Integrating Water and Waste Programs to Restore Watersheds

A Guide for Federal and State Project Managers

United States Environmental Protection Agency

Acknowledgments

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Preface

The concept for the manual came from the January 27, 2004, joint EPA Office of Water and Office of Solid Waste and Emergency Response Division Directors meeting held in Tampa, Florida. Discussion at the meeting indicated that although geographic opportunities exist for water and waste program coordination, a framework was needed to improve collaboration and make it more routine. Division Directors agreed that the first step in developing a framework would be to create a compendium of success stories and to use these successes to create conceptual collaboration models. The models would be applied to other projects and afford guidance in similar, future situations.

To implement the Division Directors' agreement, EPA Region 8 was asked to develop a manual for watershed cleanup that would help regional water and waste program managers collaborate in implementing watershed cleanup projects. The resulting manual, *Integrating Water and Waste Programs to Restore Watersheds*, was based on several regional success stories.

User feedback on the manual indicated that a version for state and local staff was necessary. The purpose of this document is to enhance, strengthen, and increase the effectiveness of working relationships among EPA, state and local managers working in water and waste programs.

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NOTE: These appendices are available via **www.epa.gov/superfund/resources/integrating**

Executive Summary

The goal of this manual is to enhance coordination across United States Environmental Protection Agency (EPA), state and local waste and water programs to streamline requirements, satisfy multiple objectives, tap into a variety of funding sources and implement restoration activities more efficiently, showing measurable results. It provides a road map to conducting cross-programmatic watershed assessments and cleanups in watersheds with both water and waste program issues and presents innovative tools to enhance program integration. Water and waste programs typically work independently to accomplish their goals; however, given the overlap in activities and limited resources, it benefits both programs to work together to develop project funding, perform necessary assessments and studies, prioritize projects, conduct cleanups and monitor results. This manual provides guidance on how to integrate assessment and cleanup activities to optimize available tools and resources and help restore contaminated waters efficiently and effectively.

This manual is targeted primarily at federal and state project managers in water and waste programs who are working on assessment or cleanup projects in watersheds contaminated by hazardous materials or waste. The manual is also a helpful reference document for stakeholders involved in the watershed. This manual complements other watershed assessment, cleanup and community involvement guidance documents by presenting the authorities, resources, and processes used in hazardous materials and waste contaminated watersheds.

This manual describes the interrelationships between programs and agencies involved in watershed assessment and cleanup and suggests potential opportunities for program integration. It uses case studies to illustrate important points.

Chapter 1 presents a brief background on cleanup programs, elements of a successful watershed cleanup and the potential roles of the watershed cleanup project manager. The remainder of the document reviews these steps in greater detail to demonstrate how to develop and implement an effective watershed cleanup program.

Chapter 2 lists the primary programs and stakeholders likely to have lead roles in watershed cleanup and summarizes regulatory roles, authorities, and processes. Identifying programs and agencies with interests in the watershed is essential to the process of building a multiprogram Watershed Cleanup Team (WCT) with a holistic approach.

Chapter 3 presents the resources available for watershed assessment and cleanup and includes an expanded list of agencies, programs and other stakeholders that might be involved in watershed cleanup. Watershed-based cleanups can be accomplished through a variety of funding and other resources available for investigation, cleanup, monitoring and community involvement. This chapter specifically addresses applicability of funds, accessing the funds and project requirements for using the funds. It also discusses nonfinancial resources available through government and nongovernmental agencies, such as scientific resources, contracting resources, facility and staffing resources and analytical resources.

Chapter 4 discusses issues related to data integration and watershed assessment. This chapter discusses two primary opportunities for coordination—preliminary data compilation and streamlined collection of additional data. ***The Comprehensive Preliminary Watershed Assessment*** is presented as a tool for preliminary data compilation. This tool focuses the efforts of the WCT on the most important watershed issues and helps identify the primary stakeholders and watershed cleanup goals. It is an effective tool that will help project managers understand watershed conditions and develop a preliminary watershed conceptual model.

Streamlining watershed assessment involves coordinated and collaborative data collection. To ensure that all opportunities for integration are used to save resources while reducing the waste of duplicative sampling efforts, coordinated assessment activities are performed independently by programs, agencies and stakeholders. The WCT reviews in advance the sampling and analysis plans (SAPs), which include the field sampling plan (FSP) and the quality assurance project plan (QAPP). Collaborative assessment is conducted when WCT partners combine efforts to perform additional assessment and sampling. Collaborative assessment requires developing common approaches and consistent methods that consider the multiple programs involved.

To integrate data compilation and collection, managers must consider the data requirements of the various programs. Chapter 4 presents issues that involve compiling existing data and collecting additional data, such as data quality, data evaluation, data management and the benchmarks against which the data are compared. It also presents the Triad approach to sampling used by several EPA programs. To provide personnel from different programs with an understanding of other program efforts, the chapter ends with a summary of typical program-specific assessment procedures and requirements.

Chapter 5 discusses integrated watershed cleanup topics such as the ***Watershed Feasibility Assessment (WFA), "Three-Rs" approach***, Superfund-Restoration integration, total maximum daily load (TMDL)-Restoration integration using water quality trading, Supplemental Environmental Projects and WCT task assignments. It also discusses integrated monitoring. The chapter continues with a summary of program requirements for determining remediation and restoration actions and for long-term monitoring of watershed conditions. It concludes with additional topics that managers should consider in watershed cleanup such as wetlands and other applicable or relevant and appropriate requirements (ARARs).

This document proposes that federal and state programs and local watershed groups use the ***WFA*** to review and prioritize cross-programmatic cleanup opportunities. The WFA provides critical information regarding significant point and nonpoint sources (NPS) that have been identified and quantifies their associated loads to surface water. The analysis suggests potential remediation alternatives and assigns costs associated with specific load reductions. The WFA might not fulfill all the requirements of the various programs (such as a Superfund Feasibility Study (FS), Engineering Evaluation/Cost Analysis (EE/CA), or TMDL allocated loads), but it would provide the framework for these documents. To facilitate cleanup at each individual location, managers would perform fine-tuned assessment and design in subsequent steps according to specific program requirements.

The ***"Three-Rs"*** are remediation, restoration and reuse. The WCT should cooperatively set remediation, restoration and reuse goals and ensure the goals are met by project implementation by using applicable authorities and available funding mechanisms.

In summary, coordinating the efforts of agencies and programs yields significant opportunities for streamlining and reducing the final cost of watershed cleanup, restoration, and redevelopment, resulting in cleaner watersheds for beneficial use.

List of Acronyms

ACRT................Allis Chalmers Reorganization Trust
AEA..................Atomic Energy Act
AMD.................Acid Mine Drainage
AML ....Abandoned Mine Land
ARARs..............Applicable or Relevant and Appropriate Requirements
ASTM ....American Society for Testing and Materials
ATSDR..............Agency for Toxic Substances and Disease Registry
AWPPG ....Assessment and Watershed Protection Program
AWRC ....Anacostia Watershed Restoration Commission
BASINS ....Better Assessment Science Integrating Point & Nonpoint Sources
BCHD ....Boulder County Health Department
BEAP ....Brownfield Environmental Assessment Program
BEDI.................Brownfields Economic Development Initiative
BFPP.................Bona Fide Prospective Purchaser
BEACH ....Beaches Environmental Assessment Closure and Health
BIA...................Bureau of Indian Affairs
BLM..................Bureau of Land Management
BMPs................Best Management Practices
BOD ....Biological Oxygen Demand
BOM.................Bureau of Mines
BOR..................Bureau of Reclamation
BTAG................Biological Technical Assistance Group
CA ....Cooperative Agreement
CAA..................Clean Air Act
CARE................Community Action for a Renewed Environment
$CBOD_5$..............carbonaceous biochemical oxygen demand
CCC..................Commodity Credit Corporation
CDC ....Center for Disease Control
CDF ....Confined Disposal Facilities
CDPHE ....Colorado Department of Public Health and Environment
CERCLA............Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS...........CERCLA Information System
CFDA................Catalog of Federal Domestic Assistance
CFR ....*Code of Federal Regulations*
CLP...................EPA Contract Laboratory Program
CLU-IN ....Clean-Up Information
CMD ....Coal Mining Drainage

CMI ....Corrective Measures Implementation
CMS ....Corrective Measures Study
CNPCP ....Coastal Nonpoint Pollution Control Program
CRDL.................Contract Required Detection Limit
CRP ....Conservation Reserve Program
CRQL.................Contract Required Quantitation Limit
CSO...................Combined Sewer Overflow
CSP ....Conservation Security Program
CTIC..................Conservation Technology Information Center
CU ....University of Colorado
CWA..................Clean Water Act
CWI...................Clean Water Initiative
CWNS................Clean Watersheds Needs Survey
CWRP................Corporate Wetlands Restoration Partnership
CWSRF..............Clean Water State Revolving Fund
DCNR ....Department of Conservation and Natural Resources
DelTRiP ....Delaware River Toxics Reduction Program
DEP ....Department of Environmental Protection
DEQ ....Department of Environmental Quality
DDT ....Dichlor-Diphenyl Trichlorethane
DNR ....Department of Natural Resources
DNREQ ....Department of Natural Resources and Environmental Quality
DRBC ....Delaware River Basin Commission
DOC ....Department of Commerce
DoD...................Department of Defense
DOE...................Department of Energy
DOI ....Department of Interior
DOJ ....Department of Justice
DQA ....Data Quality Assessment
DQI ....Data Quality Indicators
DQO..................Data Quality Objectives
DU ....Designated Use
DWQ ....Division of Water Quality
DWSRF ....Drinking Water State Revolving Fund
ECARP...............Environmental Conservation Acreage Reserve Program
EE/CA ....Engineering Evaluation/Cost Analysis
EFC ....Environmental Finance Center
EIS ....Environmental Impact Statement
EJ......................Environmental Justice
EPA....................U.S. Environmental Protection Agency
EPCRA ....Emergency Planning Community Right-to-Know Act
EPIC ....Environmental Photographic Interpretation Center
EQIP..................Environmental Quality Incentives Program
ERAMS..............Environmental Radiation Ambient Monitoring System
ERRS.................Emergency and Rapid Response Services
ERT ....Environmental Response Team
ESA ....Endangered Species Act
ESAT..................Environmental Services Assistance Team

ESD ....Explanation of Significant Differences
FIFRA ....Federal Insecticide, Fungicide, and Rodenticide Act
FISRWG.............Federal Interagency Stream Restoration Working Group
FLM...................Federal Land Management Agency
FPQA ....Food Quality Protection Act
FRP ....Federal Response Plan
FS ....Feasibility Study
FSA ....Farm Service Agency
FSP....................Field Sampling Plan
FWPCA.............Federal Water Pollution Control Act
GIS ....Geographic Information System
GPS ....Global Positioning System
GRTS ....Grants Reporting and Tracking System
HABS.................Historic American Building Survey
HAER ....Historic American Engineering Record
HEP ....Habitat Evaluation Procedures
HRS...................Hazard Ranking System
HSI....................Habitat Suitability Indices
HUD ....Housing and Urban Development
IAC ....Implementation Advisory Council
IAG ....Interagency Agreement
ICIS ....Integrated Compliance Information System
IPM ....Integrated Pest Management
IRS ....Internal Revenue Service
LA ....Load Allocation
LERRDs ....Lands, Easements, Rights-of-way, Relocations, and Disposal Sites
LUST ....Leaking Underground Storage Tank
LWTF ....Left Hand Watershed Task Force
LWOG................Left Hand Watershed Oversight Group
MCL ....Maximum Contaminant Level
MCLG ....Maximum Contaminant Level Goal
MDN..................Mercury Deposition Network
mg/L ....Milligrams per Liter
MNR..................Monitored Natural Recovery
MOA..................Memorandum of Agreement
MOS ....Margin of Safety
MOU ....Memorandum of Understanding
MPCA ....Minnesota Pollution Control Agency
MS4...................Municipal Separate Storm Sewer System
MSWLF ....Municipal Solid Waste Landfill
NAD ....National Assessment Database
NAGPRA...........Native American Graves and Repatriation Act
NASQAN ....National Stream Quality Accounting Network
NAWQA.............National Water Quality Assessment
NCP...................National Oil and Hazardous Substances Pollution Contingency Plan
NEPA ....National Environmental Policy Act
NFS ....National Forest Service
NFWF................National Fish and Wildlife Foundation

NHD ....National Hydrography Dataset
NLFWA.............National Listing of Fish and Wildlife Advisories
NOAA................National Oceanic and Atmospheric Administration
NOx...................Nitrogen Oxides
NPDES..............National Pollutant Discharge Elimination System
NPL ....National Priorities List
NPS ....Nonpoint Source
NRCS ....Natural Resources Conservation Service
NRDA ....National Resources Damage Assessment
NTCRA ....Non-Time Critical Removal Action
NTTS.................National Total Maximum Daily Load Tracking System
NTU ....Nephelometric Turbidity Units
NWIS.................National Water Information System
O&M ....Operations and Maintenance
OPA...................Oil Pollution Act of 1990
ORD ....EPA Office of Research and Development
OSC...................On-Scene Coordinator
OSM ....Office of Surface Mining
OSRTI................Office of Superfund Remediation and Technology Innovation
OSWER ....Office of Solid Waste and Emergency Response
OU.....................Operable Unit
PA......................Preliminary Assessment
PAH ....Polycyclic Aromatic Hydrocarbon
PBT ....Persistent, Bioaccumulative, Toxic
PCBs.................Polychlorinated Biphenyls
PCB ....Polychlorinated Biphenyl
PCS ....Permit Compliance System
PMP ....Pollutant Minimization Plan
PP ....Proposed Plan
PPM ....Parts per Million
PRGs ....Preliminary Remediation Goals
PRP ....Potentially Responsible Party
QAPP.................Quality Assurance Project Plan
QA/QC ....Quality Assurance/Quality Control
RA ....Remedial Action
RACs ....Response Action Contracts
RAMS ....Restoration of Abandoned Mine Sites
RAS ....Routine Analytical Services
RBCs ....Risk Based Concentrations
RCRA ....Resource Conservation and Recovery Act
RD ....Remedial Design
REAC.................Response Engineering and Analytical Contract
RFA ....RCRA Facility Assessment
RFI ....RCRA Facility Investigation
RFP ....Request for Proposals
RI/FS.................Remedial Investigation/Feasibility Study
RNRF.................Renewable Natural Resources Foundation
ROD ....Record of Decision

RPGP................Regional Priorities Grants Program
RPM ....Remedial Project Manager, also Regional Project Managers
RTDF................Remediation Technologies Development Forum
SAP ....Sampling and Analysis Plan
SARA................Superfund Amendments and Reauthorization Act of 1986
SAS ....Special Analytical Services
SCDM...............Superfund Chemical Data Matrix
SCWA ....Swatara Creek Watershed Association
SDWA................Safe Drinking Water Act
SDWIS..............Safe Drinking Water Information System
SEP....................Supplemental Environmental Project
SI.......................Site Inspection
SMBSC.............Southern Minnesota Beet Sugar Cooperative
SMIC.................Surface Water and Water Quality Models Information Clearinghouse
SMOA ....Superfund Memorandum of Agreement
SRF ....State Revolving Fund
SRI ....Superfund Redevelopment Initiative
SSAs..................Site-Specific Assessments
SSC ....State Superfund Contract
SSLs ....Soil Screening Levels
SSO ....Sanitary Sewer Overflow
SSRC.................Superfund Sediment Resource Center
STAG ....State and Tribal Assistance Grant
START ....Superfund Technical Assessment and Response Team
STORET ....Storage and Retrieval of Water-Related Data
SWP ....Source Water Protection
SWPPP ....Stormwater Pollution Prevention Plan
TAC ....Toxics Advisory Committee
TAG ....Technical Assistance Grant
TBA ....Targeted Brownfields Assessments
TBC ....To-Be-Considered
TCRA................Time Critical Removal Action
TDS ....Total Dissolved Solids
TMDL................Total Maximum Daily Load
TRI ....Toxics Release Inventory
TOSC................Technical Outreach Services for Communities
TSC ....Technical Support Center
TSCA ....Toxic Substances Control Act
TSDF ....Treatment, Storage, and Disposal Facilities
TSS....................Total Suspended Solids
TVA ....Tennessee Valley Authority
UAA...................Use Attainability Analyses
UIC....................Underground Injection Control
UPA ....Unified Phase Assessment
USACE..............U.S. Army Corps of Engineers
USC ....United States Code
USCG ................U.S. Coast Guard
USDA ................U.S. Department of Agriculture

