CHAPTER 2

CONDUCTING THE ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)

2.1 OVERVIEW

In 1987, the Emergency Response Division began development of the first draft guidance on Engineering Evaluations/Cost Analyses (EE/CAs) for non-time-critical removal actions. Because issuance of a final EE/CA guidance was delayed pending the outcome of issues related to the NCP revisions, in 1988 a draft outline was distributed to assist the Regions in preparing EE/CAs. This chapter replaces the 1988 memo to help the Regions in fulfilling the goals of the EE/CA, which are to:

- Satisfy environmental review requirements for removal actions
- Satisfy administrative record requirements for improved documentation of removal action selection
- Provide a framework for evaluating and selecting alternative technologies.

Non-time-critical removal actions will be the appropriate response for a variety of sites and will range in scope from small-scale, low-cost actions to complicated multi-media response actions requiring exemptions from the statutory time and/or dollar limits. Non-time-critical removal actions may be interim or final actions; they may be the first and only action at a site, or one of a series of planned response actions. The scope of the non-time-critical removal action will determine the detail of the EE/CA. The EE/CA is a flexible document tailored to the scope, goals, and objectives of the non-time-critical removal action. It should contain only those data necessary to support the selection of a response alternative, and rely upon existing documentation whenever possible.

The range of site characteristics affecting the non-time-critical removal action forms a continuum. At one end are sites where the non-time-critical removal action is the first and only action expected at a site and where no other data are available. In this case, the EE/CA should provide definitive information on the source, nature, and extent of contamination, and risks presented by the site. At the other end of the continuum are sites where the non-time-critical removal action is one of a series of response actions, where a completed RI is or will be available, and where the nature and extent of contamination and the risk presented by the site have been or will be determined. In this case, the EE/CA would be similar to a focused FS, concentrating on the analysis of perhaps two or three appropriate alternatives and providing reference to existing information on the nature and extent of contamination and risks.

Many non-time-critical removal actions may occur at sites with characteristics that fall within these extremes. OSCs/RPMs should tailor the EE/CA to match the specific goals and objectives of the non-time-critical removal action planned for a given site. The goals of the removal should be based on the relevant factor(s) listed in sections 300.415(b)(2)(i)-(viii) of the NCP. The relevant factors should be cited in the EE/CA Approval Memorandum as justification for conducting the EE/CA. The scope of the action takes into account two major considerations: the physical portion of the site to be addressed and whether the action represents a final or interim step toward addressing a particular exposure pathway.

2.1 OVERVIEW (CONTINUED)

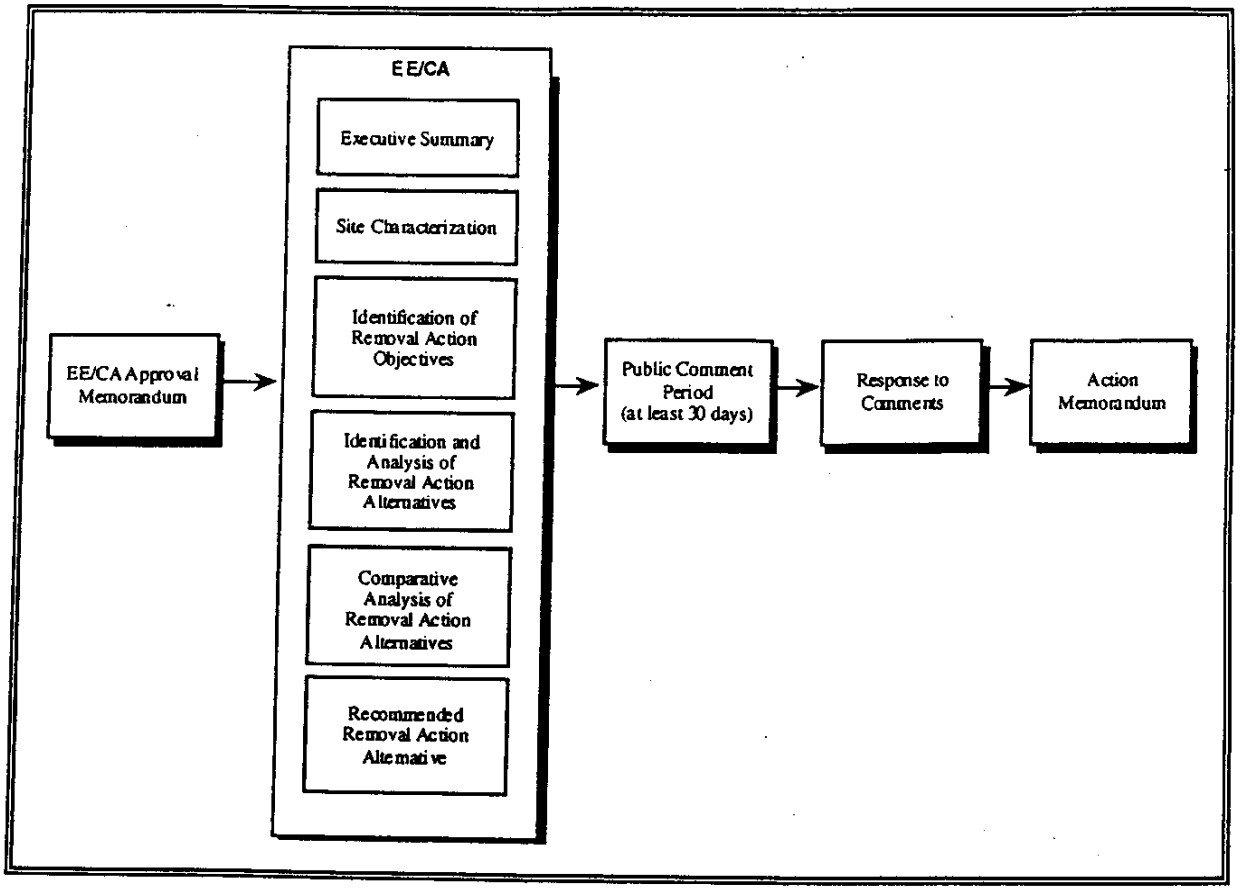
Specific objectives are then developed for the site. Removal action objectives generally consist of environmental medium-specific goals for protecting human health and the environment. The objectives should be as specific as possible, but not so specific that the range of alternatives that can be developed is unduly limited. Removal action objectives should identify, for example, the contaminants of concern and exposure route(s) and receptor(s).

