS scores cannot sufficiently determine either the extent of contamination or the appropriate cleanup response for a particular site. Furthermore, the sites with the highest HRS scores do not necessarily come to EPA's attention first – this would require stopping work at sites with already underway cleanup actions. EPA relies on more detailed studies in the [Remedial Investigation/Feasibility Study \(RI/FS\) process](#) that typically follows site listing.

#### [Remedial Investigation/Feasibility Study \(RI/FS\)](#)

The RI/FS phase determines the nature and extent of contamination, and EPA performs an RI/FS after designating a site as a priority for Federal funding and action. The RI serves as the mechanism for collecting data to:

- Characterize site conditions;
- Determine the nature of the waste;
- Assess risk to human health and the environment; and
- Conduct testing to evaluate the potential performance and cost of the treatment technologies under consideration.

The FS serves as the mechanism for the development, screening, and detailed evaluation of alternative cleanup actions. EPA conducts the RI/FS process concurrently – data collected in the RI influence the development of cleanup alternatives in the FS, which in turn affects the scope of additional studies and field investigations. According to EPA, this phased approach encourages the continual scoping of site characterization, minimizes the collection of unnecessary data, and maximizes data quality. The RI/FS process includes the following phases: [scoping](#), [site](#)

[characterization](#), [development and screening of cleanup options](#), [treatability investigations](#), and [detailed analysis](#).

### Scoping

Scoping represents the initial planning phase of the [RI/FS](#) process, and EPA refines many of the planning steps begun during the scoping in later phases of the RI/FS. Scoping activities typically begin with the collection of existing site data, including data from previous investigations such as the [PA/SI](#). On the basis of this information, EPA undertakes site management planning to: preliminarily identify boundaries of the study area; identify likely cleanup objectives and whether interim actions may be necessary or appropriate; and establish whether to address the site as one of several separate operable units. Once EPA agrees on an overall management strategy, EPA plans the RI/FS for a specific operable unit or the site as a whole. Typical scoping activities include: initiating the identification and discussion of potential [Applicable or Relevant and Appropriate Requirements](#) with the support agency; determining the types of decisions to make and the data needed to support these decisions; assembling a technical advisory committee to assist in activities, serve as a review board for important deliverables, and monitor progress during the study; and preparing the work plan, sampling and analysis plan, health and safety plan, and community relations plan.

### Site Characterization

EPA initiates field sampling and laboratory analysis during the site characterization phase of the [RI/FS](#). Preliminary site characterization summaries provide the lead agency with information early in the process before preparation of the full RI report. The summary helps determine the feasibility of potential technologies and assists both the lead and support agencies with the initial identification of applicable or relevant and appropriate requirements.

According to regional EPA staff, the Agency's site prioritization follows a risk-based process. EPA applies its [Risk Assessment Guidance](#) to develop electronic templates of standard risk assessment data reporting tables that provide clear, consistent, and transparent risk data presentations. The electronically transferred tables provide the summary-level risk data that EPA staff must enter into its automated inventory of hazardous waste sites. EPA requires a baseline risk assessment for all listed sites that identifies the existing or potential risks that sites may pose to human health and the environment.

Three types of risks may require site cleanups: human health cancer risks; human health non-cancer risks; or ecological risks. Because the baseline risk assessment identifies the primary health and environmental threats at a site, it also provides valuable input to the development and evaluation of alternatives during the FS. EPA uses the  $1 \times 10^{-6}$  (one in a million) to  $1 \times 10^{-4}$  (1 in ten thousand) cancer risk range as a "target range" to manage cleanup risks and as an acceptable risk range for cleanup levels. For human health threats, where the baseline risk assessment indicates that the lifetime cancer risk range to

an individual for either current or future land use exceeds  $1 \times 10^{-4}$ , the site generally warrants further Federal action. Once EPA decides to commence cleanup action, the Agency has expressed a preference for cleanups achieving the more protective end of the risk range (i.e.,  $1 \times 10^{-6}$ ). Site cleanup must also protect against non-cancer risks or threats, and generally should not result in a Hazard Index<sup>1</sup> greater than one. To justify site action based upon ecological concerns, an [ecological risk assessment](#) must establish that an actual or potential ecological threat exists at a site. Ecological risk assessments can have their greatest influence on risk management at a site in the evaluation and selection of cleanup options.