USFS ................U.S. Forest Service
USFWS.............U.S. Fish and Wildlife Service
USGS................U.S. Geological Survey
USNPS .............U.S. National Park Service
UST ....Underground Storage Tank
VCP ....Voluntary Cleanup Program
VOC..................Volatile Organic Compound
WATERS ....Watershed Assessment, Tracking, and Environmental Results
WCT ....Watershed Cleanup Team
WFA ....Watershed Feasibility Assessment
WLA ....Wasteload Allocation
WPDG ....Wetlands Program Development Grants
WQBELs ....Water Quality-Based Effluent Limits
WQLS ....Water Quality Limited Segments
WQS.................Water Quality Standards
WQSDB ....Water Quality Standards Database
WQX ....Water Quality Exchange
WRDA ....Water Resources Development Act

Introduction

Purpose

The purpose of this manual is to help better integrate assessment and cleanup activities when addressing the unique challenges presented by contaminated watersheds. The contamination in a watershed typically comes from many sources, differing geographically and over time. Although many federal and state programs address such contamination, they often operate independently and with little interaction. EPA's principal regulatory programs that control ongoing source activity—the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), and the Clean Air Act (CAA)—are media-centric, as are most states' authorized versions of those programs. EPA's response programs for addressing past contamination—principally the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Oil Pollution Act (OPA)—are project-specific and often consult with their regulatory counterparts only at discrete points in the cleanup process as required by regulations. These communication and coordination difficulties can be especially acute when trying to clean up a contaminated watershed, the sources of which often include ongoing point source and nonpoint source (NPS) discharges as well as historical disposal activities. Moreover, the cleanup of contaminated watersheds typically involves many stakeholders, including private and commercial interests, various federal and state government agencies acting in their roles as land managers or trustees as well as regulators and local land use planning and redevelopment authorities.

The goal of this manual is to draw together the many resources within the varied programs and to describe ways to integrate the use of available tools and resources. This approach will likely result in more efficient and effective cleanup and restoration of contaminated watersheds.

Target Audience

This manual is written primarily for project managers in water and waste programs who are working on assessment or cleanup projects in watersheds contaminated by hazardous substances (broadly defined). The manual is intended to complement and summarize other watershed assessment, cleanup and community involvement guidance documents, not to replace them.

Organization

This manual describes the interrelationships between programs and agencies involved in watershed assessment and cleanup, and it suggests potential opportunities for program integration. This introductory chapter presents a brief background on cleanup programs, elements of a successful watershed cleanup and potential roles of the watershed cleanup project manager. The remainder of the document reviews each step in greater detail to show how to develop and implement an effective watershed cleanup program. Chapter 2 lists the programs and stakeholders likely to have lead roles in watershed cleanup and summarizes regulatory roles, authorities and processes. Chapter 3 presents the resources available for watershed assessment and cleanup; it also includes an expanded list of agencies, programs and other stakeholders that might be involved in a watershed cleanup. A summary of the resources and their applicability is provided in a table at the end of the chapter. Chapters 4 and 5 summarize the assessment and cleanup studies performed, processes used and approaches applied by each of the major EPA and state programs and point out opportunities for integration. Two tools, the Comprehensive Preliminary Watershed Assessment and the Watershed Feasibility Assessment (WFA), are explained in Chapters 4 and 5, respectively, to help managers who might develop the watershed conceptual model and the watershed cleanup plan. Case studies are interspersed throughout the manual to highlight key concepts. For example, the Left Hand Watershed case study at the end of Chapter 2 demonstrates a multiprogrammatic approach to watershed cleanup during the assessment, cleanup and funding stages.

Federal Programs that Address Waterbody Contamination

(See Chapters 2 and 3)

- Water Quality Monitoring and Assessment
- National Pollutant Discharge Elimination System (NPDES) Program
- TMDL Program
- CWA section 404 Dredge and Fill
- NPS Grants
- Source Water Protection
- Superfund
- Brownfields
- RCRA
- Abandoned Mine Lands
- Farm Bill
- Natural Resource Damage Assessment (NRDA)

Background

Over the past 30 years the country has made great strides toward reducing the amount of pollution in our waters through regulatory controls and improved wastewater treatment. Many of our waterways, however, are still contaminated as a result of ongoing industrial activities, polluted runoff and the remains from historical disposal activities. In addition, the time frames associated with cleanup at some contaminated sites span decades, hampering the overall success of watershed restoration. Specific water and waste programs often become involved in a watershed on a sequential or location-specific basis rather than following a coordinated approach. This lack of integration can waste resources and lead to conflicting site-specific results in a watershed that are difficult to redress after a particular agency decision is reached, such as issuance of a CERCLA record of decision (ROD) or finalization of a TMDL. For example, conflict might occur when one regulatory program office allocates loads within a watershed in a TMDL to meet water quality standards (WQS) while another regulatory program office waives WQS when selecting a site remedy under CERCLA within the same watershed. Other potential conflicts can arise when trying to appropriately coordinate schedules for taking action to address releases from different sources within a watershed under different regulatory authorities.

Although there are numerous potential pitfalls in attempting to coordinate various programs in a watershed cleanup, agencies can complement and reinforce each other's activities, avoid duplication and leverage resources to achieve greater results through integration.

Programs that Address Waterbody Contamination

Various federal and state programs address the assessment, cleanup and restoration of contaminated waterbodies. These programs are discussed in detail in Chapter 2. Because Superfund and RCRA sites are often in watersheds where TMDLs are being developed, the chapter summarizes three of the most prominent programs: the CERCLA Program, the RCRA Corrective Action Program, and the TMDL Program.

The CERCLA Program identifies sites from which hazardous substances, pollutants or contaminants have been released or have the potential to be released, posing a threat to human health or the environment. If a site has been deemed sufficiently hazardous, it is placed on the National Priorities List (NPL) to receive funding and priority for cleanup. In general, EPA carries out the Superfund Program at most Superfund sites, either directly or by supervising work being performed by potentially responsible parties (PRPs). States can have the lead role at sites within their jurisdiction after developing a Superfund Memorandum of Agreement (SMOA), State-Superfund Contract (SSC), and/or a Cooperative Agreement (CA) with EPA. Other federal agencies carry out CERCLA cleanups (using separately appropriated funds) at facilities under their respective jurisdiction, custody or control.

Accidents or other activities at RCRA treatment, storage, and disposal facilities have sometimes released contamination into soil, ground water, surface water and air. The RCRA Corrective Action Program allows these facilities to address the investigation and cleanup of such releases themselves, under governmental supervision. The RCRA Corrective Action Program differs from Superfund in that it deals with sites that have viable operators and ongoing operations.

Under the CWA's TMDL Program, states are required to identify waterbodies that do not meet WQS. Such *impaired waterbodies* are placed on the state's CWA section 303(d) list if a TMDL has not yet been completed. For each waterbody on a state's 303(d) list, the state must calculate how much of a particular pollutant (contributing to the impairment) can enter the waterbody without exceeding the WQS. The calculation, called a TMDL, must be submitted to EPA for approval.

If the watershed includes 303(d)-listed waters or has a TMDL, the waste and water programs should be encouraged to work together to ensure that assessment and cleanup activities are coordinated so that the requirements of all the programs are addressed.

Historically, the restoration of contaminated waterbodies has been approached from the perspective of individual federal and state programs. With shrinking budgets and increased demands on our time, we need to approach the cleanup of waterbodies in a holistic and integrated manner, using all the programmatic resources available. In many cases, the data collected to satisfy requirements under one program also can be used to meet requirements under other programs. For example, a tracer study performed to determine contaminant fate and transport for a Remedial Investigation (RI) at an NPL site could also be used to determine contaminant loading for a TMDL. Water quality and flow information used to develop or refine a state WQS could be used to help meet Superfund Site Inspection, RI, Risk Assessment, NRDA, and state water quality assessment requirements if sample collection and analysis procedures are agreed upon in advance. TMDL targets are often used as one of the remediation endpoints for RCRA sites that affect water quality.

Using a Watershed Approach

In the past 15 years, more and more organizations and agencies have moved away from individual efforts and more toward managing water resources using a watershed approach. A watershed approach is a flexible framework for managing water resource quality holistically within specified drainage areas. This approach includes stakeholder involvement and activities supported by sound science and appropriate level of management. The watershed planning and cleanup process works within this framework by following a series of cooperative, iterative steps to assess existing conditions, identify and prioritize problems, develop goals and cleanup strategies and monitor the effectiveness of cleanup efforts.

Developing a Comprehensive Watershed Management Plan

Use of a watershed approach begins with the development of a watershed management plan. EPA Nonpoint Source (CWA section 319) funds, which are administered by the states, can be used to support the development of watershed plans by local stakeholder groups. A watershed plan is a strategy that provides assessment and management information for a geographically defined watershed, including the analyses, action, participants and resources relating to developing and implementing the plan. A successful plan should have monitoring and evaluation components to document progress and support adaptive management processes to address new opportunities as well as emerging problems previously undocumented.

The watershed activities described in this manual, although similar to watershed plans frequently developed with 319 funds, are focused on watersheds contaminated with hazardous or toxic materials. Efforts to address toxic substances in the watershed might be a subset of a larger watershed management plan and should complement that plan. The Pinellas County case study at the end of this chapter demonstrates multiple agencies cooperating to prepare a watershed management plan.

To build the capacity of state and local practitioners in developing integrated watershed plans, EPA has created several new tools and resources. The Draft Handbook for *Developing Watershed Plans to Restore and Protect Our Waters* (EPA 841-B-05-005), available via **www.epa.gov/owow/nps/watershed_handbook**, is intended to help communities, watershed organizations, and agencies develop and implement watershed plans to meet water quality standards and protect water resources. The handbook helps practitioners quantify pollutant loads, determine estimates of load reductions required to meet water quality standards, develop effective management measures, track progress, and conduct community outreach. In January 2006, EPA hosted a two-hour Webcast on the handbook, and the archived seminar can be downloaded at **www.epa.gov/watershedwebcasts**.

A *Watershed Plan Builder Tool* is also available, which complements the handbook. This interactive, web-based tool is designed to help local watershed organizations develop integrated watershed plans to meet state and EPA requirements and promote water quality improvement. The tool walks practitioners through the key planning steps and produces a customized watershed plan that is tailored for a particular watershed and populated with relevant links to EPA, other federal agencies, and state water programs. The tool is available at **www.epa.gov/owow/watershedplanning**.

Another tool, the *Nonpoint Source Outreach Toolbox*, is intended for use by state and local agencies and other organizations interested in educating the public on nonpoint source pollution or stormwater runoff. The toolbox contains a variety of resources to help develop an effective and targeted outreach campaign, including a searchable catalog of nearly 800 print, radio and TV ads and outreach materials. The toolbox is available at **www.epa.gov/nps/toolbox**.

EPA's Watershed Academy hosts monthly Webcasts and provides both live and Web-based training for federal agencies, states, local governments, watershed groups and others on implementing a watershed approach and other aspects of watershed management. **www.epa.gov/owow/watershed/wacademy**

Elements of an Effective Watershed Cleanup Process

Several elements are essential for successful watershed cleanups. The steps presented in Figure 1-1 and described below apply to most projects. However, when the watershed approach is initiated

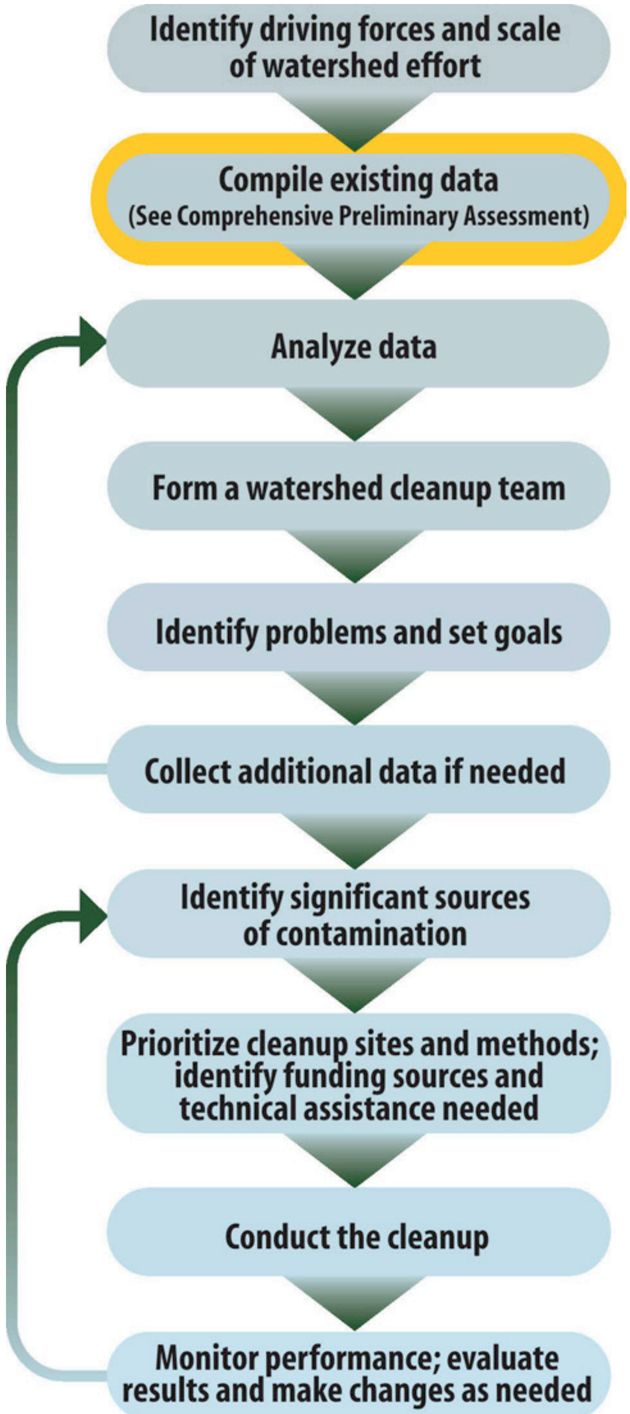


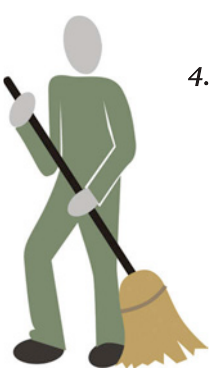
Figure 1-1. Watershed Cleanup Process

the extent and importance of the elements are likely to vary depending on the scope, location and complexity of the problem and the status of any existing program activities in the watershed. Community involvement is encouraged throughout the process and, indeed, is a required part of any CERCLA cleanup or TMDL development. Although, ideally, progress through these steps will be iterative, the key point is to ensure that they are accomplished, drawing on all possible resources available from all the stakeholders.

1. ***Identify driving forces and scale of watershed effort.*** The identification of an affected watershed often begins with a CWA 303(d) or NPL listing. These actions spur public interest and trigger funding support for public and agency involvement. The geographic scale of the project area will vary with the scope of the problem and the location of sources that contribute to the problem. If subwatersheds are designated, an additive approach can be taken to allow integration with downstream subwatersheds. The scale of the effort can also be defined by the impacts that will be addressed. The hydrologically defined geographic area should include all potential sources that can contribute to the impairment of the waterbody.