The scope of the non-time-critical removal action (e.g., an interim action conducted during an ongoing remedial effort) and the specific objectives determine the information to be collected during the EE/CA. Accordingly, qualitative risk information that identifies pathways of concern and concentrations of contaminants above standards could have been documented at the site during the RI, and may be referred to in the EE/CA; a separate risk assessment is not necessary to support the non-time-critical removal action. Data to characterize the nature and extent of contamination should be limited to those needed to support the specific objectives of the non-time-critical removal action, supplementing existing data (e.g., the existing RI/FS) to the extent appropriate. Finally, an initial screening of alternatives generally will not be necessary; only a few viable alternatives relevant to the EE/CA objectives should be identified and analyzed.

As noted in Chapter 1, an EE/CA must be completed for all non-time-critical removal actions under CERCLA as required by section 300.415(b)(4)(i) of the NCP. The goals of the EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. Thus, an EE/CA serves an analogous function, but is more streamlined than the RI/FS conducted for remedial actions. Soliciting and responding to public comments on the administrative record, including the EE/CA, is required by section 300.820(a) of the NCP. (See Appendix C for a side-by-side comparison of the EE/CA process and the RI/FS process.)

The results of the EE/CA, along with EPA's response decision, are summarized in the Action Memorandum. The costs of performing an EE/CA, which is considered a CERCLA section 104(b)(1) study, are not counted toward the $2 million statutory limit on removal actions. Exhibit 3, on the following page, depicts the process for developing an EE/CA.

EXHIBIT 3
EE/CA Development Process



This chapter provides guidance on the components of the EE/CA Approval Memorandum, as shown in Exhibit 4, on the following page, and the EE/CA, as shown in Exhibit 5. The chapter discusses and provides checklists for each section of the EE/CA; however, each section can be modified to satisfy special requirements of the removal action or to justify the selection of a specific alternative.

For More Information:

1. CERCLA §104(b)(1), Information; Studies and Investigations
2. NCP:
   §300.415, Removal Action
   §300.415(b)(2), Appropriateness Factors
   §300.415(b)(4)(i), EE/CA Requirement

EXHIBIT 4
EE/CA Approval Memorandum

- ❑ Subject
- ❑ Background
- ❑ Threat to Public Health, Welfare, or the Environment (Includes Expected Change If No Action Taken)
- ❑ Imminent and Substantial Endangerment If Present
- ❑ Enforcement Actions
- ❑ Proposed Project/Oversight and Cost
- ❑ Approval/Disapproval

2.2 EE/CA APPROVAL MEMORANDUM

In general, the EE/CA Approval Memorandum is prepared once the need for a non-time-critical removal action has been determined; a removal site evaluation may have been completed, or if the site is on the NPL, information may also be available from other sources. The EE/CA Approval Memorandum is not a part of the EE/CA, but is part of the administrative record for the site.

The EE/CA Approval Memorandum serves important functions. First, it secures management approval and funding approval to conduct the EE/CA or, for PRP-lead actions, to provide oversight of EE/CAs. If the action is PRP-lead, provisions for oversight funding will be contained in an administrative order and should be included in an Approval Memorandum. Second, the memorandum documents that the situation meets the NCP criteria for initiating a removal action and that the required action is non-time-critical. Third, it provides a finding of an actual or threatened release from the site and, if present, a finding of an imminent and substantial endangerment, or refers to a document establishing such a determination. The Approval Memorandum also provides general information pertaining to the site background; threats to public health, welfare, or the environment posed by the site (including expected changes in the site situation if no action is taken or if the action is delayed); enforcement activities related to the site; and estimated EE/CA costs.