### [Development and Screening of Cleanup Options](#)

This phase usually begins during scoping when EPA may first identify likely cleanup scenarios. Developing cleanup options requires:

- Identifying objectives;
- Identifying potential treatment technologies that will satisfy the objectives;
- Screening technologies based on effectiveness, implementability, and cost; and
- Assembling technologies into alternatives for the site or operable unit.

EPA can develop cleanup options to address a contaminated medium, a specific area of the site, or the entire site. Once EPA develops potential cleanup alternatives, the Agency screens certain options to reduce the number of alternatives for analysis. EPA usually conducts the screening process on a general basis and with limited resources because of the lack of complete information necessary to fully evaluate cleanup options at this point in the process. The FS evaluates the risks in the absence of cleanup actions to provide a baseline for comparison with other alternatives.

### [Treatability Investigations](#)

EPA conducts treatability investigations primarily to: provide sufficient data to allow for the full development and evaluation of treatment alternatives during the [detailed analysis](#) phase; support the [design](#) of selected cleanup options; and reduce cost and performance uncertainties for treatment alternatives to acceptable levels so that EPA can select an option.

### [Detailed Analysis](#)

During this phase, EPA evaluates cleanup alternatives with respect to [nine criteria](#) that the Agency developed to address statutory requirements. EPA considers the first two criteria as “threshold” criteria; the next five as “balancing” criteria; and the last two as “modifying” criteria. Specifically:

---

<sup>1</sup>EPA defines the Hazard Index as the ratio of the exposure level to the referenced, acceptable daily long-term dose from exposure to contaminants at the site.



Nine Criteria for Evaluating Cleanup Alternatives	
<b>Threshold Criteria</b>	<ol style="list-style-type: none"> <li>1. Overall protection of human health and the environment</li> <li>2. Compliance with applicable or relevant and appropriate requirements</li> </ol>
<b>Balancing Criteria</b>	<ol style="list-style-type: none"> <li>3. Long-term effectiveness and permanence</li> <li>4. Reduction of toxicity, mobility, or volume</li> <li>5. Short-term effectiveness</li> <li>6. Implementability</li> <li>7. Cost</li> </ol>
<b>Modifying Criteria</b>	<ol style="list-style-type: none"> <li>8. State acceptance</li> <li>9. Community acceptance</li> </ol>

EPA analyzes cleanup alternatives individually against each criterion and then compares each alternative against one another to determine their respective strengths and weaknesses. EPA also uses its [National Remedy Review Board](#), comprised of Headquarters and regional staff, to review cleanup options to ensure consistency with hazardous waste regulations. The results of this process help the Agency select an appropriate cleanup option.

### [Record of Decision](#)

EPA creates the [Record of Decision](#) from information generated during the [RI/FS](#), and the Record of Decision functions as a public document that explains which cleanup options EPA selected for a site. The Record of Decision includes a table listing the final cleanup goals and the corresponding risk level for each chemical of concern.

### [Design and Implementation of Cleanup Action](#)

Based on specifications described in the [Record of Decision](#), EPA designs the technical specifications for cleanup options and technologies during this phase, followed by the actual construction or implementation phase of site cleanup.

### [Designating Priority Sites for Federal Funding and Action](#)

EPA designates priority sites for Federal funding and action upon completion of HRS scoring and after EPA addresses public comments on proposed sites to ensure that EPA allocates scarce resources to the sites posing the most risk to human health and the environment. EPA's [National Risk-Based Priority Panel](#) evaluates the risk posed at listed sites to establish funding priorities for new cleanup construction projects. This system allows for an evaluation of projects based on: protection of human health; protection from significant environmental threats; and protection against potential human health or environmental threats based upon current site conditions. The panel meets during the course of the year as needed to prioritize new projects. EPA regional staff complete and submit site forms to the Priority Panel for scoring, and Example C-1 includes a copy of a blank Priority Panel form.