2. ***Compile existing data.*** To conduct an initial assessment, the Watershed Cleanup Team (WCT) collects and evaluates all existing water chemistry and flow, sediment, geological, soils, biological and source data. Special care should be taken to ensure that each stakeholder contributes existing data for use in a watershed-wide database. Often individual members of large organizations, including federal and state agencies as well as large, multi-location businesses, are unaware of all the information resources available to them. In addition to regulatory and water resource agencies, colleges and universities are often an untapped source of information. Data should be compiled so that all participants can access and use it. Issues related to data integration are discussed in Chapter 4. Data should also be validated by field reconnaissance. A useful tool to accomplish preliminary data integration and field validation on a watershed-wide basis is the Comprehensive Preliminary Watershed Assessment, presented in Chapter 4. The assessment can be used to develop a site conceptual model, examples of which are also included in Chapter 4.

3. ***Analyze data.*** On the basis of existing data, the Comprehensive Preliminary Watershed Assessment, data analysis and the site conceptual model, stakeholders will determine whether additional data are needed and, if so, how they will be collected. Data needs will depend on specific programmatic requirements. The studies conducted for the major assessment and cleanup programs are described in Chapter 4, along with potential opportunities for integration, but participants should also consider additional areas for integration that might apply to the contaminants, watershed, and participants in the specific watershed project. After carefully considering the types of additional data required for each agency or program and evaluating opportunities to consolidate data collection, managers can determine the methods and mechanisms for collecting the data. The data can be collected independently by stakeholders with available authorities and resources (as long as it is collected according to an agreed-upon quality assurance/quality control (QA/QC) plan, as described below), or a collaborative data collection effort can be launched.



4. ***Form a WCT.*** A variety of stakeholders might play significant roles in the watershed cleanup, including local, state and federal governments; private corporations; nonprofit organizations; and concerned citizens. Many impaired waterways already have one or more nongovernmental organizations working on restoration activities. A key component of an effective watershed approach is ensuring communication and cooperation among the various community, local, state and federal stakeholders. The effort can be facilitated by a designated watershed project manager from a waste or water program. The project manager should identify regulatory programs that have potential involvement in assessment or cleanup efforts in the watershed and examine opportunities to coordinate resources in the watershed. Additional stakeholders might be identified later as additional land ownership or regulatory issues arise. The effort should

promote a holistic approach in both a programmatic and geographic sense to ensure coordination in establishing and achieving cleanup goals.

5. ***Identify problems and set goals.*** The WCT identifies the problems and expected results or outcomes of assessment and cleanup. Each program or stakeholder group will identify its priorities and goals, provide available data and commit to a level of involvement in the process. Involvement can include in-kind services, contract support, funding and data acquisition or management; the possibilities should not be limited. The WCT establishes common endpoints or, if necessary, agrees to do so on the basis of the findings of additional studies. Often one of the most difficult issues is prioritizing sites for cleanup—a determination that is the product of both regulatory and response program requirements, as well as stakeholder input. Also, a CERCLA removal, a CERCLA remedial action and a natural resource restoration protection project each might result in a different degree of cleanup because of the respective programs' differing goals. Although some objectives will be unique to specific stakeholders, information gathered as part of work in the watershed should be shared with the stakeholder group and at least summarized for the public, ideally through a regularly updated Web site. (See the discussion of Community Outreach and Involvement below.) This might be a contentious process, but all stakeholder interests should be considered. Recognize that while regulatory agencies typically have responsibilities that must be carried out, any of the stakeholders might suggest ideas for carrying them out creatively.

6. ***Collect additional data, if needed.*** Identify potential sampling and analysis resources. Such resources can include EPA regional labs, access to existing CERCLA lab contracts and grants to stakeholders or local universities. For collaborative sampling efforts, a joint sampling and analysis plan (SAP) should be prepared, and agency staff and stakeholders participating in fieldwork should be provided training to ensure that data collection is performed according to Agency protocol. Additional data collection will be determined as additional sources are identified and priorities are set. The process can be iterative. Any agencies collecting data independently of the collaborative efforts should agree to abide by the SAP, or the absence of adherence should be duly noted. In any event, independently collected data should be characterized by consistent naming conventions and data format to allow all data to be compiled and shared through a single database.

7. ***Identify significant sources of contamination.*** Determine the significant sources of contamination and the associated contaminant loads on the basis of data from the Comprehensive Preliminary Watershed Assessment and additional data collected. This is part of the TMDL development, but it will also help other participants to prioritize sites. Identification and quantification of all significant sources provides the necessary data to assess the cumulative impacts from the watershed to the impaired waterbody. Identify seasonal variations in loads and loading contributions from the various sources. Identify resources for cleanup priorities and any additional assessments that will be necessary at significant source locations.

8. ***Prioritize cleanup sites and methods.*** The WCT identifies priority cleanup sites and potential cleanup alternatives. A tool it can use to evaluate cleanup options and their applicability to various situations is the WFA, described in Chapter 5. Many factors can affect the choice of priority cleanup locations, including contribution to contaminant loading, authority to require cleanup, willingness of property owners to participate, funding mechanisms, complexity of the site and available technologies. Estimates of load reductions that would result from the

cleanup of selected sites require supporting technical analysis demonstrating that the cleanup will attain and maintain the water quality defined by individual program standards.

9. ***Conduct the cleanup.*** Cleanup can be accomplished through CERCLA or RCRA actions, voluntary cleanups, brownfields cleanups, and implementation of NPDES permits, TMDLs, best management practices (BMPs) or any other available methods. Each of these cleanup methods typically requires the participation of the affected site owner and other PRP, voluntarily or pursuant to enforceable requirements. In addition, EPA might have resources to fund CERCLA cleanups, to facilitate brownfields cleanups and to otherwise aid the effort. To avoid potential conflicts that can arise when trying to coordinate schedules and appropriate levels of cleanup for taking action to address releases from different sources within a watershed under different regulatory authorities, a document can be developed in which stakeholders delineate a clear process and line of authority for managing cleanup actions. The document need not itself be legally binding but can reference regulations or other agreements.

10. ***Monitor performance.*** The watershed project manager develops a monitoring plan to determine the effectiveness of the implementation or cleanup actions and determine whether load reductions are being achieved and endpoints met. Effective long-term monitoring should include parameters of interest to all stakeholders and can include involvement of federal, state, tribal and local agencies; community groups; volunteer organizations; and educational institutions.

Community Outreach/Involvement

Although the stakeholders should represent a cross section of the community or communities affected by the watershed cleanup, the WCT will likely need to communicate directly with those affected by its work. CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require extensive outreach to affected communities, and cleanups proposed at NPL sites must be presented to the public for their review and comment. EPA has issued several useful guidance documents supporting such activities, including the *Superfund Community Involvement Handbook*, **www.epa.gov/publicinvolvement/involvework.htm**. EPA is developing an additional resource for creating and operating a WCT, *Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, EPA 841-B-05-005, October 2005, **www.epa.gov/owow/nps/watershed_handbook**. EPA maintains a searchable, online directory of watershed organizations at **www.epa.gov/adopt** that lists more than 4,000 groups involved in watershed protection activities across the country. This can serve as a useful resource in reaching out to key community groups.

Role of the Watershed Project Manager

The project manager is responsible for forming the WCT or interacting with the group in a manner that will allow programs, agencies and communities to work together. The level of effort required and specific tasks will vary significantly depending on the size and complexity of the project and the number of participating agencies and stakeholders. Initial tasks the project manager might perform or arrange include the following:

- Identify stakeholders
- Initiate contact with all relevant stakeholders for the purpose of getting project buy-in
- Inform stakeholders of the ten elements of an effective watershed cleanup process
- Prepare an initial problem statement and maps summarizing existing data for use at the initial stakeholder meeting

- Identify potential funding for stakeholder groups and assist in funding acquisition, as necessary
- Continue communication with all participants throughout the process
- Organize and arrange meetings
- Prepare information sheets for use throughout the project, including a draft information sheet for use by participants in enlisting support for watershed cleanup efforts
- Prepare Comprehensive Preliminary Watershed Assessment
- Prepare statements of work for grants and contractors

If the WCT determines that a consolidated sampling effort will be conducted, the project manager might also perform or arrange for the following tasks:

- Perform initial site reconnaissance
- Prepare SAP
- Identify sampling locations
- Organize sampling responsibilities
- Arrange for training on sampling and sample-handling methods
- Develop maps showing sampling sites, potential sources and waterbody names and points of access to sampling sites
- Use Global Positioning System (GPS) technology to identify sampling sites
- Facilitate agreement on sampling methods, analytes, timing and priorities
- Enlist assistance with field support, funding support, and public participation support
- Enlist regional, state or contract laboratory support
- Synchronize sampling events
- Arrange multiprogram/multiagency sampling teams
- Review and assess sampling results and provide data summaries

Identifying Priority Watersheds

Cross-coordination between waste and water programs on individual waterbodies and in watersheds should be examined for all sites that have the potential to involve multiple programs. Often determinations are made in the EPA Regions and states to focus significant resources on certain *priority watersheds*. Numerous environmental and human health factors, resource availability, stakeholder interests, and any specific legal requirements should be considered in the process of determining which watersheds will be designated as *priorities*. Water quality is clearly an important consideration but so are soil contamination, pesticide runoff, endangered species, loss of wetlands (acreage and condition), miles of impaired streams, air pollution deposition, wildlife impacts, natural vegetation impacts, human health concerns and many other factors. The second case study in this chapter presents Oregon's prioritization of its 303(d) list of impaired waters for TMDL development, which takes into account the severity of the pollution and the uses of such waters.

CASE STUDY

Developing a Watershed Management Plan

Cross Bayou Watershed, Pinellas County, Florida

Multiple stakeholders are preparing a watershed management plan for the Cross Bayou watershed in Pinellas County, the most densely populated county in Florida.

Background

The overall watershed management plan will address flooding, erosion, sedimentation, and stormwater pollution in the watershed through management strategies that identify and address sensitive and degraded uplands, wetland and open-water habitats, and sources of known or potential contamination. The plan will focus on the 10.5-mile-long Cross Bayou Canal, which has very poor water quality relative to other waterbodies in Pinellas County.

Cross Bayou, Florida

Hundreds of regulated sites within the pilot target area affect water quality in the Cross Bayou Canal and across the watershed. Pinellas County has created an inventory of sites of concern within the area. The county is establishing a brownfields program as the Cross Bayou watershed management plan is developed. The primary goal of the pilot is to integrate and implement Brownfields, One Cleanup, and Land Revitalization principles within the watershed area.

The watershed management plan's objectives and the wide diversity of the federal, state, and local partnership involved in the Watershed Management Taskforce provide an optimum framework for a successful One Cleanup/Land Revitalization pilot project.

Stakeholders

EPA programs involved in the area-wide pilot include the One Cleanup and Land Revitalization, Brownfields, Underground Storage Tank, RCRA, CERCLA, Federal Facilities, Pollution Prevention, Watershed Management, NPDES, NPS, Smart Growth, and National Estuary programs. Other federal partners include the National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE), Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), Federal Aviation Administration, U.S. Coast Guard, and federal brownfields partners. Partners within the Florida Department of Environmental Protection include the Brownfields, Underground Storage Tank (UST), RCRA, CERCLA, Federal Facilities, Waste Cleanup, and Water Quality Programs. The Florida Fish and Wildlife Conservation Commission also is a partner. Regional partners include the Southwest Florida Water Management District and Tampa Bay National Estuary Program. Local government partners include Pinellas County at the head of the Watershed Management Taskforce and the cities of Pinellas Park, Largo and Seminole. Stakeholder involvement of local citizens and businesses will be covered by the Citizens Advisory Committee to the Watershed Management Taskforce.

Key Activities

The pilot project will coordinate water quality improvements with cleanup and redevelopment priorities.

- The watershed management plan will provide information online to the public about regulated sites in the watershed. Detailed information on sites that are remediated under the watershed management plan and pilot project will be provided through GIS and Web-based applications.
- The nexus of environmental cleanup and water quality assurance under the pilot project provides opportunities for federal and state regulators to integrate cross-program performance measures and results.
- Brownfields and other underutilized properties will be evaluated for productive reuse, including evaluation for inclusion in the implementation strategy for the Cross Bayou watershed management plan.

CASE STUDY

Criteria Used to Identify Priority Watersheds for Cleanup

State of Oregon

Background

Oregon developed a list of criteria to help prioritize its 303(d) list of impaired waters for TMDL development. The four levels of priority take into account the severity of the pollution and the anticipated uses for each waterbody.

Priority 1

- ***Endangered Fish Species:*** Spawning and rearing waterbodies for federally listed threatened or endangered species or species addressed under the Oregon Plan.
  - ***Parameters of Concern:*** Biological criteria, dissolved oxygen, flow modification, habitat modification, pH, sedimentation, temperature, total dissolved gas, toxics, turbidity
- ***Health Advisories:*** Streams and lakes where the Oregon Health Division has issued a fish consumption advisory.
  - ***Parameters of Concern:*** Toxics (tissue)
- ***Drinking Water:*** Public and private domestic water supply where standard pretreatment technology (filtration and disinfection) is inadequate to meet drinking standards.
  - ***Parameters of Concern:*** Total dissolved solids, toxics (water column)

Priority 2

- ***Candidate Fish Species:*** Spawning and rearing waterbodies for fish species that are candidates or proposed for federal listing as threatened or endangered species or listed as critical on the Oregon sensitive species list.
  - ***Parameters of Concern:*** Biological criteria, dissolved oxygen, flow modification, habitat modification, pH, sedimentation, temperature, total dissolved gas, toxics, turbidity
- ***Shellfish:*** Waterbodies that experience periodic closures for not meeting standards for shellfish growing waters.
  - ***Parameters of Concern:*** bacteria, toxics
- ***Water Contact Recreation:*** Waterbodies that experience chronic, dry-weather exceedances that correspond with higher recreational usage (generally June through September).
  - ***Parameters of Concern:*** Bacteria

Priority 3

- ***Salmonid habitat:*** Waterbodies designated for salmonid spawning and rearing that do not meet appropriate WQS.
  - ***Parameters of Concern:*** Biological criteria, dissolved oxygen, flow modification, habitat modification, pH, sedimentation, temperature, total dissolved gas, toxics, turbidity
- ***Water Contact Recreation:*** Waterbodies that experience chronic wet weather exceedances that correspond with lower recreational usage (generally October through May) or nonhealth-related (aesthetic) concerns.
  - ***Parameters of Concern:*** Bacteria, aquatic weeds or algae, chlorophyll *a*, nutrients, turbidity
- ***Wild and Scenic Rivers and State Scenic Waterways:*** Federally or state-designated wild and scenic waters not meeting WQS that relate to aesthetics or other recreational water use.
  - ***Parameters of Concern:*** Aquatic weeds or algae, chlorophyll *a*, nutrients, turbidity

(continued)

State of Oregon

- ***Industrial Water Supply:*** Waters designated for industrial water supply where standard pretreatment technology is inadequate to meet standards.
  - ***Parameters of Concern:*** Total dissolved solids, turbidity

Priority 4

- ***Livestock Watering:*** Waters designated for livestock watering that do not meet appropriate WQS.
  - ***Parameters of Concern:*** Chlorophyll *a* or algae
- ***Other Resident Fish and Aquatic Life:*** Waterbodies not designated for salmonid spawning and rearing that do not meet appropriate WQS
  - ***Parameters of Concern:*** biological criteria, dissolved oxygen, flow modification, habitat modification, pH, sedimentation, temperature, total dissolved gas, toxics, turbidity
- ***Aesthetics:*** Other waters (not federally or state-designated wild and scenic waters) not meeting WQS that relate to aesthetics or other recreational water use.
  - ***Parameters of Concern:*** Aquatic weeds or algae, chlorophyll *a*, nutrients, turbidity

Regulatory Authorities and Stakeholders

Federal, state and local environmental agencies often have an interest in site assessment and cleanup and might be able to contribute to the watershed remediation process. This chapter describes the potential roles, authorities and interests of each of these agencies. The level of participation of a program will vary from project to project. The watershed project manager should ensure that respective parties' roles in a specific watershed project are discussed and identified at the initial meetings, while allowing for adjustment during subsequent meetings according to the projects. This chapter describes the agencies that operate under major environmental authorities, and then describes other stakeholders and the roles each can play in watershed investigation and cleanup. Additional entities that can provide resources for watershed cleanup are described in Chapter 3.