The EE/CA Approval Memorandum should indicate a current or potential threat to public health, welfare, or the environment. The memorandum should focus on providing sufficient information that such a threat or potential threat could exist, while the EE/CA will provide the information for EPA to determine that such a threat or potential threat actually exists. The preliminary identification of exposures is based on information obtained from the PA or SI and possibly other previous investigations. The OSC/RPM should develop a conceptual site model as a starting point for this analysis. The model identifies potential releases, potential areas of contamination, chemicals of concern, possible routes of exposure, possible routes of contaminant transport, and potential exposure pathways.

This potential for exposure indicates the likelihood of meeting the NCP criteria for taking a removal action, which in turn justifies the need for conducting the EE/CA. For example, risk consideration can identify the possibility of exposure of nearby populations, animals, or the food chain to hazardous substances, pollutants, or contaminants. Similarly, this preliminary risk

information may also indicate the possibility of contamination of drinking water or sensitive environments or other situations or factors that may pose threats to public health, welfare, or the environment.

- The Regional Administrator (or authorized designee) evaluates the EE/CA Approval Memorandum and provides authorization. Funds expended to prepare an EE/CA Approval Memorandum are CERCLA 104(b)(1) monies and are not counted toward the $2 million statutory limit for removal actions.

For More Information:

1. CERCLA §104(b)(i), Information; Studies and Investigations.
2. NCP:
   §300.415(m)(4)(i), Community Relations
   §300.415(b)(4), EE/CA Requirement

EXHIBIT 5
EE/CA Outline

- ❑ Executive Summary
- ❑ Site Characterization
  - ❑ Site description and background
  - ❑ Previous removal actions
  - ❑ Source, nature, and extent of contamination
  - ❑ Analytical data
  - ❑ Streamlined risk evaluation
- ❑ Identification of Removal Action Objectives
  - ❑ Statutory limits on removal actions
  - ❑ Determination of removal scope
  - ❑ Determination of removal schedule
  - ❑ Planned remedial activities
- ❑ Identification and Analysis of Removal Action Alternatives
  - ❑ Effectiveness
  - ❑ Implementability
  - ❑ Cost
- ❑ Comparative Analysis of Removal Action Alternatives
- ❑ Recommended Removal Action Alternative

2.3 EE/CA EXECUTIVE SUMMARY

The EE/CA Executive Summary provides a general overview of the contents of the EE/CA. It should contain a brief discussion of the site and the current or potential threat posed by site

2.3 EE/CA EXECUTIVE SUMMARY (CONTINUED)

conditions. The Executive Summary should also identify the scope and objectives of the removal action, as well as the removal action alternatives. Finally, this section of the EE/CA should provide information on the recommended removal action alternative.

The Executive Summary is intended to make the contents of the EE/CA more accessible to review by the public, and is analogous in this respect to the Proposed Plan used in the remedial process. This summary can then be used in the Action Memorandum, which should include a description of the EE/CA.

2.4 SITE CHARACTERIZATION

The EE/CA should summarize available data on the physical, demographic, and other characteristics of the site and surrounding areas. These data may be available from a removal site evaluation, from previous investigations, or from other EPA activities at the site (e.g., work in preparation for NPL listing). Documents providing information for the EE/CA should be placed in the administrative record for the site. Whatever the source, the data on the site must provide background engineering information for analysis of removal alternatives. Because of the CERCLA preference for treatment over containment or land disposal, it is important that alternatives that employ treatment and that yield permanent solutions be fully evaluated for non-time-critical removal actions and early remedial actions. Furthermore, potential differences between early action and long-term action data quality objectives and risk assessment goals should be reconciled as early as possible. Therefore, EPA should coordinate activities of the OSC/RPM with those of the site assessment manager, risk assessor, and enforcement/legal staff to ensure appropriate data are collected to characterize the site.

Information about the site may be readily available from many sources, including:

- Scoring packages for NPL sites
- Removal site evaluations
- Remedial PA/SI reports
- EE/CA Approval Memoranda
- RI/FSs
- RODs
- State and local government reports
- The Agency for Toxic Substances and Disease Registry (ATSDR) or State public health agencies
- State Historic Preservation Officer
- Environmental Impact Statements (EISs)
- CERCLA section 104(e) information requests
- Newspaper articles
- Resource Conservation and Recovery Act (RCRA) enforcement actions
- Published engineering evaluations and technical reference documents
- Documents from other Federal agencies, such as U.S. Geological Survey (USGS) maps and Federal Emergency Management Agency evacuation reports
- Company records
- Employee interviews
- EPCRA—Toxic Release Inventory data.

2.4 SITE CHARACTERIZATION (CONTINUED)

Site Description and Background

The site description includes current and historical information. This information may help identify hazardous substances, pollutants, or contaminants of concern, or areas of the site requiring additional sampling. In gathering this information, OSCs/RPMs should review State, local, and Federal permit files, construction records, and local deed records for information on previous owners to determine materials produced, stored, or disposed of at the site. CERCLA section 104(e) information requests should also be considered. In addition, interviews should be conducted, as necessary, with neighbors of the site or past employees who can describe past operational practices or identify other past employees. The site background may include historical and aerial photographs. The EE/CA should document these data to convey a clear understanding of the nature of the site.