The Priority Panel applies five criteria and associated weighting factors to classify threats that contaminants may pose at a site. The Panel then applies the criteria and associated weighting factors to compare sites based on common criteria. The five criteria are:

Five Criteria for Classifying Threats
<ol style="list-style-type: none"> <li>1. Risks to human population exposed</li> <li>2. Contaminant stability</li> <li>3. Contaminant characteristics</li> <li>4. Threat to a significant environment</li> <li>5. Program management considerations</li> </ol>

The Panel ranks each criterion on a scale of one to five. The highest score for any criterion is five, representing a current risk-current exposure scenario posing risk to human health and the environment. The lowest score for any factor is one, representing a future risk-future exposure. EPA multiplies the raw score by the weight factor for each criterion as follows, with a maximum possible score of 100:

Criteria	Raw Score Range	x	Weight Factor	= Maximum Total Score *
<b>Risk to human population exposed:</b> population size, proximity to contaminants, and likelihood of exposure.	1 - 5	x	5	<b>25</b>
<b>Stability:</b> mobility of contaminants, site structure, and effectiveness of any institutional or physical controls.	1 - 5	x	5	<b>25</b>
<b>Contaminant characteristics:</b> concentration, toxicity, and volume.	1 - 5	x	3	<b>15</b>
<b>Threat to a significant environment:</b> endangered species or their critical habitats, and sensitive environmental areas.	1 - 5	x	3	<b>15</b>
<b>Program management considerations:</b> innovative technologies, cost delays, high profile projects, environmental justice, State involvement, and Brownfields/economic redevelopment.	1 - 5	x	4	<b>20</b>
<b>Maximum total project score</b>				<b>100</b>

\* We multiplied the weight factor by the high end of the raw score range.

## Exhibit C-1

### Superfund Response Action Priority Form

Regional Site Priority: \_\_\_\_\_ Region: \_\_\_\_\_  
Site Name: \_\_\_\_\_  
CERCLIS ID: \_\_\_\_\_ NPL Status: \_\_\_\_\_

#### Site Location

City: \_\_\_\_\_ State: \_\_\_\_\_  
Cong. District: \_\_\_\_\_

#### Action

\_\_\_ Remedial, or OU#: \_\_\_\_\_  
\_\_\_ Time Critical Removal (NPL/Non-NPL)  
\_\_\_ Non-Time Critical Removal (NPL/Non-NPL)

First, Subsequent, or Final Action for site: \_\_\_\_\_

If this is a final action, will this result in construction completion for site (Yes/No)?

#### Site Description

(size, volume of waste, current and future land uses of the site and land adjacent to the site, etc.):

#### Response Action Summary

- 1) Describe briefly, site activities conducted in the past or currently underway.
- 2) Specifically identify the discrete activities to be considered by this panel evaluation along with associated cost and projected schedule.
- 3) What are the projected additional activities that will result in this site reaching construction completion? What is the estimated cost of these additional activities?

**Cost of Proposed Response Action: \$** \_\_\_\_\_

(If the response action exceeds \$10 million, consultation with the Regional Center Director to discuss alternatives should precede ranking by panel. Deviation from project budget, resulting in the exceedance of the \$10 million limit, requires HQ consultation.)

**Planned FY 2002 and FY 2003 Needs** (If large dollar project, please provide a quarterly forecast): \$ \_\_\_\_\_ (Note: State match = 10%)

**Readiness Criteria:**

Date State Superfund Contract or State Cooperative Agreement will be signed (Month)?

If non-time critical, is State cost sharing (provide details)?

State match = 10%

If Remedial Action when will Remedial Design be 95% complete (Month)?

When will Region be able to obligate money to the site?

Estimate when on-site construction activities will begin ?

**I. Principal Contaminants (Please provide average and high concentrations)**

	Contaminant	Media	Concentration	
			(Average)	(High)
1)	_____	_____	_____	_____
2)	_____	_____	_____	_____
3)	_____	_____	_____	_____
4)	_____	_____	_____	_____

Media: (AR) Air, (SL) Soil, (ST) Sediment, (GW) Ground Water, (SW) Surface Water

**II. Site/Contaminant Stability** (Describe the means/likelihood that contamination could impact other areas/media given current containment):

**III. Summarize Human Exposures/Risks** (Describe the Exposure Scenario(s) driving the risk and remedy (Include: current/future, on-site/off-site, media, exposure route, receptor):

Estimate the number of people reasonably anticipated to be exposed in the absence of any future EPA action for each medium for the following time frames:

Medium	< 2yrs.	< 10 yrs.	> 10 yrs.
_____	_____	_____	_____

Discuss the likelihood that the above exposures will occur?