Watershed Cleanup Team

Coordination starts by identifying WCT participants that have a regulatory, financial, trustee/land manager, aesthetic or other interest in watershed cleanup. Typical participants include the following:

- U.S. Department of Agriculture (USDA)
- U.S. Forest Service (USFS)
- U.S. Department of Interior (DOI)
    - Bureau of Land Management (BLM)
    - Bureau of Indian Affairs (BIA)
- USGS
- U.S. Fish and Wildlife Service (USFWS)
- National Park Service
- Office of Surface Mining (OSM)
- USACE
- State environment and health departments
- Community action groups
- Water allocation and other cross-jurisdictional agencies (e.g., port authorities)
- Drinking water and wastewater treatment providers
- County, local health or environmental departments
- Local and regional land use planning agencies
- Soil conservation districts
- Industry, landowners and educational institutions

The potential roles of these agencies and stakeholders are described below. For the purposes of this manual, *communities* is used to refer to municipalities and related local agencies and established stakeholder groups. Additional information describing these groups can be found at the end of this chapter.

The authorities under which these participants can act include:

- EPA and state Superfund Programs (Preliminary Assessment (PA)/Site Inspection (SI), Removal, and Remedial Programs)
- EPA and state RCRA programs
- EPA and state Clean Water Act programs (NPDES, NPS, TMDL)
- EPA and state Clean Air Act (CAA) programs
- EPA Toxic Substances Control Act (TSCA) Program
- EPA Pesticide and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) programs
- EPA and state Safe Drinking Water Act (SDWA) programs
- EPA's Brownfields Program
- Natural Resource Trustees (Natural Resource Damage Assessment and Restoration)

Regulatory Authorities

Introduction

Depending on watershed location, contaminants, land use and ownership and the type of resources impacted, a variety of regulatory and response authorities may be used to conduct studies, force cleanup actions, facilitate public participation, and otherwise contribute to cleanup of watersheds contaminated with hazardous substances and wastes. Sometimes, state and federal agencies are empowered to act within the same regulatory framework. This section describes regulatory and response authorities and the agencies and programs tasked with those authorities. Table 2-1 summarizes the benefits and contributions of programs in cross-programmatic watershed cleanup. Figure 2-1 provides a visual presentation of how the primary watershed cleanup programs fit together. For brevity, these descriptions use the term *states* for roles that may also be filled by tribes and territories, as applicable.

When considering the various regulatory and response programs, several of their common, as well as distinguishing, characteristics should be kept in mind by the watershed team as it looks for the best cleanup strategy. For example, some programs such as the CWA and RCRA are primarily (but not exclusively) regulatory programs. They apply most easily to facilities (and categories of industry) with ongoing business operations and impose a detailed set of regulations that are carried out in part in a required operating permit. Other programs, such as CERCLA, authorize actions that respond to discrete environmental contamination wherever it is located and regardless of whether it comes from one or many different sources. While the CERCLA Program looks first to enforcement mechanisms in carrying out its mission, it does include resources that can fund cleanups where liable parties are (at least initially) unwilling to participate or cannot be found. While CERCLA has a careful process for considering the ARARs of other regulatory authorities, it does not require federal, state or environmental permits for its

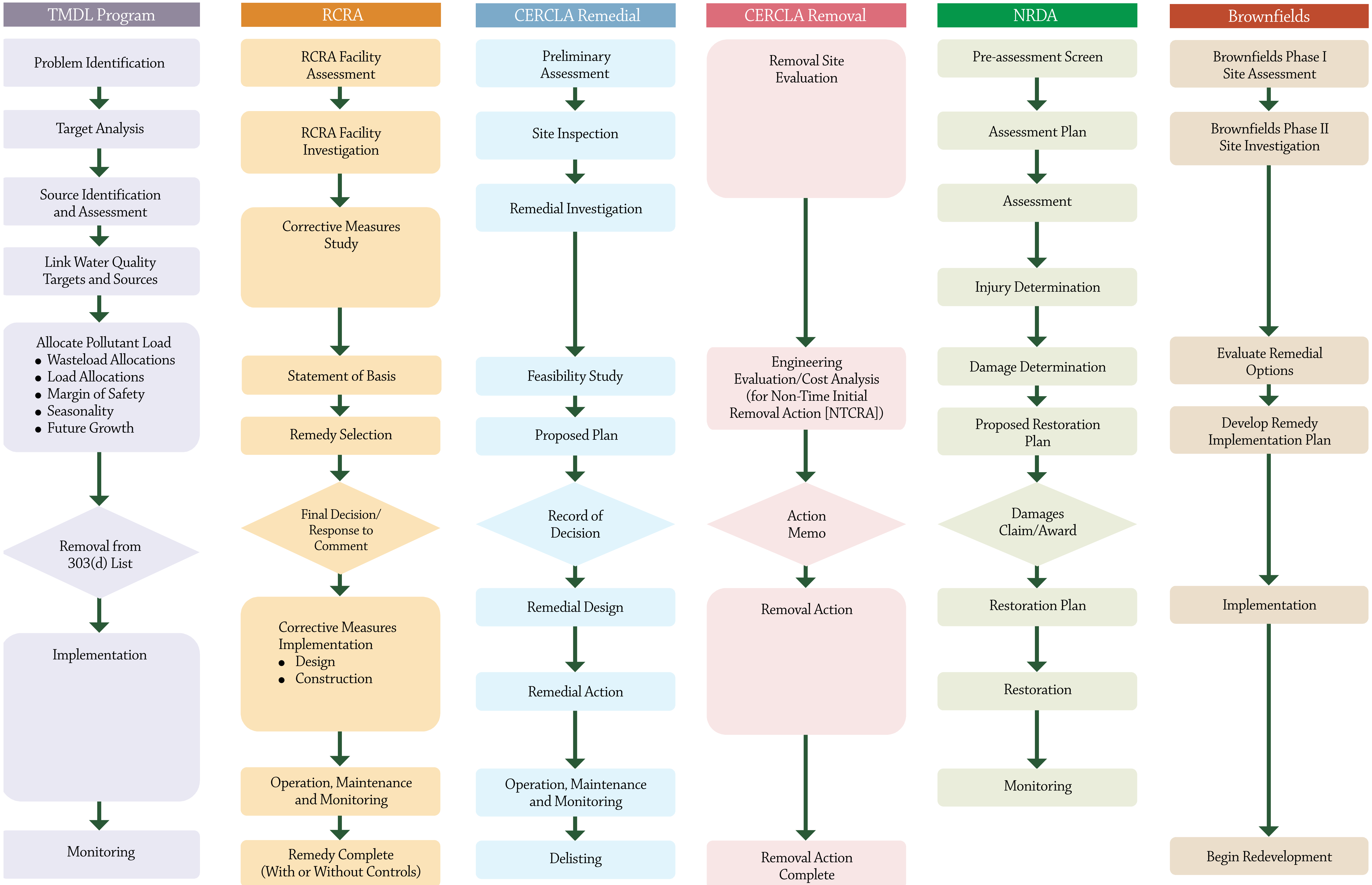


Figure 2-1. Program Flow Chart

Table 2-1. EPA Programs Using a Watershed Approach

Program Contributions	Program Benefits
WATER PROGRAMS	
Water Quality Standards Program	
• Provides water quality goals for specific water bodies in the watershed • Provides designated water uses and water quality criteria to protect the uses, for each waterbody • Provides state/tribal antidegradation policy	• Standards provide specific goals for watershed planning and are a basis for regulatory requirements • Standards can be adapted to reflect holistic, watershed approach • States/tribes must consider input from the public regarding appropriate WQS revisions
Monitoring and Assessment Program	
• Provides water quality data • Identification of impacted waters • Ongoing water quality monitoring	• Assistance with ongoing water quality monitoring • Water quality data • Access to EPA regional laboratories
NPDES Program	
• Effluent quality data from dischargers • Identification of point sources • Implementation of TMDL source allocations by permit restrictions • Report ongoing discharge monitoring results (pollutant loads) • Enforceable permit limits to meet Water Quality Standards	• Watershed approach will assist the NPDES Program in setting appropriate discharge limitations • Coordinated ongoing monitoring • Water quality data, including ambient condition data
TMDL Program	
• Identification of impaired waters • Development of TMDLs, which identify the loads needed to attain water quality standards • Plan and participate in data collection	• Identification of sources in watershed • Identification of impaired waters • Quantification of significant source loads • Public participation process • Coordinated data collection • Coordinated long-term monitoring
Clean Watersheds Needs Survey Program	
• Identification of current and projected point sources and nonpoint sources • Current and projected wastewater treatment plant populations served and outflows • Projects needed to meet NPDES requirements, water quality standards, and TMDL allocations • Estimated project costs	• Supports watershed-based decisions by providing project and cost information for point source and nonpoint source projects
319 NPS Program	
• Funding for cleanup • Funding for assessment • Funding for public participation • Funding for developing and implementing watershed plans • Local contacts	• Coordinated relationships with agencies and community in assessment and implementation • Assistance in prioritizing NPS cleanup • Coordination on federal lands • Coordinated long-term monitoring
Drinking Water and Source Water Protection	
• Identify water sources used by public water systems • Data on water quality and potential sources of contamination • Analysis of contamination risks • Funding for assessment, protection, planning and implementation	• Improved public health • Strong public support to maintain clean drinking water • Sustainable water infrastructure: reduced drinking water treatment costs • Coordinated stakeholder approach
RCRA PROGRAMS	
• Identification of contaminant sources • Authority for assessment and cleanup • Data • Long-term monitoring and management	• Problem site identification and prioritization • Community involvement process • Collaborative monitoring

Table 2-1. EPA Programs Using a Watershed Approach (continued)

Program Contributions	Program Benefits
CERCLA PROGRAMS	
• Contract support for watershed assessment activities • Funding for Community Involvement • Sample collection • Laboratory analysis • Immediate action at sites causing unacceptable threat to human health or the environment • Data from Site Assessment, Removal Assessment, Remedial Investigation • Authority to conduct cleanup at sites • Contract support for database development • Training	• Ongoing monitoring (state or PRP funded) • Risk assessment studies • Watershed program manager • Contributions to watershed database • Community involvement process • Assistance with ongoing monitoring • Coordinated interagency efforts • Additional information for five-year reviews • Site identification • Site prioritization
BROWNFIELDS PROGRAMS	
• Funding for community involvement and assessment support • Authority and funding for cleanup actions	• Site Identification • Community involvement process • Site prioritization

on-site response actions. Under some CWA and RCRA Programs (as well as the CAA) states may be *authorized* to administer the federal programs under state law upon approval by EPA, sometimes imposing stricter standards than are required in the *base* federal program. CERCLA is not a delegated program (although EPA funds states to carry out certain CERCLA activities for the Agency). However, a number of states have *mini* Superfunds that are similar to CERCLA; many states also have brownfields cleanup programs that have set state cleanup standards, to which EPA's CERCLA Program may give some deference under memoranda of agreement.

Another way in which the various regulatory and response programs vary is through their use of terminology that can be sometimes confusing. Typically, the principal federal and state environmental laws applicable to watershed cleanup can be triggered by a broad range of substances, a subset of which have been deemed especially *hazardous* or *toxic* and are made subject to stricter controls and authorities. Understanding which kind of substances are impacting a watershed and how they fit into federal and state regulatory programs, will make it easier for the watershed project manager to develop the most efficient response strategy. This issue is complicated by the fact that key terms often sound similar from one program to another, and yet can have different meanings and indeed might not be consistent. *Solid waste*, *hazardous waste*, *hazardous substance*, *pollutant* and *toxic pollutant* are each used in various federal environmental programs, sometimes referring to the same, and sometimes different, substances.

Finally, the WCT should be aware that different regulatory and response programs may result in different degrees of pollution control or cleanup. Indeed, this can be the case in a single program. For example, as explained in more detail below, a CERCLA *response* action in the removal program may be designed to abate a threat to human health and the environment. While many CERCLA *response* actions conducted by the removal program will complete the cleanup at the site, some may leave behind contaminants at a level that will require further measures to complete a CERCLA *remedial* action. Note also that still further cleanup might be necessary to achieve restoration of natural resources under CERCLA. Different regulatory and response programs can also result in different cleanup standards in different media. For example, copper standards are typically much lower in surface water than in ground water, while the reverse is true for most volatile organic compounds (VOCs).

Clean Water Act

Perhaps the most important programs for consideration by the WCT are found in the CWA, which establishes several means to restore and maintain the chemical, physical, and biological integrity of the nation's waters.[1] The 1972 Act set forth a goal of achieving zero discharge of pollutants by 1985 and, as an interim goal, wherever attainable, achieving water quality that provides for protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water by mid-1983. These goals remain today. Under the CWA, a pollutant is broadly defined to include industrial, municipal or agricultural waste discharged into water, subject to certain exceptions. The term *pollutant* means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharged into water. (Note that, as discussed below, certain categories of activities involving *pollutants* may nevertheless be exempt from regulation under the CWA.)

The Water Quality Standards and Water Quality Monitoring and Assessment Programs provide the foundations for the CWA water quality programs. Once water quality conditions and goals have been established, the CWA includes various programs, including TMDL, NPS, and NPDES for achieving those water quality conditions and goals. EPA and state environment departments administer all CWA programs except for the CWA section 404 Dredge and Fill Program (see Chapter 5 of this manual), which the USACE jointly administers with EPA and authorized states.

The Clean Water Act requires point source discharges to receive NPDES permits (see further discussion below). Permits must consider both technology-based and water quality-based effluent limitations. All dischargers must meet industry-specific effluent limitations based on the technology available to control pollution. Where NPDES permit authorities (states and EPA) determine that these technology-based effluent limitations are inadequate to attain or maintain water quality standards, the CWA requires dischargers to comply with additional water quality-based effluent limitations. In impaired water bodies, states and EPA develop pollution loading budgets called "total maximum daily loads" or TMDLs. TMDLs not only guide the water quality-based effluent limitations in NPDES permits, but also establish specific goals for addressing nonpoint sources of pollution. EPA and states have been increasingly emphasizing TMDLs because nonpoint sources account for the majority of remaining impairments to water quality.

Water Quality Standards

CWA section 303(c) establishes the basis for a WQS Program. WQS consist of three elements:

- Designated (beneficial) uses
- Numeric and/or narrative criteria
- Antidegradation policies and procedures

States are required to specify appropriate water uses to be achieved and protected, taking into consideration the use and value of water for public water supplies; protection and propagation of fish, shellfish and wildlife; recreation in and on the water; and agricultural, industrial and other purposes including navigation. Typical designated water uses include recreational (primary—with human contact, and secondary—incidental human contact), agriculture (crop irrigation and livestock drinking), aquatic life (cold water aquatic life, warm water aquatic life, wetlands), and domestic water supply. Section 101(a)(2) of the CWA established as a national goal water quality, wherever attainable, that " provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water." WQS are developed by states, but must be approved by EPA. **www.epa.gov/waterscience/standards**

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[1] Similar to RCRA and the CAA, the 1977 Clean Water Act actually comprised amendments to existing federal water pollution control legislation, the most important of which was the Federal Water Pollution Control Act Amendments of 1972, (Pub. L. 92500) (FWPCA), which established the NPDES permit system.