The site description section of the EE/CA should include the following types of information where available and as appropriate to the site-specific conditions and the scope of the removal action:

- Site location
  - Street address and crossroads
  - USGS topographic map quadrangle
  - Latitude/longitude

- Type of facility and operational status
  - Materials manufactured, stored, or disposed on-site
  - Estimated quantities of contaminants and potential hazards
  - Years of operation
  - Present/prior site use
  - Regulatory history, including previous responses, investigations, and litigation by State, local, and Federal agencies

- Structures/topography
  - Facility size/dimensions
  - Boundary descriptions
  - Land cover/vegetation/stresses to topography
  - Utilities/transportation features
  - Buildings
  - Surface water bodies/conveyances
  - Drainage channels/pathways
  - Historically/archaeologically significant features
  - Sewer lines/manholes
  - Stormwater drainage pipes
  - Open ditches/canals
  - Power lines/pipelines

- Geology/soil information
  - Depth to aquifer
  - Soil types (surface and vadose zones)
  - Local geological formulations
  - Surface water hydrology and hydrogeology

2.4 SITE CHARACTERIZATION (CONTINUED)

- Surrounding land use and populations
  - Residential, industrial, or commercial land use
  - Possible pathways of exposure
  - Identification of sensitive populations
  - Estimate of population densities within potentially affected radius
  - Description of drinking water sources
  - National Historic Preservation Act considerations

- Sensitive ecosystems
  - Wetlands, wildlife breeding areas
  - Wild and scenic rivers
  - Connection to the human food chain or food chains of other organisms
  - Sensitive and/or endangered species
  - Coastal zones

- Meteorology
  - Rainfall/snowfall
  - Temperature ranges
  - Wind conditions

Previous Removal Actions

The site characterization section of the EE/CA should also describe any previous removal actions at the site. Exhibit 6, on the following page, shows useful information that may be obtained from a previous removal action and its applicability to the current EE/CA. Previous information, if relevant, may be organized as follows:

- The scope and objectives of the previous removal action
- The amount of time spent on the previous removal action
- The amount of money spent on the previous removal action
- The nature and extent of hazardous substances, pollutants, or contaminants treated or controlled during the previous removal action
- The technologies used and/or treatment levels used for the previous removal action.

Like all documents that serve as the basis for Superfund decisions, EE/CAs are subject to public review and must be part of the administrative record. Although confidential and enforcement-sensitive documents are typically not relied upon in selecting response actions, when they are relied upon they should be contained in a separate confidential portion of both the EE/CA and the administrative record. Confidential information includes the following:

- Trade secrets, commercial or financial information
- State secrets
- Confidential informant files
- Privacy Act privileged information, attorney-client privileged information, and attorney work product privileged information
- Information exempted by other statutes.

Enforcement-sensitive information that generally should not be placed in the administrative record file includes:

- Financial status of PRPs
- Record of previous negotiations with PRPs and the results
- Investigatory files relating to law enforcement
- Additional information on enforcement history, strategy, discussion, and recommendations.

EXHIBIT 6
Information From Previous Removal Actions Applicable To Current EE/CA

Information From Previous Removals	Applicability To Current EE/CA
Nature and Extent of Contaminants	This information may allow the OSC/RPM to narrow the scope of evaluation to certain areas of the site or to specific analyses.
Treatability of Compounds	Previous use of a technology may affect the decision to use the same technology again.
Equipment/Utilities at Site	If the previous removal action resulted in supplies and equipment being left at the site or provision of specific utilities (e.g., electrical power, sewer line), this information may affect the choice of treatment/control options employed.
Site-Specific Conditions	Lessons learned from a previous removal action are valuable to the current EE/CA. Specific examples could include seasonal weather patterns affecting technology applications or site access limitations because of vehicle transportation routes.

Source, Nature, and Extent of Contamination

To the extent possible, site characterization data should be gathered during the removal site evaluation to support the EE/CA, unless such data were gathered in prior investigations. Existing information may be useful in determining the location(s) of contamination at a particular site. This information may include:

- Location(s) of the hazardous substance(s), pollutant(s), or contaminant(s)
- Quantity, volume, size, or magnitude of the contamination
- Physical and chemical attribute(s) of the hazardous substance(s), pollutant(s), or contaminant(s)
- Target(s) potentially affected by the site.

2.4 SITE CHARACTERIZATION (CONTINUED)

The source of the contamination for a removal action is often well defined. However, if the source, nature, and extent of contamination cannot be readily identified, the OSC/RPM should survey the area. Contamination sources and locations can often be determined by:

- Using nonanalytical methods, including geophysical surveys, which may indicate the presence of buried objects, such as drums
- Examining aerial photographs (especially those taken over a period of time), which may indicate land areas or drainage patterns that have been disturbed
- Reviewing past operations and information from the Toxic Release Inventory and interviewing past or current employees, which may help determine the source of contamination.