Medium	< 2yrs.	< 10 yrs.	> 10 yrs.
_____	_____	_____	_____

Discuss the likelihood that the above exposures will occur?

#### **IV. Explain any Ecological Risks/Impacts**

Describe any observed or predicted adverse impacts on ecological receptors including their ecological significance and likelihood of occurring, size of the impacted area.

Would natural recovery occur if no action was taken? If so, estimate how long this would take.

#### **V. Programmatic Considerations**

Describe the degree to which the community accepts the response action:

Describe the degree to which the State accepts the response action:

Describe other programmatic considerations (e.g., natural resource damage claim pending, Brownfields site, uses an innovative technology, construction completion, economic redevelopment, environmental justice, etc.):

## ***EPA's Cost Estimating Process***

Recognizing that unique and changing site circumstances require flexibility in estimating costs for cleanup, EPA estimates costs throughout the Agency's process of prioritizing sites for Federal action, and costs change as projects move forward and more definitive scopes emerge. EPA estimates technical support and supply costs for all phases of cleanups through Independent Government Cost Estimates (IGCEs). EPA estimates costs as one of nine criteria to choose suitable cleanup options. After selecting a cleanup option, EPA performs a detailed construction cost estimate. EPA's guidance documents address cost estimates of cleanup options developed during site investigations, assist project managers with the preparation of assignment-specific IGCEs, and provide cost estimating resources including a web-based "cost-estimating toolbox." Regional project managers do not document historic project costs; rather, they estimate initial costs and ask other prior and current site teams about their cost experiences.

EPA estimates costs throughout the cleanup process. EPA has recently begun to invest more money in the study and design phases of cleanup to develop more accurate cost estimates earlier in the process. Very little cost estimating occurs during the site discovery phase, and the cost estimating that occurs during site discovery assists EPA staff with site characterization. EPA's actual cost estimating process begins during the [Remedial Investigation/Feasibility Study \(RI/FS\)](#) phase after EPA adds a site to its prioritized list for Federal action but prior to actual cleanup. For most cost estimates developed during this phase, EPA relies on anecdotal and empirical data from past sites. According to the National Advisory Council for Environmental Policy and Technology, accurate cleanup estimates are difficult to predict because EPA only has cost information for sites or portions of sites where EPA pays for cleanups using program funds. Potentially responsible parties are not obligated to disclose the amount they spend on cleanup.

According to EPA projections, costs really begin to narrow as EPA better characterizes the site (which reduces uncertainty) and [designs](#) its cleanup process. EPA uses cost estimates developed while evaluating and comparing cleanup alternatives to select a suitable option, not for establishing project budgets or negotiating enforcement settlements. EPA begins tracking costs once the Agency selects a cleanup option so as not to prejudice the selection process.

When selecting the most suitable cleanup option for a specific site, EPA uses screening-level cost estimates to screen out disproportionately expensive alternatives in the scoping phase and to help determine what alternatives to retain for detailed analysis. The screening process evaluates cleanup alternatives with respect to their effectiveness, implementability, and cost, and EPA does not carry forward higher cost alternatives. The basis for a screening-level cost estimate can include a variety of sources, such as cost curves, generic unit costs, vendor information, standard cost estimating guides, historical cost data, and estimates for similar projects, as modified for the specific site. EPA considers both capital and operation and maintenance costs, where appropriate, at the screening level. EPA screens out alternatives if they: (1) provide effectiveness similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost; or (2) have costs that are grossly excessive compared to their overall effectiveness. After screening alternatives, EPA conducts extensive investigations