EPA develops National Recommended Water Quality Criteria which are expressed as levels of individual pollutants, water quality characteristics, or descriptions of conditions of the waterbody that, if met, will generally protect the designated use of the water. Criteria are expressed in either narrative or numeric formats and may be developed to apply generally or to site-specific situations. EPA's compilation of National Recommended Water Quality Criteria contains recommended water quality criteria for the protection of aquatic life and human health in surface water for approximately 150 pollutants. These criteria are published pursuant to section 304(a) of the CWA and provide guidance for states and tribes to use in adopting WQS. EPA's National Recommended Water Quality Criteria are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. In adopting criteria, states and tribes may do the following:

- Adopt the criteria that EPA publishes under section 304(a) of the CWA
- Modify the section 304(a) criteria to reflect site-specific conditions
- Adopt criteria on the basis of other scientifically defensible methods

www.epa.gov/waterscience/criteria

Numeric water quality criteria generally contain three components: magnitude, duration and frequency. The magnitude is the acceptable amount of pollutant or other indicator in the surface water. Most criterion magnitudes are expressed as concentrations (e.g., milligrams per liter (mg/l)). Duration refers to to the time period over which exposure is to be averaged. For example, some criteria for protection of aquatic life are expressed, in part, as 4-day average concentrations of a particular pollutant (i.e., the duration is 4 days). Frequency describes how often waterbody conditions can surpass the combined magnitude and duration components (e.g., once every three years). Antidegradation policies are established to protect existing uses and high quality waters. States are required to adopt an antidegradation policy consistent with the WQS regulation (40 *Code of Federal Regulations* (CFR) Part 131).

WQS provide the regulatory basis for effluent limits beyond technology-based levels of treatment for NPDES permits. WQS also provide the basis for allocations in TMDLs. State WQS for waterbodies may be obtained from EPA's Web site at **www.epa.gov/waterscience/standards/wqslibrary/index.html** or on EPA's WATERS database at **www.epa.gov/waters.**

Water Quality Monitoring and Assessment

EPA and states need comprehensive water quality monitoring and assessment information on environmental conditions and changes over time to help set levels of protection in WQS and to identify problem areas that are emerging or that need additional regulatory and nonregulatory actions to support water quality management decisions such as TMDLs, NPDES permits, enforcement and NPS management. This information also informs EPA and state decision makers, the Congress, the public and other stakeholders of the progress that the Agency and state partners are making in protecting human health and the environment.

The CWA gives states and territories the primary responsibility for implementing programs to protect and restore water quality, including monitoring and assessing the nation's waters and reporting on their quality. CWA section 106(e)(1) requires EPA to determine that a state is monitoring the quality of navigable waters; compiling and analyzing data on water quality; and including it in the state's section 305(b) report prior to the award of section 106 grant funds. *Elements of a State Water Monitoring and Assessment Program* (EPA 2003: EPA 841-B-03-003) (see the boxes on pages 22 and 23) recommends the basic elements of a state water monitoring program and serves as a tool to help EPA and the states determine whether a monitoring program meets the prerequisites of CWA section 106(e)(1).

While state agencies have the lead in implementing monitoring programs and assessing the condition of those waters as required by the CWA, other federal agencies are also involved in water quality monitoring to meet their own agency and program objectives. The state should consider data from these sources (on the basis of data quality, accessibility and applicability) when making an impairment decision for an individual waterbody (i.e., healthy or impaired). For example, the USGS conducts extensive chemical monitoring through its National Stream Quality Accounting Network (NASQAN) at fixed locations on large rivers around the country. Its National Water Quality Assessment Program (NAWQA) uses a regional focus to study status and trends in water, sediment and biota. The USFWS, NOAA and the USACE are other examples of federal agencies that conduct water quality monitoring to support their programs and activities.

State agencies, such as game and fish agencies, and private entities such as universities, watershed associations, environmental groups and industries also perform water quality monitoring. They might collect water quality data for their own purposes, as well as to share with government decision makers. Volunteer monitors—private citizens who volunteer to regularly collect and analyze water samples, conduct visual assessments of physical conditions, and measure the biological health of waters—can be of great assistance in collecting data and assessing the biological condition (health) of that waterbody. Before implementing any locally based monitoring effort, the WCT should review the state's monitoring strategy, list of core indicators and assessment methodology. Before conducting any monitoring in a cleanup area, the monitoring objectives should be established and indicators selected that ensure the predetermined objectives will be achieved.

To assess the conditions of their waters, states employ assessment methodologies to make WQS attainment determinations. The assessment methodology should be consistent with the state's WQS and include a description of how the state identifies, considers and evaluates all existing and readily available data and information. The assessment methodology may also include a description of how the state interprets their narrative WQS for making water quality attainment determinations. In addition to ambient monitoring data, other sources of data and information states use to make WQS attainment status determinations may include results from predictive modeling, remote sensing data, land use analysis, knowledge about pollutant sources and loadings and observed effects.

Additional information on development and implementation of state assessment methodologies is available in EPA's *Guidance for Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the CWA* (commonly referred to as the Integrated Reporting Guidance [**www.epa.gov/owow/tmdl**]) and EPA's Consolidated Assessment and Listing Methodology (EPA, July 2002).

In 2005, EPA designed a new interactive National Assessment Database (NAD), an on-line database of state water quality information. The NAD allows users to electronically view assessment findings for individual states, specific waterbodies, and watersheds in a user friendly format. **www.epa.gov/waters/305b**

Water Quality Reporting

States are required to report on the water quality status of their waters every 2 years under sections 303(d), 305(b), and 314 of the CWA. A summary of states' reporting requirements for each of these sections and corresponding regulations is provided below.

- **Section 303(d)** – by April 1 of all even-numbered years, the state must publish a list of impaired and threatened waters still requiring TMDLs; identification of the impairing pollutant(s); and priority ranking of these waters, including waters targeted for TMDL development within the next 2 years. The list of waters impaired or threatened by a pollutant and still requiring a TMDL is commonly referred to as a state's section 303(d) list. Impaired waters are those waters not meeting one or more of their WQS. Threatened waters are

Elements of a State Water Monitoring and Assessment Program

www.epa.gov/owow/monitoring/elements/elements.html

The recommended 10 elements of a state water monitoring and assessment program are the following:

1. ***Monitoring Program Strategy***
   The state has a comprehensive monitoring program strategy that serves its water quality management needs and addresses all state waters, including streams, rivers, lakes, the Great Lakes, reservoirs, estuaries, coastal areas, wetlands and ground water. The strategy should contain or reference a description of how the state plans to address each of the remaining nine elements. The monitoring program strategy is a long-term implementation plan and should include a timeline, not to exceed 10 years for completing implementation of the strategy. EPA believes that state monitoring programs can be upgraded to include all the elements described below within the next 10 years. It is important that the strategy be comprehensive in scope and identify the technical issues and resource needs that are impediments to an adequate monitoring program.

2. ***Monitoring Objectives***
   The state has identified monitoring objectives critical to the design of a monitoring program that is efficient and effective in generating data that serve management decision needs. EPA expects the state to develop a strategy and implement a monitoring program that reflects a full range of state water quality management objectives including, but not limited to, CWA goals. For example, monitoring objectives could include helping establish WQS, determining water quality status and trends, identifying impaired waters, identifying causes and sources of water quality problems, implementing water quality management programs, and evaluating program effectiveness. Consistent with the CWA, monitoring objectives should reflect the decision needs relevant to all types of state waters.

3. ***Monitoring Design***
   The state has an approach and rationale for selecting monitoring designs and sample sites that best serve its monitoring objectives. The state monitoring program will likely integrate several monitoring designs (e.g., fixed station, intensive and screening-level monitoring, rotating basin, judgmental and probability design) to meet the full range of decision needs. The state monitoring design should include a probability-based network for making statistically valid inferences about the condition of all state water types, over time. EPA expects the state to use the most efficient combination of monitoring designs to meet its objectives.

4. ***Core and Supplemental Water Quality Indicators***
   The state uses a tiered approach to monitoring that includes core indicators selected to represent each applicable designated use, plus supplemental indicators selected according to site-specific or project-specific decision criteria. Core indicators for each water resource type include physical/habitat, chemical/toxicological and biological/ecological endpoints as appropriate and can be used routinely to assess attainment with applicable WQS throughout the state. Supplemental indicators are used when there is a reasonable expectation that a specific pollutant might be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern.

(continued)

those waters that are currently attaining WQS but are expected to exceed WQS by the next 303(d) list reporting cycle.

- **Section 305(b)** – by April 1 of all even-numbered years, the state must list a description of the water quality of all waters of the state (including rivers/streams, lakes, estuaries/oceans and wetlands). States may also include in their section 305(b) submittal a description of the nature and extent of ground water pollution and recommendations of state plans or programs needed to maintain or improve ground water quality. This reporting requirement is commonly referred to as a state's 305(b) report.
- **Section 314** – in each section 305(b) submittal, the state must provide an assessment of status and trends of significant publicly owned lakes including extent of point source and NPS impacts due to toxics, conventional pollutants and acidification.

Elements of a State Water Monitoring and Assessment Program *(continued)*

5. ***Quality Assurance***
Quality management plans and quality assurance program/project plans are established, maintained and peer reviewed according to EPA policy to ensure the scientific validity of monitoring and laboratory activities and to ensure that state reporting requirements are met.

6. ***Data Management***
The state uses an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, biological data, with timely data entry (following appropriate metadata and state/federal geo-locational standards) and public access. In the future, EPA will require all states to directly or indirectly make their monitoring data available through the new Storage and Retrieval (STORET) system. For states that do not currently operate STORET, their monitoring strategies should provide for use of STORET as soon as is practicable. For the 305(b) reports and 303(d) lists, EPA strongly recommends that all states store assessment information using the EPA Assessment Database or an equivalent relational database and define the geographic location of assessment units using the National Hydrography Dataset (NHD).

7. ***Data Analysis/Assessment***
The state has a methodology for assessing attainment of WQS based on analysis of various types of data (chemical, physical, biological, land use) from various sources, for all waterbody types and all state waters. The methodology includes criteria for compiling, analyzing and integrating all readily available and existing information (e.g., volunteer monitoring data, discharge monitoring reports).

8. ***Reporting***
The state produces timely and complete water quality reports and lists called for under sections 305(b), 303(d), 314, and 319 of the CWA and section 406 of the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. EPA issued *Guidance for 2006 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d), 305(b), and 314 of the Clean Water Act* (2006 Integrated Report Guidance) to provide a recommended reporting format and suggested content to be used in developing a single document that integrates the reporting requirements of the CWA sections 303(d), 305(b), and 314. EPA will continue to support the use of this integrated reporting framework for future reporting cycles. Under current regulations, section 303(d) lists and section 305(b) reports are due no later than April 1 of even-numbered years. To remain eligible for section 106 grants, the state also must submit annual updates of water quality information. This requirement may be satisfied by annually updating 305(b) assessment information or by annually uploading monitoring data to the national STORET warehouse.
www.epa.gov/owow/tmdl/2006IRG, **www.epa.gov/owow/tmdl/2008_ir_memorandum.html**

9. ***Programmatic Evaluation***
The state, in consultation with its EPA Region, conducts periodic reviews of each aspect of its monitoring program to determine how well the program serves its water quality decision needs for all state waters, including all waterbody types. This should involve evaluating the monitoring program to determine how well each of the elements is addressed and determining how needed changes and additions are incorporated into future monitoring cycles.

10. ***General Support and Infrastructure Planning***
The state identifies current and future resource needs it requires to fully implement its monitoring program strategy. This needs assessment should describe funding, staff, training, laboratory resources and upcoming improvements.

EPA encourages states to prepare a single report (the *Integrated Report*) that satisfies the reporting requirements of sections 303(d), 305(b), and 314, and describes the state's assessment methodology for making water quality attainment determinations (see EPA's Integrated Reporting Guidance at **www.epa.gov/owow/TMDL**). As part of EPA's guidance to states for preparing Integrated Reports, EPA recommends that states use the following five reporting categories to report on the water quality status of all waters in their state:

Category 1: All designated uses (DU) are supported, no use is threatened

Category 2: Available data and/or information indicate that some, but not all the DUs are supported

Category 3: There is insufficient available data and/or information to make a DU support determination

Category 4: Available data and/or information indicate that at least one DU is not being supported or is threatened, but a TMDL is not needed

Category 5: Available data and/or information indicate that at least one DU is not being supported or is threatened, and a TMDL is needed

In classifying the status of their waters, states may report each waterbody in one or more of the reporting categories listed on page 23.

As these categories show, waters assigned to Category 4 and 5 are impaired or threatened; however, waters assigned to Category 5 represent waters on a state's section 303(d) list. A state's section 303(d) list is composed of waters impaired or threatened by a pollutant and needing a TMDL. Similar to Category 5, waters in Category 4 are also impaired or threatened; however, other conditions exist that no longer require them to be included on a state's section 303(d) list. These conditions, which are referred to as subcategories of Category 4, are described below:

Category 4a: TMDL has been completed.

Category 4b: TMDL is not needed because other required controls are expected to result in the attainment of an applicable WQS in a reasonable period of time.

Category 4c: The nonattainment of any applicable WQS for the waterbody is not caused by a pollutant. Examples of circumstances where an impaired segment may be placed in Category 4c include waterbodies impaired solely due to lack of adequate flow or to stream channelization.

In addition to subcategories presented above, some states may choose to establish new or additional subcategories in addition to the proposed five major categories. For example, a state may decide to divide Category 3 into two subcategories to distinguish between those segments for which no data or information exist from those segments for which some data or information exist, but the data are insufficient to make a determination whether the segment is attaining applicable standards. A state may also choose to use subcategories for segments placed into Category 3 when establishing monitoring priorities. For example, the state may place its segments into different subcategories depending on whether the segment is high, medium or low priority for follow-up monitoring based on information from probability-based monitoring, landscape or water quality models, land use data or limited site-specific monitoring.

States are required to submit their section 303(d) lists and section 305(b) reports to EPA by April 1 of every even-numbered year. Under section 303(d), EPA approves or disapproves the state's section 303(d) lists (Category 5 of an Integrated Report) or establishes the list if the state's submission is inadequate. EPA is not required to approve or disapprove states' reporting requirements under section 305(b). However, as discussed above, states are required to submit their section 305(b) reports to be eligible for section 106 grant funds.

National Pollutant Discharge Elimination System

The CWA generally prohibits point source discharges of pollutants into waters of the United States without an NPDES permit. A point source is any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure or container. It also includes vessels or other floating craft from which pollutants are or may be discharged. By law, the term *point source* also includes concentrated animal feeding operations, which are places where animals are confined and fed. Significantly, Congress exempted agricultural stormwater discharges and return flows from irrigated agriculture from the definition of point sources, even when it is collected and discharged from a pipe, ditch or other discrete conveyance. Discharge of storm water from municipal separate storm sewer systems require an NPDES permit.

The CWA's NPDES Program recognizes three categories of pollutants:

- ***Conventional pollutants*** include biological oxygen demand (BOD), total suspended solids (TSS), coliform, pH, and oil and grease.
- ***Toxic pollutants*** are designated by EPA as those pollutants or combination of pollutants, including disease-causing agents, "which after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains" will "cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring." Thus far, EPA has designated 65 categories of toxic pollutants under the CWA.
- Nontoxic ***nonconventional*** include any pollutants not included in the first two categories but that still might pose a threat (e.g., ammonia and heat).

NPDES permits include discharge limits and monitoring requirements. Discharge limits are based on technology and on WQS, and may be based on the mass of pollutant allowed to be discharged, the concentration of the pollutants in the effluent, indicator concentrations, effluent toxicity, effluent flow rate or visual observations (e.g., sheen, foam, or floating solids). To find out if a discharge is covered by an NPDES permit, call the EPA Regional office or the state office responsible for issuing NPDES permits.

A state must calculate a water quality-based limitation for a NPDES discharger where there is a reasonable potential that a discharger will cause or contribute to an exceedance of WQS. The determination of reasonable potential must account for existing controls, variability of the pollutant in the effluent and, if appropriate, dilution of the effluent in the receiving water. Water quality-based effluent limits are often based on a TMDL with the wasteload allocation component of the TMDL applicable to point source discharges. The calculation of water quality-based limits includes a loading analysis to determine the level of control needed to achieve WQS at the point of compliance in the waterbody. In the watershed approach, the permit writer should consider the cumulative effects from multiple discharges in a basin. Section 301(b)(1)(C) requires that limits be included in NPDES permits that are as stringent as necessary to meet WQS.