If contamination is found in a containment vessel (e.g., under- or above-ground storage tanks, drums, lagoons), the integrity of the vessels should be determined. The integrity may have an impact on the selection of the removal action.

Analytical Data

The analytical data section presents quantifiable data collected for the EE/CA. This section begins with existing data and expands as additional data are collected. When sufficient data are collected, significant findings should be presented in a narrative discussion. The actual data can be presented in tables, either within the section or in an appendix, or incorporated by reference to the document containing the data.

Sampling should typically be performed in accordance with accepted EPA and Contract Laboratory Program (CLP) protocols. Where feasible, sampling should be coordinated through the integrated assessment approach of SACM. Where a SACM approach is used, appropriate data quality objectives should be used for decisions in support of remedial and removal actions. If the site is not already on the NPL, sample collection and analysis should generally ensure that data generated will also support assessment of whether NPL listing and remedial action are appropriate.

Analytical data from studies conducted by EPA or other groups (e.g., State or local health or environmental authorities or PRPs) are useful in characterizing the site. Reviewing any soil, water, or waste analyses will help OSCs/RPMs determine the precision, accuracy, representativeness, completeness, and comparability of previous sampling. These parameters can be evaluated by examining the results of routine quality control procedures, such as replicate samples and/or analyses, replicate spiked samples and/or analyses, field blanks, method blanks, and analysis of standard reference materials.

To reflect SACM's integrated assessment approach, future guidance will further address data collection and analysis to support removal actions, early remedial actions, and long-term actions. The Environmental Response Team (ERT) is currently developing integrated guidance on air, waste, and water sampling, and ecological assessment. All data used to justify a non-time-critical action should be supported by quality control data. Furthermore, these data should be

evaluated based on quality assurance documentation. Following this quality assurance and control process, data can be compared to existing health- or risk-based standards to determine the nature of the threat to public health, welfare, or the environment.

Streamlined Risk Evaluation

The streamlined risk evaluation is a new type of evaluation, intermediate in scope between the limited risk evaluation undertaken for emergency removal actions and the conventional baseline assessment normally conducted for remedial actions. This streamlined risk evaluation can help justify taking a removal action and identify what current or potential exposures should be prevented. The risk evaluation uses sampling data from the site to identify the chemicals of concern, provides an estimate of how and to what extent people might be exposed to these chemicals, and provides an assessment of the health effects associated with these chemicals. A streamlined risk evaluation projects the potential risk of health problems occurring if no cleanup action is taken at a site. Therefore, the results of the streamlined risk evaluation help EPA decide whether to take a cleanup action at the site, what exposures need to be addressed by the action, and in some cases define appropriate cleanup levels.

In planning a non-time-critical removal action, OSCs/RPMs should consult with the Regional risk assessors on potential action and cleanup levels. The risk evaluation at the site should remain the responsibility of EPA. Since removal and remedial action cleanup levels may differ, all early action decisions should consider the possible long-term action and corresponding cleanup levels. The OSC/RPM should ensure that all risk assessment activities are consistent with any future remedial action remaining to be taken (or potential for listing, if the site is not on the NPL) to achieve consistent risk goals. OSCs/RPMs should refer to OSWER Publication 9285.7-01B, "Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A, Interim Final" (December 1989), EPA/540/1-89/002, PB90-155581, for guidance on conducting risk evaluations.

For the EE/CA, the streamlined risk evaluation should focus on the specific problem that the removal action is intended to address. For example, if the non-time-critical removal action is to install a ground water containment system, the risk evaluation should address risk due to consumption and use of ground water. If the action is intended to address a particular source of contamination, the risk evaluation should address the risks related only to that source of contamination.

To assist in focusing the risk evaluation on specific site problems, OSCs/RPMs should rely on the conceptual site model and data developed during site characterization. A risk evaluation that identifies only contaminants of concern in the affected media, contaminant concentrations, and the toxicity associated with the chemical can be sufficient to justify taking an action. In some situations, exposure pathways can be identified as an obvious threat to human health or the environment by comparing EE/CA contaminant concentrations to standards that are potential chemical-specific applicable or relevant and appropriate requirements (ARARs) for the action. These may include non-zero Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs) for ground water or leachate, or State air quality standards for contaminants that may volatilize or be entrained by the wind. When potential ARARs for chemicals of concern do not exist for a specific contaminant, risk-based chemical concentrations should be used.

Risk based

2.4 SITE CHARACTERIZATION (CONTINUED)

Where standards for one or more contaminants in a given medium are clearly exceeded, a removal action is generally warranted, and further quantitative assessment that considers all chemicals, their potential additive effects, or additivity of multiple exposure pathways, are generally not necessary. In cases where standards are not clearly exceeded, or where the available information is deficient or of questionable quality, a more thorough risk assessment may be advisable before deciding whether to take a removal action.