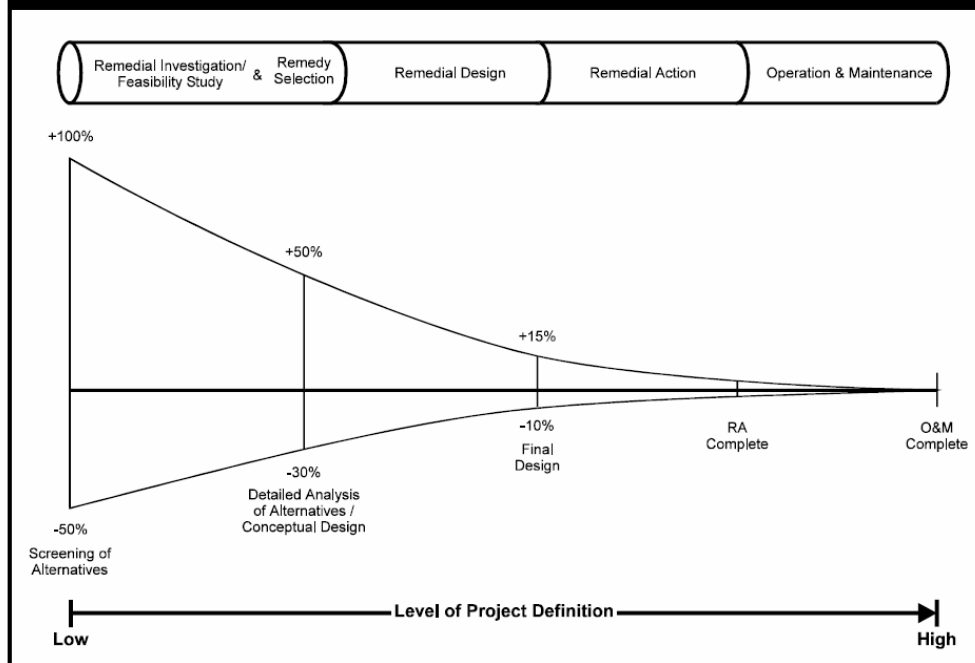
to provide sufficient data to fully develop and evaluate alternatives during the next and final stage of selecting a cleanup option.

The detailed analysis that follows supports the [design](#) of selected alternatives, helps reduce cost and performance uncertainties for cleanup alternatives to acceptable levels, and aids EPA's selection of cost-effective cleanup options. EPA evaluates cleanup alternatives in detail with respect to the aforementioned [nine criteria](#)<sup>2</sup> that the Agency developed to address the statutory requirements and preferences of the program. Cost functions as one of five "balancing" criteria used to assess cleanup alternatives. EPA analyzes the cleanup alternatives individually against each criterion and then compares each alternative against one another to determine their respective strengths and weaknesses. EPA evaluates cost along with the other "balancing" criteria in determining which cleanup option represents the practicable extent to which EPA can apply permanent treatment solutions or resource recovery technologies at the site. While EPA balances the reasonableness of the cost when evaluating cleanup options, cost does not predominate over other factors, such as long-term effectiveness and permanence. EPA's [National Remedy Review Board](#) helps review cleanup options to control response costs and promote consistent and cost-effective decisions.

The accuracy of potential cleanup option cost estimates increase as sites move through EPA's prioritization process, with the detailed analysis phase achieving a greater level of accuracy than screen-level estimates (see illustration that follows, which is Exhibit 2-3 in EPA's "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study). EPA estimates a +50% to -30% accuracy rate for cost estimates performed during the Agency's detailed analysis of cleanup alternatives. Once EPA completes the final cleanup design, the accuracy range of the cost estimate narrows to a +15% to -10% range as costs still change along the tail end of the process.

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<sup>2</sup> EPA evaluates cleanup options with respect to: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) State acceptance; and (9) community acceptance.

**Exhibit 2-3****Expected Cost Estimate Accuracy Along the Superfund Pipeline**

From:  
[A Guide to Developing and Documenting Cost Estimates During the Feasibility Study \(EPA 540-R-00-002\)](#)  
(July 2000).