Stormwater management is also included in the NPDES Program. The NPDES Stormwater Program addresses nonagricultural sources of stormwater discharges that adversely affect the quality of the nation's waters. The program uses the NPDES permitting mechanism to require the implementation of controls designed to prevent harmful pollutants from being washed by stormwater runoff into local waterbodies. The NPDES stormwater permit regulations promulgated by EPA cover the following classes of stormwater discharges:

- Operators of Municipal Separate Storm Sewer System (MS4s) in *urbanized areas* as delineated by the Bureau of the Census.
- Industrial facilities in any of the 11 categories that discharge to an MS4 or to waters of the United States; all categories of industrial activity (except construction) may certify to a condition of *no exposure* if their industrial materials and operations are not exposed to stormwater, thus eliminating the need to obtain stormwater permit coverage.
- Operators of construction activity that disturbs one or more acres of land; construction sites less than one acre are covered if part of a larger plan of development.

Opportunity for Integration

- CERCLA decision documents may include BMPs for stormwater management when they are related to the Superfund response and support the protectiveness of the remedy. The EPA site **http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm** provides a menu of construction and post-construction BMPs based on the Stormwater Phase II Rules as a resource for additional information.
- In EPA Region 10, all CERCLA RODs for mining sites include stormwater management plans.

The regulated entities must obtain an NPDES stormwater permit and implement stormwater pollution prevention plans (SWPPPs) or stormwater management programs (both using BMPs) that effectively reduce or prevent the discharge of pollutants into receiving waters.

The NPDES program occupies a unique position within the overall water program, because it is both a key customer and an essential partner in supporting other Office of Water program activities and achieving many of the broader water quality goals. For example, NPDES permits implement portions of TMDLs and other watershed plans; water quality standards decisions affect the content of NPDES permits and decisions that point sources must make about treatment or process changes; point source discharges may impact the hydrology of a stream and the structure of an aquatic community; sources of pollutants are either subject to NPDES program requirements (e.g., municipal and industrial stormwater) or represent potential nonpoint source trading partners for point sources in a water quality trading program; and NPDES permit conditions may be written specifically to protect sources of drinking water.

Since 1994, EPA issued policy and technical guidance on how to implement NPDES permitting activities on a watershed basis. In December 2003, the Office of Water issued the *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance* that describes the concept of and the process for developing and issuing NPDES permits on a watershed basis. In the summer of 2007, EPA will have released its *Watershed-based NPDES Permitting Technical Guidance*.

Integrating NPDES permits into a watershed approach means developing and using a watershed-based analysis as part of the permitting process. The result of a watershed-based analysis is identifying a range of NPDES implementation options and, potentially, related program options to achieve watershed goals. These options extend beyond the traditional approach of developing and issuing a single NPDES permit to an individual point source discharger or using general permits for multiple dischargers. Stakeholders may then set priorities for implementation of some or all of these options. This set of priority options constitutes an NPDES watershed framework. Visit **www.epa.gov/npdes/watersheds** for detailed information on this topic.

Information about NPDES permits for major sources that discharge greater than one million gallons of water per day is available on EPA's Permit Compliance System (PCS) database and from EPA's Watershed Assessment, Tracking, and Environmental Results (WATERS) database (**www.epa.gov/waters**). Data about smaller NPDES permitted dischargers may be listed in PCS but are also available from state discharge permitting agencies and EPA Regions.

Load is the total mass of pollutant that flows through the waterbody over a given period of time.

Load = Concentration x Flow

Total Maximum Daily Load (TMDL)

When pollutants adversely affect the use of a waterbody even after implementation of effluent limits for point source dischargers under the NPDES Program, the CWA requires a study to be conducted and a plan developed whereby the impaired segment of that waterbody will be restored. Both this study and the actual numeric load that the stream can bear and still meet WQS are commonly called the TMDL. The TMDL establishes the amount of a pollutant allowed in the relevant waterbody. Section 303(d) requires that states develop a list of waterbodies that need additional work beyond existing controls to achieve or maintain WQS. The additional work necessary includes the establishment of TMDLs to determine the reductions in load needed to meet WQS. The TMDL should do the following:

- Identify the sources and causes of the pollutant responsible for impairment.
- Identify the water quality goal. How much does the pollutant need to be reduced to meet water quality objectives?

- Quantify the total amount of pollutant that can be allowed into the water and what reductions are needed to achieve that amount. Surrogate endpoints may be established that are directly linked to the impairment to ensure the achievement of the water quality goals.

The following two elements are not required but may be included with a TMDL submission.

- Identify and implement the practices needed to reduce excess pollutants.
- Monitor the waterbodies to ensure the goals are being met, and modify the plan if needed.

TMDL documents are measured against the following review criteria:

1. **Water Quality Impairment Status**
   TMDL documents should include a description of the listed water quality impairments (pollutants). While the 303(d) list identifies probable causes and sources of water quality impairments, the information contained in the 303(d) list is generally not sufficiently detailed to provide an adequate understanding of the impairments. TMDL documents should include a thorough description or summary of all available water quality data such that the water quality impairments are clearly defined and linked to the impaired beneficial uses (e.g., aquatic life, drinking water) and/or appropriate WQS.
2. **Water Quality Standards**
   The TMDL document should include a description of all applicable WQS for all affected jurisdictions. TMDLs should result in attaining and maintaining WQS. WQS are the basis from which TMDLs are established and the TMDL targets are derived, including the numeric, narrative, use classification and antidegradation components of the standards.
3. **Water Quality Targets**
   Quantified targets or endpoints (e.g., numeric standards, macroinvertebrate diversity) should be provided to address each listed pollutant/waterbody combination. Target values should represent achievement of applicable WQS and support of associated beneficial uses. For pollutants with numeric WQS, the numeric standards are generally used as the TMDL target. For pollutants with narrative standards, the narrative standard is translated into a measurable value. At a minimum, one target is identified for each pollutant/waterbody combination. It is generally desirable, however, to include several targets that represent achievement of the standard and support of beneficial uses (e.g., for a sediment impairment issue, it might be appropriate to include targets representing water column sediment such as TSS, embeddedness, stream morphology, up-slope conditions and a measure of biota).
4. **Significant Sources**
   TMDLs should consider all significant sources of the stressor of concern. All sources or causes of the stressor should be identified or accounted for in some manner. The detail provided in the source assessment step drives the rigor of the allocation step. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source when the relative load contribution from each source has been estimated. Ideally, therefore, the pollutant load from each significant source should be quantified. This can be accomplished using site-specific monitoring data, modeling or applying other assessment techniques.
5. **Total Maximum Daily Load**
   TMDLs include a quantified pollutant reduction target. According to EPA regulation (40 CFR 130.2(i)), TMDLs can be expressed as mass per unit of time, toxicity, percent load reduction or other measure. TMDLs should address, either singly or in combination, each listed pollutant/waterbody combination.

6. **Allocation**
   TMDLs apportion responsibility for taking actions or allocating the available assimilative capacity among the various point, nonpoint and natural pollutant sources. Allocations may be expressed in a variety of ways, such as by individual discharger, by tributary watershed, by source or land use category, by land parcel or other appropriate scale or division of responsibility. A performance-based allocation approach, where a detailed strategy is articulated for the application of BMPs, may also be appropriate for NPS.

7. **Margin of Safety/Seasonality**
   A margin of safety (MOS) is a component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody (303(d)(1)(c)). The MOS can be implicitly expressed by incorporating an MOS into conservative assumptions used to develop the TMDL. In other cases, the MOS can be built in as a separate component of the TMDL (in this case, quantitatively, a TMDL = Wasteload Allocation + Load Allocation + Margin of Safety).

   Seasonal considerations, such as critical flow periods (high flow, low flow), should also be considered when establishing TMDLs, targets and allocations.

8. **Monitoring Strategy**
   Depending on the amount of data and information available to develop the TMDL, a certain level of uncertainty is associated with one or more elements of the plan (e.g., estimates of source loadings and assimilative capacity). Although not a required element of a TMDL submittal, a monitoring plan is recommended to address any uncertainties that may exist when the document is prepared and evaluate the extent to which implementation measures are succeeding in attaining water quality standards. A monitoring plan may include the following:

   - Articulate the monitoring hypothesis and explain how the monitoring plan will test it;
   - Address the relationships between the monitoring plan and the various components of the TMDL (targets, sources, allocations, etc.); and
   - Explain any assumptions used.

9. **Public Participation**
   The fundamental requirement for public participation is that all stakeholders have an opportunity to be part of the process, and EPA will take into account comments and information submitted by interested parties at the time of making TMDL decisions. Public participation should fit the needs of the TMDL.

10. **Restoration Strategy**
    At a minimum, sufficient information should be provided in the TMDL document to demonstrate that if the TMDL were implemented, WQS would be attained or maintained. Adding detail regarding the proposed approach for the restoration of water quality is not a regulatory requirement but is considered a value added component of a TMDL document.

11. **Technical Analysis**
    TMDLs should be supported by an appropriate level of technical analysis. It applies to all of the components of a TMDL document. It is vitally important that the technical basis for all conclusions be articulated in a manner that is easily understandable and readily apparent to the reader. Of special importance, the cause and effect relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and allocations must be supported by an appropriate level of technical analysis.

The state develops the TMDL in cooperation with interested parties prior to formal submission for public comment. After incorporating comments, the state submits the TMDL to EPA for approval. EPA either approves or disapproves the TMDL. **www.epa.gov/owow/tmdl**

The TMDL is implemented using a variety of authorities and strategies. CWA Programs that may be used to accomplish solutions to watershed pollution include the NPDES Program, CWA section 319 NPS Program, CWA section 401 Authority, CWA section 404 Program, and the Clean Water State Revolving Fund (CWSRF). Using the watershed approach, CERCLA, RCRA, Brownfields, Farm Bill Act and other authorities and funding mechanisms may be used to affect cleanup and achieve WQS.

In 2005, EPA's Watershed Academy sponsored a two-hour Webcast on the *ABC's of TMDLs for Stakeholders*. The archived version of the seminar can be downloaded at: **www.epa.gov/watershedwebcasts**.

Clean Watersheds Needs Survey (CWNS)

The CWNS, a joint effort between states and EPA, is conducted in response to Sections 205(a) and 516 of the Clean Water Act. The CWNS has information on publicly owned wastewater collection and treatment facilities, facilities for control of sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs), stormwater control activities, nonpoint source abatement projects, and programs designed to protect the nation's estuaries. Information obtained from the survey is maintained in the CWNS database. The collected data are used to produce a Report to Congress, which provides an estimate of clean water needs for the United States.

CWNS contains the following types of data:

- ***Facility Description***: Name, location, permit, effluent, and discharge data.
- ***Needs Categories***: Costs for various types of wastewater, stormwater, and nonpoint source (NPS) projects.
- ***Natures/Types***: Describes the basic functions of a CWNS facility or NPS projects.
- ***Unit Process/BMP***: Describes the unit processes or best management practices (BMPs) present or proposed for a facility or project.
- ***Population Data***: Describes the number of people present or planned to be present in a facility's service area.
- ***Flow Data***: Describes the quantity of wastewater moving through a facility.

Each facility or project in CWNS is substantiated by one or more official documents. Documents include:

- Engineering reports
- Capital improvement plans
- CWSRF program documents
- CSO long-term control plans
- Stormwater management plans
- Source water assessment/protection plans
- TMDL program documents
- 319 NPS program documents
- State approved area-wide or regional basin plans

www.epa.gov/cwns

Nonpoint Sources

Congress enacted section 319 of the CWA in 1987, establishing a national program to reduce NPS water pollution. NPS pollution is caused by rainfall or snowmelt moving over and through the ground and carrying natural and anthropogenic pollutants into lakes, rivers, streams, wetlands, estuaries, other coastal waters and ground water. Atmospheric deposition and hydrologic modification are also NPS of pollution.

Section 319 of the CWA authorizes EPA to award grants to states and territories (hereinafter referred to as *states*) for the purpose of assisting them in implementing approved NPS management programs developed pursuant to section 319(b). The primary goal of the NPS Program is to control NPS pollution by implementing of management measures and practices to reduce pollutant loadings resulting from each category or subcategory of NPS identified in the state's NPS assessment report developed pursuant to section 319(a). Section 319 grants are also awarded to eligible Indian Tribes that have approved NPS assessments, approved NPS management programs and also have *treatment-as-a-state* status.

Section 319 grants are awarded to state NPS agencies in two categories: base funds and incremental funds. States may use the *base funds* for the full range of activities addressed in their approved NPS management programs. For example, the funds may be used for protection of unimpaired waters, restoration of impaired waters, education and training and staffing or support to manage and implement their NPS management Programs. In general, states have great flexibility as to how to use these base funds. States must use $100 million of section 319 funds, referred to as *incremental funds*, to develop and implement watershed-based plans that address NPS impairments in watersheds that contain section 303(d)-listed waters. Up to 20 percent of the base and incremental funds may be used to develop NPS TMDLs and watershed-based plans to implement NPS TMDLs.

EPA emphasizes watershed-based planning as a means for resolving and preventing NPS pollution problems and threats. Watershed-based plans provide a coordinating framework for solving water quality problems by providing a specific geographic focus, integrating strong partnerships, integrating strong science and data and coordinating priority setting and integrated solutions. The following information must be included in watershed-based plans to restore waters impaired by NPS pollution using incremental section 319 funds:

- An identification of the causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve load reductions and any other goals identified in the watershed-based plan
- An estimate of the load reductions expected from the implementation of management measures
- A description of the NPS management measures needed to achieve load reduction and identification of the critical areas in which the measures will be needed to implement the plan
- An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the plan
- An information and education component that the state will use to enhance public understanding of the project and encourage public involvement in selecting, designing, and implementing the NPS management measures
- A schedule for implementing the NPS management measures identified in the plan that is reasonably expeditious
- A description of interim, measurable milestones that can be used to determine whether NPS management measures or other control actions are being implemented
- A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward the WQS and for determining whether the plan needs to be revised or, if an NPS TMDL has been established, whether the NPS TMDL needs to be revised
- A monitoring component to evaluate how effective the implementation efforts are as measured against the set of criteria developed as described previously

- EPA has published a draft *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (October 2005, EPA 841-B-05-005) intended to help communities; watershed organizations; and state, local, tribal and federal environmental agencies develop and implement watershed plans to meet WQS and protect water resources. The Handbook is available online at: **www.epa.gov/owow/nps/watershed_handbook**.

Wetlands

Wetlands are protected under CWA sections 401 and 402 as waters of the United States as well as under CWA section 404. CWA section 404 states that dredged or fill material cannot be deposited into waters of the United States if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded. A permit is required for all construction within the nation's wetlands and other aquatic resources. EPA sets environmental criteria that must be satisfied to obtain a permit and retains other section 404 authority; the USACE reviews applications and issues permits. To apply for a permit, one must show that he or she has: taken steps to avoid wetland impacts where practicable, minimized potential impacts to wetlands and provided compensation for any remaining, unavoidable impacts through activities to restore or create wetlands. Projects with potentially significant impacts to aquatic resources, including wetlands, typically require an individual permit; however, USACE is authorized to issue categorical *general permits,* permitting certain types of activities for which it determines that the activities in such a category are similar in nature, will cause only minimal adverse environmental effects when performed separately and will have only minimal cumulative adverse effects on the environment. General permits may be issued on a nationwide, regional or state basis for categories of activities (for example, minor road crossings, utility line backfill and bedding) as a means to expedite the permitting process. During the permitting process, the USACE considers the views of other federal, state and local agencies; interest groups; and the general public. Any adverse impacts to the aquatic environment from a permitted activity must be offset by mitigation requirements, which may include restoring, enhancing, creating and preserving aquatic functions and values. **www.epa.gov/owow/wetlands/regs/sec404.html**

Oil and Hazardous Substances

Section 311 of the 1972 Federal Water Pollution Control Act (FWPCA), titled *Oil and Hazardous Substance Liability*, provides federal authority to respond to spills of oil or hazardous substances "into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone..." Oil is defined broadly under this section and includes "oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil." Section 311(b) of the FWPCA further charges EPA with the task of developing regulations designating hazardous substances other than oil that in any quantity could result in imminent and substantial danger to the public health or welfare if discharged and to develop methods for addressing such discharges.