In most, if not all, PRP-and State-lead actions with no RI/FS or other site evaluation and little likelihood of future EPA remedial action, a conventional risk assessment will be necessary to evaluate all potential pathways. If more substantial information or data are needed regarding risks posed at a site (e.g., due to insufficient data quality from prior site work), OSCs/RPMs should not hesitate to request supplementary risk information before any type of response action is selected, being careful to justify any additional work that may be required. However, only in the case where the non-time-critical action will be the only Fund-lead action expected at the site should OSCs/RPMs consider performing a risk assessment that addresses all potential exposure pathways.

For More Information:

1. CERCLA §104(e), Information Gathering and Access
2. OSWER Publication 9200.2-16FS, "Quality Assurance for Superfund Environmental Data Collection Activities" (February 1993), PB93-963273.
3. OSWER Publication 9285.7-01B, "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part A, Interim Final" (December 1989), EPA/540/1-89/002, PB90-155581.
4. OSWER Publication 9360.4-01, "Quality Assurance/Quality Control Guidance for Removal Activities—Sampling QA/QC Plan and Data Validation Procedures (Interim Final)" (April 1990), EPA/540/G-90/004, PB90-274481.
5. OSWER Publication 9360.4-02, "Compendium of ERT Soil Sampling and Surface Geophysics Procedures" (January 1991), EPA/540/P-91/006, PB91-921273.
6. OSWER Publication 9360.4-03, "Compendium of ERT Surface Water and Sediment Sampling Procedures" (January 1991), EPA/540/P-91/005, PB91-921274.
7. OSWER Publication 9360.4-05, "Compendium of ERT Air Sampling Procedures" (May 1992), PB92-963406.
8. OSWER Publication 9360.4-06, "Compendium of ERT Ground Water Sampling Procedures" (January 1991), EPA/540/P-91/007, PB91-921275.
9. OSWER Publication 9360.4-07, "Compendium of ERT Waste Sampling Procedures" (January 1991), EPA/540/P-91/008, PB91-921276.
10. OSWER Publication 9360.4-08, "Compendium of ERT Toxicity Testing Procedures" (January 1991), EPA/540/P-91/009, PB91-921271.
11. OSWER Publication 9360.4-10, "Removal Program—Representative Soil Sampling Guidance" (November 1991), PB92-963408.

2.5 IDENTIFICATION OF REMOVAL ACTION SCOPE, GOALS, AND OBJECTIVES

Identifying the scope, goals, and objectives for a removal action is a critical step in the EE/CA and in the conduct of non-time-critical removal actions. At any release, regardless of whether the site is on the NPL, where the lead agency determines there is a threat to public health, welfare, or the environment, a removal action may be taken to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release.

The following example illustrates this process at an NPL site with an ongoing RI/FS, and where an opportunity exists to conduct a non-time-critical removal action. The non-time-critical removal action will minimize migration of contaminated ground water and contaminants from subsurface soil but is considered an interim action because it is expected that the remedial action will ultimately address the area of concern.

In this example, the goal of the non-time-critical removal action is to minimize migration of contaminated ground water and to begin to reduce contaminants in the soil that are the source of ground water contamination. This goal corresponds to section 300.415(b)(2)(iv) of the NCP, which identifies "high levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface, that may migrate" as a factor to be considered in determining the appropriateness of a removal action.

Five specific objectives are then developed for the site:

- Minimize migration of contaminated ground water through installation of a containment system
- Initiate removal of volatile organic compounds from contaminated soils through in-situ treatment
- Dewater areas necessary to treat effectively the decontaminated soils
- Install and operate appropriate treatment systems for ground water and vapor generated by containment, dewatering, and soil treatment that will prevent unacceptable discharges or emissions.
- Dispose of waste streams from the removal action.

These objectives should be achieved by meeting specified cleanup levels while working within the statutory limits and attaining ARARs to the extent practicable. Exhibit 7 provides a checklist of factors to consider in developing EE/CA objectives.

Statutory Limits on Removal Actions

Because the EE/CA is a public document and readers may not be aware of the statutory limits on removal actions, the objectives section of the EE/CA should briefly explain the $2 million and 12-month statutory limits for Fund-financed removal actions pursuant to section 104(c)(1) of CERCLA. If the need for an exemption is determined early in the action, the details should be described in the EE/CA as well as in the Action Memorandum requesting the exemption.

2.5 IDENTIFICATION OF REMOVAL ACTION SCOPE, GOALS, AND OBJECTIVES (CONTINUED)

Determination of Removal Scope

The EE/CA should help define the scope of the removal action. The scope of the action could be, for example, total site cleanup, site stabilization, or surface cleanup of hazardous substances. It is critical that removal actions at non-NPL sites consider the potential for future listing to ensure the goals of the removal are consistent with any potential long-term remediation. When a non-time-critical removal action will be the only or last action taken to clean up a potential NPL site, the EE/CA should provide adequate documentation that activities performed at the site are sufficient to meet completion requirements.

Specific objectives vary with the type of removal. If cleanup levels are necessary as part of a specific objective, OSCs/RPMs employ several methods to determine these levels. Examples of current practice include applying an appropriate Federal or State ARAR, consulting a Regional risk assessor, or requesting support from ATSDR or ERT.