When estimating cleanup option costs, EPA estimates technical and contractor costs, as well as construction costs necessary to implement the selected option. First, EPA estimates the costs of technical support through an IGCE conducted in-house by EPA staff for each work assignment at a site. Work assignments represent a specific step, or several steps, in EPA's site prioritization process, such as initial assessment and inspection following site discovery, or work assignments to prepare remedial designs for cleanup actions. An IGCE includes a detailed estimate of the cost to the government for services and/or supplies typically acquired from contractors for the specific work assignment. The main components of IGCEs include costs for labor, travel, subcontracts, special equipment, and general and administrative costs. The estimate must represent the government's own in-house estimate based upon information specific to the work at hand, and the estimate can include use of historical cost data from similar projects. The IGCE should represent a "fair and reasonable" cost of doing the work, and the IGCE provides the work assignment manager with information about how much it will cost for a contractor to complete a technical assignment. Since most EPA Regions lack in-house cost estimators, EPA issued a memorandum in June 2004 to assist work assignment managers in preparing IGCEs. EPA also provides regional staff an Internet-based ["Cost Estimating Toolbox"](#) that includes guidance documents and worksheets to help project managers prepare site-specific IGCEs and document assumptions made in preparing these estimates.

EPA conducts the second type of cost estimate after the Agency selects a cleanup option that meets statutory and regulatory requirements. EPA employs outside contractors to prepare construction cost estimates, or detailed estimates of the cost to construct the selected cleanup action. Contractors base construction cost estimates on the type and quantities of labor,



equipment, and materials required to perform the work. [RS Means Cost Guides](#) construction cost manuals provide useful information. Means data often serves as the standard for construction costs both in the private sector and throughout government, including such agencies as the Federal Housing Administration, the Department of Defense, and the General Services Administration. EPA staff include contractors' construction cost estimates in the IGCE for the cleanup action work assignment, which follows the completion of the design of the chosen cleanup option. EPA's [Guidance on Preparing Independent Cost Estimates](#) states that contractors should not use estimates developed during the evaluation of cleanup alternatives (with a typical expected accuracy range of +50% to -30%) for construction cost estimates. Third-party contractors often review construction cost estimates. EPA recommends that project managers obtain third-party review of cost estimates prior to advertising for bids, and that the third-party reviewer consists of a qualified cost estimator employed by the U.S. Army Corps of Engineers. EPA documents each cost estimate for the different cleanup phases in CERCLIS. While CERCLIS documentation of cost estimates provides an appropriate audit trail, some EPA staff believe it unnecessary to document every cost-related nuance.

The [Superfund 120-Day Study](#) recommended that EPA prepare and distribute a "cost cookbook" describing frequent construction tasks and estimates of the hours needed to complete the tasks to help regional staff prepare cost estimates. This "cookbook" could include both good and bad examples and experiences from Regions. Additionally, the Government Accountability Office has recommended that EPA maintain data on actual costs of contracted work on a web-based tool accessible by cost estimating staff. The Government Accountability Office also noted the need for Federal agencies to collect detailed site-specific data that includes both current and historical task and cost information, and that Federal agencies utilize co-located agencies with cost estimating expertise for assistance with cost estimating. EPA participates in a Cost Estimating Workgroup presently composed of members from the U.S. Army, U.S. Air Force, U.S. Navy, National Aeronautics and Space Administration, and Department of Energy. All agencies in the Workgroup, with the exception of EPA, have in-house cost estimating expertise.

EPA-OIG issued a 2003 report, ["Implementation, Information, and Statutory Obstacles Impede Achievement of Environmental Results from EPA's National Hardrock Mining Framework"](#) (Report No. 2003-P-00010; August 7, 2003) stating that EPA does not have current, accurate data on the extent of financial and environmental challenges posed by hardrock mining. EPA's response to the report included existing sources of information on the environmental impacts from mining such as: (1) environmental impact data on priority mine sites; (2) updated mining impact data in Land Disposal Restriction Phase IV technical background documents; (3) characterization of mining impacted waters when issuing mine site National Pollutant Discharge Elimination System permits; (4) evaluation of the potential for adverse environmental impacts during review of mine site Environmental Impact Statements; (5) characterization of radiological impacts of mining on Navajo lands; and (6) information on environmental releases from mine sites through the Toxics Release Inventory program. Each source could help determine the environmental liabilities of hardrock mine sites for financial statement purposes. Other documents that can assist in assessing the costs, liabilities, and environmental impacts of mining include EPA's [Abandoned Mine Lands website](#), EPA's [Publications on Mining Waste Management in Indian Country](#), and the Agency's [Abandoned Mine Site Characterization and Cleanup Handbook](#).

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Agency Followup Official (the CFO)  
Agency Followup Coordinator  
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Audit Followup Coordinator, Office of Solid Waste and Emergency Response  
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