The Oil Pollution Act of 1990 (OPA) established new requirements and extensively amended section 311 to provide, in part, enhanced capabilities for oil spill response and natural resource damage assessment by a federal trustee. **www.epa.gov/oilspill/opaover.htm**

An owner or operator may be held liable for all actual costs of response incurred under 33 U.S.C. section 1321(c), subject to certain limitations. Costs of removal may include any expenses incurred by the federal or state government in the restoration or replacement of natural resources damaged by an oil spill discharge. The 311 Program is a response program that operates similar to CERCLA; indeed, the CERCLA NCP was first created under section 311.

Responsibilities under section 311 are shared primarily by EPA and the United States Coast Guard (USCG). Generally EPA is the lead federal response agency for oil spills occurring in inland waters, and the USCG is the lead response agency for spills in coastal waters and deepwater ports.

Clean Water Act Enforcement

EPA or the state may issue an order to any person or company who violates the CWA. The order may impose a civil penalty plus recovery of any economic benefit of noncompliance and may require correction of the violation. Any person discharging a pollutant into the waters of the United States is subject to the enforcement provisions of the CWA. A person is defined as an individual, corporation, partnership, association, state, municipality, commission or political subdivision of a state, or any interstate body. Under section 309 of the CWA, penalties for discharging a pollutant without having a permit into the waters of the United States may be up to $27,500 per violation per day. Under section 311, a Class 1 penalty may be assessed in an amount of up to $10,000 per violation, not to exceed $25,000; a Class II penalty may be assessed in an amount of up to $10,000 per day per violation, but not to exceed $125,000.

Safe Drinking Water Act (SDWA)

The SDWA protects public health by regulating the nation's public drinking water supply. The SDWA authorizes EPA to set national health-based standards for drinking water supplied to the public to protect against naturally occurring and anthropogenic contaminants that may be found in drinking water. SDWA focuses on treatment of drinking water, on operator training to support that treatment, source water assessment and protection, funding for water system improvements and public information to provide safe drinking water at the tap. EPA and states administer SDWA programs. **www.epa.gov/safewater/sdwa/index.html**

Drinking Water Standards

EPA sets drinking water standards to control the level of contaminants in the nation's publicly supplied drinking water. The SDWA requires EPA to set these standards, which public water systems must meet. EPA has developed national primary drinking water regulations for 90 chemical, microbiological, radiological and physical contaminants in drinking water. EPA also conducts research and collects information to determine when currently unregulated contaminants might pose a significant widespread public health risk and should therefore be regulated in the future.

Under the SDWA, the Maximum Contaminant Level Goal (MCLG) is the level of a contaminant in drinking water below which there is no known or expected health risk, allowing for a margin of safety. These goals are set without consideration for whether the technology is available to meet them, and, therefore, are sometimes set at levels lower than public water systems can meet. MCLGs are not enforceable.

The Maximum Contaminant Level (MCL) is the maximum amount of a contaminant allowed in water delivered to a user of any public water system or a treatment technique set at levels as close to MCLGs as feasible, considering available technology and cost. MCLs are enforceable standards. While under the SDWA, compliance with drinking water standards is usually at the entrance to the distribution system, with compliance for some rules requiring monitoring in the distribution system or at the tap. CERCLA typically requires that ground water cleanups achieve MCLs and non-zero MCLGs. (See the discussion of CERCLA below.)

EPA also sets secondary drinking water regulations, which are nonenforceable guidelines for contaminants that may cause cosmetic effects (such as skin and tooth discoloration) or aesthetic effects (such as taste or odor). EPA does not require water systesm to adopt these secondary standards, but states may choose to adopt and enforce them.

Source Water Protection

The Source Water Protection Program focuses on preventing contamination of both ground water and surface water sources of public drinking water. The Source Water Protection Program has two primary parts: Source Water Assessment and local Source Water Protection planning and implementation. The state conducts a Source Water Assessment and identifies the area of the watershed or aquifer serving one or more public water systems and assesses potential point and NPSs of contamination to determine the relative risk or level of concern they could pose to the public water system's sources of drinking water to provide a platform for local protection planning. Each assessment must include four major elements:

1. Delineating (or mapping) the source water assessment area
2. Providing an inventory of potential sources of contamination in the delineated area
3. Determining the susceptibility of the water supply to those contamination sources
4. Releasing the results of the determinations to the public

Planning includes designing contaminant source management plans and contingency/emergency plans. Although some states are providing a regulatory structure for protection, under the SDWA, Source Water Protection is voluntary and uses the results of the Source Water Assessment with additional, local information as needed, to prevent and remediate contamination of the public water system's source waters. Wellhead Protection Programs protect underground-based sources of drinking water by protecting the area surrounding drinking water wells—the wellhead protection area. Source Water and Wellhead Protection Programs are statutory programs and have no associated regulations. The Sole Source Aquifer Program may also be used to help protect an aquifer serving as a drinking water source.

Emergency Powers

Section 1431 of the SDWA authorizes EPA to take actions necessary to protect the health of persons where, because of the threatened or actual presence of contaminants in a drinking water system or an underground source of drinking water or because of an intentional act designed to disrupt the provision of safe drinking water, an imminent and substantial endangerment may exist. This authority can be used whether or not a violation of any statute resulted in the imminent and substantial endangerment. The Emergency Powers provision of the SDWA does not authorize penalties as part of Administrative Orders issued under this authority, but it does allow penalties for failure to comply with such order. EPA uses section 1431 to address public drinking water systems where finished water presents a threat to the public health. However, EPA can also use this provision of the SDWA to address ground water contamination when an aquifer serving as source water becomes polluted or when drinking water that is supplied by private domestic wells becomes contaminated and poses a threat to human health.

Underground Injection Control (UIC) Program

Injection wells have the potential to cause contamination of underground drinking water sources. The UIC Program seeks to prevent such contamination by setting minimum requirements for state programs regulating underground injection. The goals of EPA's UIC Program are to prevent contamination by keeping injected fluids within the well and the intended injection zone, or, when injecting fluids directly or indirectly into or above underground sources of drinking water, to require that injected fluids not endanger underground sources of drinking water. These minimum requirements affect the siting of an injection well and the construction, operation, maintenance, monitoring, testing and, finally, the closure of the well. All injection wells require authorization under general rules or specific permits.

Resource Conservation and Recovery Act (RCRA)

RCRA governs the management of solid waste and its subset, hazardous waste, as well as USTs.[2] To achieve these goals, RCRA established three distinct yet interrelated programs whose different characteristics the WCT must consider when looking at both sources of contamination and resources for cleanup. RCRA Subtitle D, the solid waste program, encourages states to develop comprehensive plans to manage nonhazardous industrial solid waste and municipal solid waste, sets criteria for municipal solid waste landfills (MSWLFs) and other solid waste disposal facilities and prohibits the open dumping of solid waste. RCRA Subtitle C, the hazardous waste program, establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal—in effect, from cradle to grave. RCRA Subtitle I, the UST Program, regulates USTs storing hazardous substances and petroleum products. RCRA also encourages resource recovery and waste minimization. EPA and authorized states administer RCRA. Funding for assessment, cleanup, and monitoring activities is the responsibility of the facility owner.

Following is a brief summary of those provisions of RCRA likely to be most relevant to a watershed cleanup; more detailed information is available in the *RCRA Orientation Manual 2006*, EPA 530-R-06-003 (March 2006). **www.epa.gov/epaoswer/general/orientat/rom.pdf**

RCRA Solid Waste Program (Subtitle D)

Under EPA's RCRA, a *solid waste* is defined as any solid, semisolid, liquid, or contained gaseous material discarded from industrial, commercial, mining, or agricultural operations, and from community activities. Solid waste can include garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants, or air pollution control facilities, and *other discarded* materials. EPA's regulatory definition of solid waste, found in 40 CFR section 261.2, is narrower than the statutory definition, and defines *discarded* material as (1) materials that are abandoned, (2) materials that are *recycled*, (3) materials that are *inherently wastelike*, and (4) waste military munitions.[3] Each of these terms is further defined in RCRA's regulations. Exclusions from the definition of solid waste are listed at 40 CFR section 261.4(a). Key exclusions include solid or dissolved materials in irrigation return flows; industrial discharges that are point sources subject to a NPDES permit under the CWA; and source, special nuclear or byproduct material as defined by the Atomic Energy Act (AEA).

Unlike the extensive regulatory system that governs hazardous waste management (discussed below), solid waste is primarily regulated by states and municipalities and managed on the local level. EPA's role in implementing solid waste management programs includes setting national goals, providing technical assistance, and developing educational materials.[4] (One of RCRA's enforcement tools—7003 orders—applies to solid, not only hazardous, wastes, and is discussed below as part of the discussion of RCRA enforcement authorities.)

RCRA Hazardous Waste Program (Subtitle C)

A RCRA hazardous waste is a RCRA *solid waste* that EPA determines poses substantial or potential threats to public health or the environment. For a hazardous waste to be regulated as a hazardous waste, it must first fall under the regulatory definition of solid waste and then within the definition

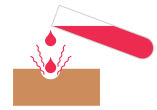
[2] Typically, the term *RCRA* is used to refer to both the statute itself (including amendments) and the regulations implementing it.

[3] For example, EPA has long struggled with defining which types of recycled materials should not be deemed *discarded* and thus excluded from the definition of solid wastes. However, this issue typically comes up only in the context of solid wastes that are also hazardous waste.

[4] Two important exceptions are 40 CFR Part 257 federal solid waste disposal facility criteria for nonhazardous, nonmunicipal landfills, and Part 258 municipal solid waste disposal facility criteria. However, the states generally carry out enforcement of these programs

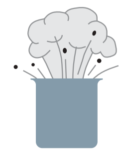
of hazardous waste, both of which are described in 40 CFR section 261, *Identification and Listing of Hazardous Waste*. There are two types of RCRA hazardous wastes: those that have been specifically listed as a hazardous waste by EPA (e.g., F001 wastes, comprised of certain halogenated solvents that have been used in degreasing activities) and those that exhibit one or more of the following characteristics of hazardous wastes (corrosiveness, ignitability, reactivity, or toxicity).

- ***Corrosive Waste.*** A corrosive material can wear away (corrode) or destroy a substance. For example, most acids are corrosives that can eat through metal, burn skin on contact and give off vapors that burn the eyes.



- ***Ignitable Waste.*** An ignitable material can burst into flames easily. It poses a fire hazard; can irritate the skin, eyes and lungs; and could give off harmful vapors. Gasoline, paint and furniture polish are ignitable.

- ***Reactive Waste.*** A reactive material can explode or create poisonous gas when combined with other chemicals. For example, chlorine bleach and ammonia are reactive and create a poisonous gas when they come into contact with each other.

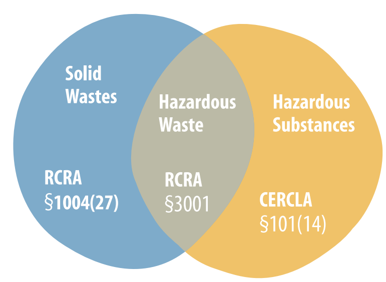


- ***Toxic Waste.*** Toxic materials or substances can poison people and other life. Toxic substances can cause illness and even death if swallowed or absorbed through the skin. Pesticides, weed killers and many household cleaners are toxic.

Additionally, RCRA hazardous wastes generally include materials generated by the treatment of hazardous waste (the *derived from* rule), or that are contained in a hazardous waste (the *mixture rule*).

RCRA Subtitle C establishes an extensive management system that regulates hazardous waste from the moment it is generated until its ultimate disposal, in effect from “cradle to grave.” EPA’s Subtitle C Program establishes various administrative requirements applicable to the three categories of hazardous waste handlers: generators; transporters; and owners or operators of treatment, storage and disposal facilities (TSDFs). The regulations applicable to RCRA TSDFs are the most extensive; therefore, facilities that only generate hazardous wastes typically take steps to ship such wastes to TSDFs before they trigger the TSDF regulations. Additional information regarding the Subtitle C Program is at **www.epa.gov/epaoswer/general/orientat/rom3.pdf**.

Of special interest to the WCT, TSDFs are required to assess all their solid waste management units, regardless of when the wastes were disposed of, and to perform corrective action for all releases of hazardous waste and hazardous constituents. Facilities must implement corrective action when necessary to protect human health and the environment, plus perform off-site corrective action when necessary. EPA estimates that at least 3,700 facilities are undergoing corrective action.



Relationship between CERCLA hazardous substances and RCRA hazardous wastes.

RCRA corrective action follows several steps, which are largely analogous to the CERCLA cleanup process.

1. ***RCRA Facility Assessment (RFA).*** An RFA is performed to determine evidence of a release and includes desktop review of available information, visual inspection and, occasionally, confirmatory sampling. After the RFA is completed, a schedule of compliance is developed for additional steps, if necessary.

2. ***RCRA Facility Investigation (RFI).*** An RFI is a detailed characterization of the nature, extent, direction, rate, movement and concentration of released contaminants. This may be performed in stages to minimize analytical costs. A corrective measures study is required if the RFI shows that action levels, determined on a site-specific basis, are exceeded. Action levels may be derived from state WQS, SDWA MCLs or other appropriate standards.
3. ***Corrective Measures Study (CMS).*** A CMS is used to determine the appropriate corrective measure. EPA selects the remedy, and the facility owner/operator implements the remedy with EPA and/or state oversight. EPA or the state may administer the remedy under various administrative mechanisms including permits, enforcement orders, or other agreements.
4. ***Corrective Measures Implementation (CMI).*** The remedy is designed, constructed, and operated and maintained.

Interim measures are short-term measures that can be required at any time to respond to immediate threats. Similar to the EPA CERCLA Removal Program, interim measures do not require an RFI or CMS.

Additional information regarding the corrective action program is at **www.epa.gov/OUST**.

RCRA Underground Storage Tank (UST) Program (Subtitle I)

The UST Program regulates USTs containing CERCLA hazardous substances and petroleum products. The RCRA UST Program does not cover certain categories of tanks.

RCRA's UST Program includes technical performance standards for all USTs and regulations to require petroleum UST owners and operators to have the financial means to pay for cleanups and to compensate third parties. The program also includes a detailed corrective action procedure.

EPA is authorized to undertake corrective action in response to a petroleum release from a UST only if such action is necessary to protect human health and the environment and one or more of the following situations exist:

1. No owner or operator can be found within 90 days to carry out the corrective action.
2. A situation exists that requires prompt action.
3. Corrective action costs at a facility exceed the requisite financial responsibility amounts.
4. The owner or operator had failed or refused to comply with a corrective action order.

When a UST owner or operator fails to start or complete an appropriate cleanup following a UST release, EPA may issue a corrective action order. RCRA section 9003(h) authorizes EPA to issue administrative orders to compel owner/operators of leaking UST to take specific corrective actions to

- Carry out investigative studies
- Take action to fix the tank and clean up what was leaked
- Close the UST

Additional information on RCRA's UST program is at **www.epa.gov/OUST**.