Specific objectives that clearly define the scope of the removal action are particularly important when the site poses multiple hazards and the response actions will be conducted in phases. OSCs/RPMs should always consider how the removal action would best contribute to the efficient performance of any remedial action to be taken, as required under CERCLA section 104(a)(2). OSWER Publication 9360.0-13, "Guidance on Implementation of the 'Contribute to Remedial Performance' Provision" (April 6, 1987), provides additional guidance on implementing CERCLA section 104(a)(2). For example, if EPA or the State plans to begin a long-term remedial action at the site in 2 years, the removal action should be designed to ensure that the site is stabilized until remedial action begins. The threats that meet the NCP removal criteria should be fully addressed, if possible, given the statutory limits on removal actions.

Determination of Removal Schedule

The general schedule for removal activities, including both the start and completion time for the non-time-critical removal action, should be part of the EE/CA. (A time-critical or emergency removal action may occur at any point from the planning phase to the completion of a non-time-critical removal action.) Although EE/CAs are only required when a planning period of at least 6 months is available, the nature of the threat may still dictate that action be initiated within 12 months or some other specific time period. The start date may also be influenced by weather, PRP negotiations, or Regional resources. For example, Regions should consult with Headquarters prior to taking any early action requiring funding beyond the Region's allowance. Also, weather can affect the schedule if the removal is to be implemented before winter. The time available before the removal action can be a significant factor in evaluating alternative technologies, since implementing technologies can necessitate considerable lead time.

The completion time should also be estimated for the removal action, considering the nature of the threat. It may be necessary to achieve beneficial results within a certain time frame to ensure adequate protection of public health and the environment. The time needed to sample treated wastes or other media prior to disposal should be factored into the schedule. Another important factor influencing the removal schedule is the statutory limit on Fund-financed removal actions. For Fund-lead sites not expected to qualify for either the emergency or consistency exemptions, the OSC/RPM should select a removal action alternative that can be implemented within the statutory limits. For Fund-lead sites expected to qualify for an exemption, the objective should be to select a

removal action alternative that can be implemented within a reasonable time limit. Factors such as weather and the availability of Regional resources may also affect the completion time.

The flexibility in the removal schedule can vary greatly from site to site. Some sites may require a strict schedule, while others allow wider latitude in start and completion times. For a PRP-lead site the 1-year statutory restriction on removal actions is not applicable. In such cases, it may be advisable to establish a removal schedule in an administrative order. The schedule established for a site can be an important decision criterion to evaluate removal action alternatives based on their implementation times.

For More Information:

1. CERCLA:
   §104(a)(2), Removal Action
   §104(c)(1), Statutory Limits
2. NCP §300.415(b)(2)(i)-(viii), Appropriateness Factors
3. OSWER Publication 9360.0-13, "Guidance on Implementation of the 'Contribute to Remedial Performance' Provision" (April 6, 1987).

2.6 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Based on the analysis of the nature and extent of contamination and on the cleanup objectives developed in the previous section, the OSC/RPM should identify and assess a limited number of alternatives appropriate for addressing the removal action objectives. If the information a Region typically uses to evaluate action alternatives is not sufficient, or if data quality is suspect, OSCs/RPMs should collect any additional technical information needed. If EPA is conducting oversight activities at the site, PRPs or State agencies may provide the information.

Treatment Technologies

Whenever practicable, the alternatives selection process should consider the CERCLA preference for treatment over conventional containment or land disposal approaches to address the principal threat at a site. Although CERCLA section 121(b) appears to apply only to remedial actions, the overall strategy scheme leads to the conclusion that this preference is also an appropriate goal for removal actions. Removal actions, however, cannot conform entirely to requirements for remedial actions because of site related time constraints and statutory limits on remedial actions. To identify alternatives, the OSC/RPM can draw from EPA experience with the particular technologies and contaminants involved, as well as technical advice from ERT, Office of Research and Development's (ORD)-START, the Technology Innovation Office (TIO), the Superfund Innovative Technology Evaluation program, EPA laboratories and task forces, technology vendors, and other sources.

2.6 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES (CONTINUED)

While treatability studies often need not be performed for proven technologies, in many cases a study is necessary to assure the attainment of treatment objectives. An EE/CA often allows time to plan and conduct a treatability study.

OSCs/RPMs should refer to OSWER Publication 9380.0-17, "Furthering the Use of Innovative Treatment Technologies in OSWER Programs" (August 1991), EPA/540/2-90/004, PB91-921366, for further guidance on assessing treatment options.

Based on the available information, only the most qualified technologies that apply to the media or source of contamination should be discussed in the EE/CA. The use of presumptive remedy guidance can in many cases provide an immediate focus to the discussion and selection of alternatives, speeding the process by limiting the universe of effective alternatives for the non-time-critical removal action. Presumptive remedies involve the use of remedial technologies that have been selected in the past at similar sites or for similar contaminants. By evaluating technologies that have been consistently selected at similar sites, a presumption can be developed that a particular remedy or set of remedies is appropriate for a specific site type. EPA is developing several presumptive remedies for a variety of response situations. Currently, information is available for wood treater sites in OSWER Publications 9355.0-46FS and 9355.0-46, "Technology Selection Guide for Wood Treater Sites" (May 1993), PB93-963505. This information was previously cited as OSWER Publications 9360.0-46FS and 9360.0-46. OSWER guidance is under development for solvent and municipal landfill sites.

A limited number of alternatives, including any identified presumptive remedies, should be selected for detailed analysis. Each of the alternatives should be described with enough detail so that the entire treatment process can be understood. For example, if one of the alternatives is incineration, information on whether the incineration will occur on-site or off-site should be provided, as well as the volume of waste to be treated, the disposition of the treatment residuals, and any ARARs that would affect significantly the action, such as the land disposal restrictions. The technical implementability of this set of potentially applicable alternatives can then be evaluated based on readily available information from the site characterization phase. Specific technologies may not be applicable to the treatment of wastes in the concentration and form found at the site, and so may be disregarded. The OSC/RPM, however, must avoid even the appearance that a technology has been pre-selected. All selected technologies should be fully considered.

How does this jive w/ presumptive remedy approach.

Treatment Technology Information Sources

Appendix D from OSWER Publication 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies (RI/FS) Under CERCLA" (October 1988), EPA/540/G-89/004, PB89-184626, provides a bibliography on various treatment technologies. In addition, EPA's Risk Reduction Engineering Laboratory is responsible for planning, implementing, and managing technology research, development, and demonstration programs. OSWER Publication 9380.3-03, "Inventory of Treatability Study Vendors" (March 1990), EPA/540/2-90/003a, PB91-228395, helps link the researcher and the user community.

Three additional databases can assist OSCs/RPMs in evaluating the effectiveness and availability of various treatment technologies. The Alternative Treatment Technology Information Center (ATTIC) is an on-line computer database that may be accessed with a personal computer and modem by calling 301-670-3808. ATTIC is a comprehensive, automated system that

integrates hazardous waste data into a centralized, searchable resource. Data about hazardous waste treatment technologies are found in many forms in this system, including:

- Literature search databases
- Expert lists
- Treatability databases
- Fate and transport databases
- Cost models
- Case histories
- Expert systems.

The central ATTIC database contains more than 1,400 technical documents collected in a key-word-searchable format. ORD Publication EPA/600/M-91/049, "Alternative Treatment Technology Information Center–ATTIC Brochure" (August 1991) provides additional information.

Another database operated by TIO is the Technology Vendor Information System for Innovative Treatment Technologies (VISITT). This database facilitates communication between technology vendors and government and private cleanup personnel and describes the capabilities and experience vendors have with innovative technologies. The database is useful in developing engineering studies and designs. The VISITT Hotline at 1-800-245-4505 can provide OSCs/RPMs with additional user information.

The Cleanup Information Bulletin Board (CLU-IN) provides electronic message capabilities, directories, on-line bulletins, and other cross-database files on innovative technologies. Special interest groups exist within the system specifically for OSCs/RPMs. CLU-IN can be accessed with a computer, modem line, and telecommunications software by calling 301-589-8366.

Defined alternatives are evaluated against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost. Subcriteria to be evaluated under each of the criteria are identified in Exhibit 7 on the following page.

Effectiveness

The effectiveness of an alternative refers to its ability to meet the objective within the scope of the removal action. This section of the EE/CA should evaluate each alternative against the scope of the removal action and against each specific objective for final disposition of the wastes and the level of cleanup desired. These objectives should be discussed in terms of protectiveness of public health and the environment.

Overall Protection of Public Health and the Environment

How well each alternative protects public health and the environment should be discussed in a consistent manner. This discussion draws on assessments conducted under other evaluation criteria, including long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

EXHIBIT 7
Objectives/Criteria To Be Used in Comparative Analysis of Alternatives

- ❑ Effectiveness
  - ❑ Protectiveness
    - ❑ Protective of public health and community
    - ❑ Protective of workers during implementation
    - ❑ Protective of the environment
    - ❑ Complies with ARARs
  - ❑ Ability to Achieve Removal Objectives
    - ❑ Level of treatment/containment expected
    - ❑ No residual effect concerns
    - ❑ Will maintain control until long-term solution implemented
- ❑ Implementability
  - ❑ Technical Feasibility
    - ❑ Construction and operational considerations
    - ❑ Demonstrated performance/useful life
    - ❑ Adaptable to environmental conditions
    - ❑ Contributes to remedial performance
    - ❑ Can be implemented in 1 year
  - ❑ Availability
    - ❑ Equipment
    - ❑ Personnel and services
    - ❑ Outside laboratory testing capacity
    - ❑ Off-site treatment and disposal capacity
    - ❑ PRSC
  - ❑ Administrative Feasibility
    - ❑ Permits required
    - ❑ Easements or right-of-ways required
    - ❑ Impact on adjoining property
    - ❑ Ability to impose institutional controls
    - ❑ Likelihood impose obtaining exemption from statutory limits (if needed)
- ❑ Cost
  - ❑ Capital cost
  - ❑ PRSC cost
  - ❑ Present worth cost