RCRA Enforcement Authorities

RCRA has several cleanup enforcement authorities available to compel cleanup, both at RCRA-regulated treatment, storage, and disposal facilities as well as any place where RCRA solid waste has been handled that has created an imminent and substantial endangerment. Cleanup enforcement under RCRA generally means that EPA or the authorized state closely monitors the hazardous waste handler (e.g., generator, transporter and TSDF) activities, provides compliance incentives and assistance and takes legal action when a facility does not comply with the regulation. Facility inspections by federal and state officials are the primary tool for monitoring compliance.

The federal RCRA cleanup enforcement authorities listed below can be valuable tools for accomplishing cleanup of a contaminated watershed:

- ***RCRA section 3013.*** EPA has the authority to issue an order requiring the owner or operator of a RCRA hazardous waste TSDF to conduct monitoring, testing, analysis and reporting to ascertain the nature and extent of a hazard.
- ***RCRA section 3007.*** Allows EPA to request information regarding hazardous waste practices and events at a facility and to gain access to a facility to collect waste samples.
- ***RCRA section 3008(a).*** EPA uses its general RCRA enforcement authority to compel compliance with any violation of Subtitle C, as well as to assess penalties.
- ***RCRA section 3008(h).*** Allows EPA to issue an order requiring corrective action at an interim status facility when there is evidence of a release of a hazardous waste or a hazardous constituent into the environment.
- ***RCRA section 7003.*** EPA uses this authority to address situations that may present an imminent and substantial endangerment. It is important to note that section 7003 applies to the management of any solid waste that may present an imminent and substantial endangerment, not merely RCRA hazardous wastes.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA, frequently referred to as Superfund, provides federal authority to respond to releases or threatened releases to the environment of *hazardous substances* or of any pollutant or contaminants that might present an imminent and substantial danger to the public health or welfare. While both CERCLA and RCRA address land contamination and have overlapping provisions, their underlying focus is different. CERCLA is a response program designed to remedy poorly made past waste management decisions wherever contamination has come to be located, whereas the RCRA waste management standards comprise a largely regulatory, prescriptive set of rules that are generally applicable to operating facilities and are designed to prevent such mistakes in the present and future.

The NCP provides the framework for response to releases and threatened releases of hazardous substances, pollutants, and contaminants under CERCLA as well as oil and hazardous substances under the CWA section 311 and 40 CFR Part 300.

Several important terms are common to all aspects of CERCLA.

> ***Hazardous substances:*** A *hazardous substance* under CERCLA is any substance that has been designated under specific sections of several other federal environmental statutes, including the Clean Air Act (CAA) (section 112 toxics), the CWA (section 1317(a) toxic pollutants), the Toxic Substances Control Act (TSCA) (section 2606 imminently hazardous chemical), and any RCRA hazardous waste. In addition, EPA may designate additional substances as hazardous substances under CERCLA. Hazardous substances under CERCLA do not include "petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance." EPA maintains a list of hazardous substances at 40 CFR Part 302.
>
> ***Pollutant or contaminant:*** The phrase *pollutant or contaminant* is broadly defined under CERCLA to include essentially any substance that may cause "death, disease, behavioral abnormalities, cancer," or other physical injuries. Petroleum products are also excluded from the definition of *pollutants or contaminants*. Although broader than *hazardous substances*,

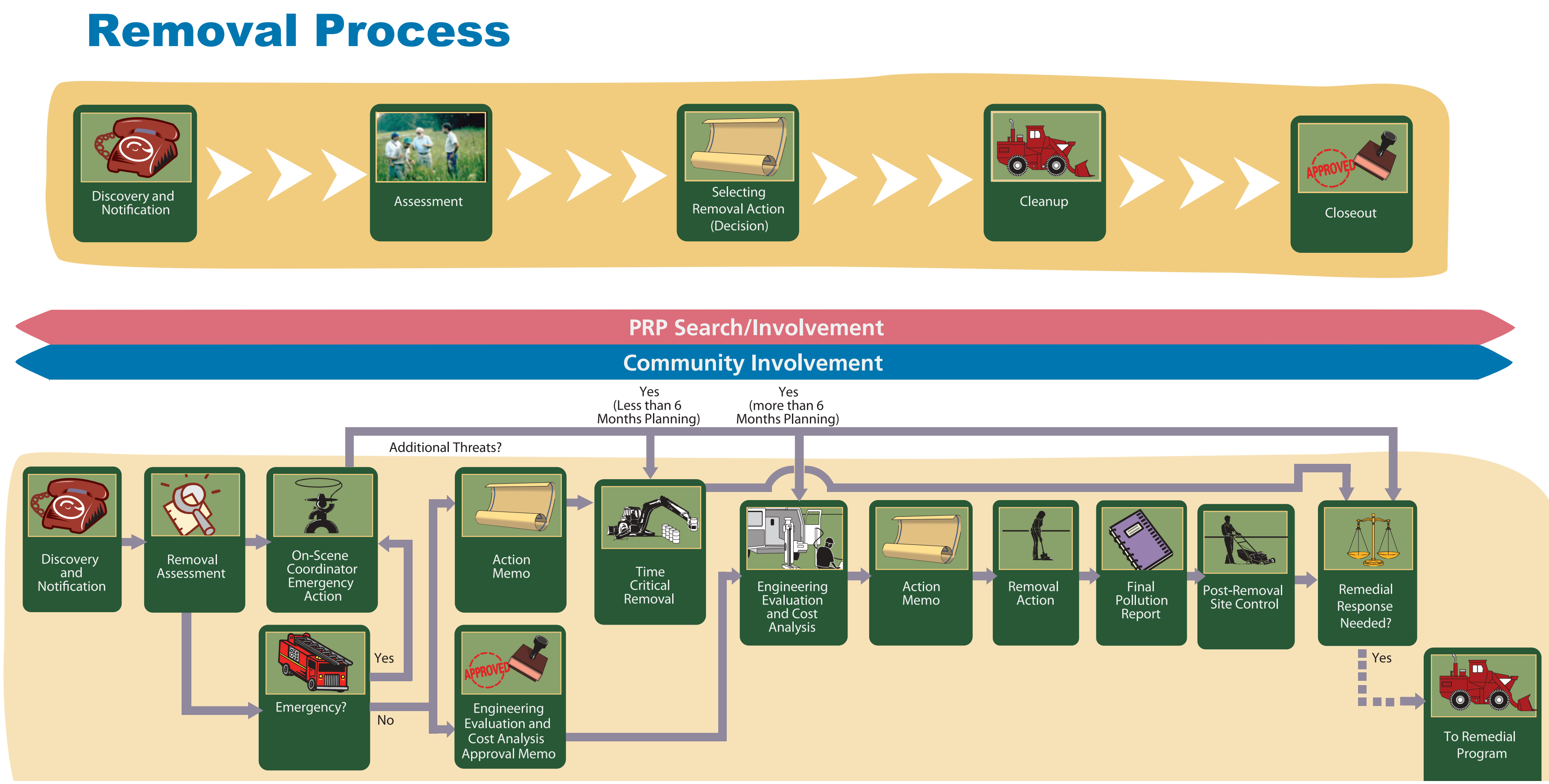


Figure 2-2. CERCLA Removal Process

pollutants or contaminants are generally not subject to EPA's enforcement authorities under sections 106 and 107.

Release: The term *release* is also defined broadly under CERCLA to include "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment."

Facility: The term *facility* under CERCLA essentially means any place where a hazardous substance, pollutant or contaminant has come to be located.

Environment: The term *environment* under CERCLA includes surface water, ground water, land surface or subsurface strata or ambient air, as well as the navigable waters and ocean waters within the United States or under jurisdiction of the United States.

The release or threatened release of hazardous substances, pollutants, or contaminants can be determined in several ways: notification of EPA by a state or local government, or a private party, as well EPA's own efforts. The six basic steps in the CERCLA response process include: discovery or notification, assessment, response alternative consideration, cleanup decision, cleanup and closeout.

CERCLA cleanups may be performed by EPA, other federal agencies, states, innocent parties or parties responsible for the contamination. However, only EPA is authorized to spend CERCLA funds. Additionally, CERCLA bars the expenditure of CERCLA remedial action funds on federal facilities. EPA first tries to get responsible parties to undertake response work themselves, either through consensual agreements or by taking other enforcement actions. If necessary, EPA will perform response actions and seek cost recovery from those responsible for the release.

EPA's CERCLA activities include the ***Removal Program***, which generally responds to immediate, short-term threats; the ***Site Assessment Program***, which considers whether a site should be placed on the NPL comprising the nation's most serious sites; and the ***Remedial Program***, which addresses NPL sites and governs the necessary assessment, planning and response actions. The following discussion also addresses CERCLA enforcement issues, federal facilities and EPA's involvement with natural resources damage assessments and restoration.

CERCLA Removal Program

The Removal Program (Figure 2-2) typically responds to situations where a release or threatened release of a hazardous substance poses an immediate, unacceptable threat to the public health or environment. Removal actions are often short-term federal responses to prevent, minimize or mitigate the effects of hazardous substances, pollutants or contaminants that have been released into the environment or where there is a substantial threat of a release. Removal actions may be conducted at non-NPL sites or in conjunction with the Remedial Program at an NPL site. Removal actions may include, for example, stabilization of an impoundment, removal of sediment hotspots, installation of a security fence or removal of drums and transportation to a RCRA TSDF.

A CERCLA removal may be conducted during any step of the response process at an NPL site, as well as at non-NPL sites. In most cases, an on-scene coordinator (OSC) designated by the lead agency (generally EPA at privately owned sites; the relevant federal agency at federally owned facilities) directs a removal action, and the work is done by emergency response contractors. When a removal takes place at an NPL site, it may be directed by a remedial project manager and performed by remedial contractors.

EPA differentiates among three types of removal actions depending on the urgency of the situation. The type of removal action at issue can also affect who conducts or otherwise supervises the response. All removal actions require preparation of an *action memorandum*, which documents the basis for taking the action.

- A *classic emergency* requires actions within minutes or hours of discovery. Actions are taken under the authority of the NCP and with the guidance of Regional and Area Contingency Plans to take the necessary actions to ensure an efficient, coordinated and effective response to discharges of hazardous substances. The Superfund Emergency Response Program maintains a response system ready for virtually any emergency wherever it occurs. EPA may undertake (or supervise) emergency removal actions at privately owned sites and on lands owned by federal land managers (FLM) [FLMs such as DOI or USDA]. The Department of Defense (DoD) and DOE undertake emergency removal actions on their lands.
- A *time-critical removal action* (TCRA) may be done if fewer than 6 months are available before site activities must be initiated to protect human health. A removal assessment is performed and alternatives to correct the problem are considered. EPA may undertake (or supervise) TCRAs at privately owned sites. The FLMs, DoD, and DOE undertake time-critical removal actions on their lands.
- A *non-time-critical removal action* (NTCRA) is generally called for if more than 6 months are available before site activities must be initiated. A removal assessment is performed to determine the extent and nature of contamination, and an EE/CA is prepared to document site characteristics, identify removal action objectives, identify ARARs, identify and analyze potential removal action alternatives and provide a recommended removal action alternative. After public comment, the removal action is selected and performed. EPA undertakes (or supervises) NTCRAs at privately owned sites. The FLMs, DoD, and DOE undertake NTCRAs on their lands.

CERCLA Site Assessment Program

The CERCLA Site Assessment Program conducts screening investigations to evaluate potential threats to human health and the environment associated with a specific site. The Program helps identify and prioritize sites that should be on the NPL. The following site assessment steps generally are taken prior to NPL listing:

1. ***Site Identification or Discovery.*** Anyone can discover a site. However, concerned citizens are the ones who frequently call the local or state health department or EPA to report a release (or the threat of a release) of a hazardous substance to the environment. Once identified, EPA enters information about the site into the CERCLA Information System (CERCLIS) database that tracks all sites investigated using funds from CERCLA.
2. ***Preliminary Assessment (PA).*** The PA typically is a limited-scope investigation in which available information about a site and its surrounding area is compiled. The PA is designed to distinguish between sites that pose little or no threat to human health and the environment and sites that might require further investigation. If the PA results in a recommendation for further investigation, an SI is performed.
3. ***Site Inspection (SI).*** The SI normally involves collecting on-site characterization samples and off-site ground water, surface water/sediments, soil, air or fish tissue samples to determine if substances at the site are being released to the environment and to assess if they pose a threat

There are three mechanisms for placing sites on the NPL:

1. EPA's HRS.
2. Each state or territory may designate one top priority site regardless of score.
3. The third mechanism allows listing a site if it meets all three of these requirements:
   - The Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Public Health Service has issued a health advisory that recommends removing people from the site.
   - EPA determines that the site poses a significant threat to public health.
   - EPA anticipates that it will be more cost effective to use its remedial authority (available only at NPL sites) than to use its removal authority to respond to the site.

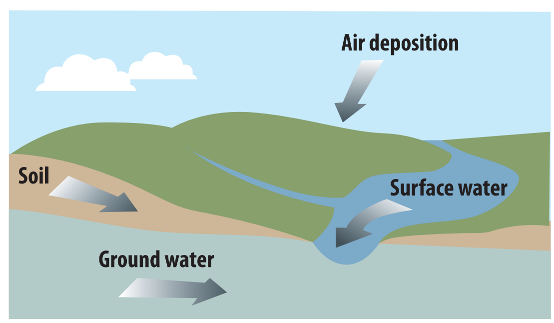
to nearby targets (such as water intakes). The SI can be conducted in one stage or two. The first stage, or focused SI, typically tests hypotheses developed during the PA and can yield information sufficient to prepare a Hazard Ranking System (HRS) scoring package. If further information is necessary to document an HRS score, an expanded SI generally is conducted. To save time and money, the PA and SI phases may be completed at once. Often EPA funds states to undertake PAs and SIs.

4. ***Hazard Ranking System Scoring.*** The HRS is a numerical screening system used to prioritize sites for listing on the basis of data from the PA and SI and that is used to decide which sites should be proposed for inclusion on the NPL. Scoring is done using three factors related to risk and four pathways of exposure. The three risk factors are likelihood of release, characteristics of the waste and the people or sensitive environments affected by the release. To determine an HRS score for a site, EPA looks at migration pathways—how contamination moves in the environment. EPA examines four migration pathways:

   - **Ground water** that may be used for drinking water
   - **Surface water** (like rivers and lakes) used for drinking water and for plant and animal habitats
   - **Soil** that people may come in contact with or that can be absorbed lower in the food chain
   - **Air** that carries contaminants

A site can score high on the HRS even if only one pathway score is high. Sites with a preliminary HRS score of 28.50 or greater are eligible for listing on the NPL. EPA may then propose sites that rank high enough on the HRS for listing on the NPL. Each state may also nominate a site for the NPL. Contaminated sites placed on the NPL may require long-term response under the CERCLA Remedial Program. Note that not all sites with a preliminary HRS score of 28.50 or above will be placed on the NPL.

HRS scores do not determine the priority for funding of remedial investigations, because the information collected to develop HRS scores is not sufficient to determine either the extent of contamination or the appropriate response (if any) for a site. Moreover, the sites with the highest scores do not necessarily come to EPA's attention first. EPA relies on more detailed studies in the RI/FS, which typically follows listing.



NPL sites may be as small as a few thousand square feet or thousands of acres. Some are complex and highly contaminated, requiring many years to fully study the problem, develop a remedy and complete the cleanup.

CERCLA Remedial Program

Once a site is listed on the NPL, the EPA Remedial Program (Figure 2-3) (or the responsible party with oversight by EPA), typically conducts an RI/FS designed to define the extent of contamination, estimate the risk to human health and the environment and evaluate effective remedial alternatives to address the problem, consistent with the NCP. Federal agencies normally conduct their own RI/FSs at facilities under their jurisdiction, custody or control. A ROD normally is prepared describing the selected action to clean up the site and documenting the remedy selection decision. The remedial action is generally undertaken, according to the remedial design. Long-term operations and maintenance (O&M) are conducted as necessary. After cleanup is complete at all sites at which hazardous substances remain at levels that do not allow for unrestricted use and unlimited exposure, EPA reviews the remedy every 5 years to ensure the remedy remains protective.

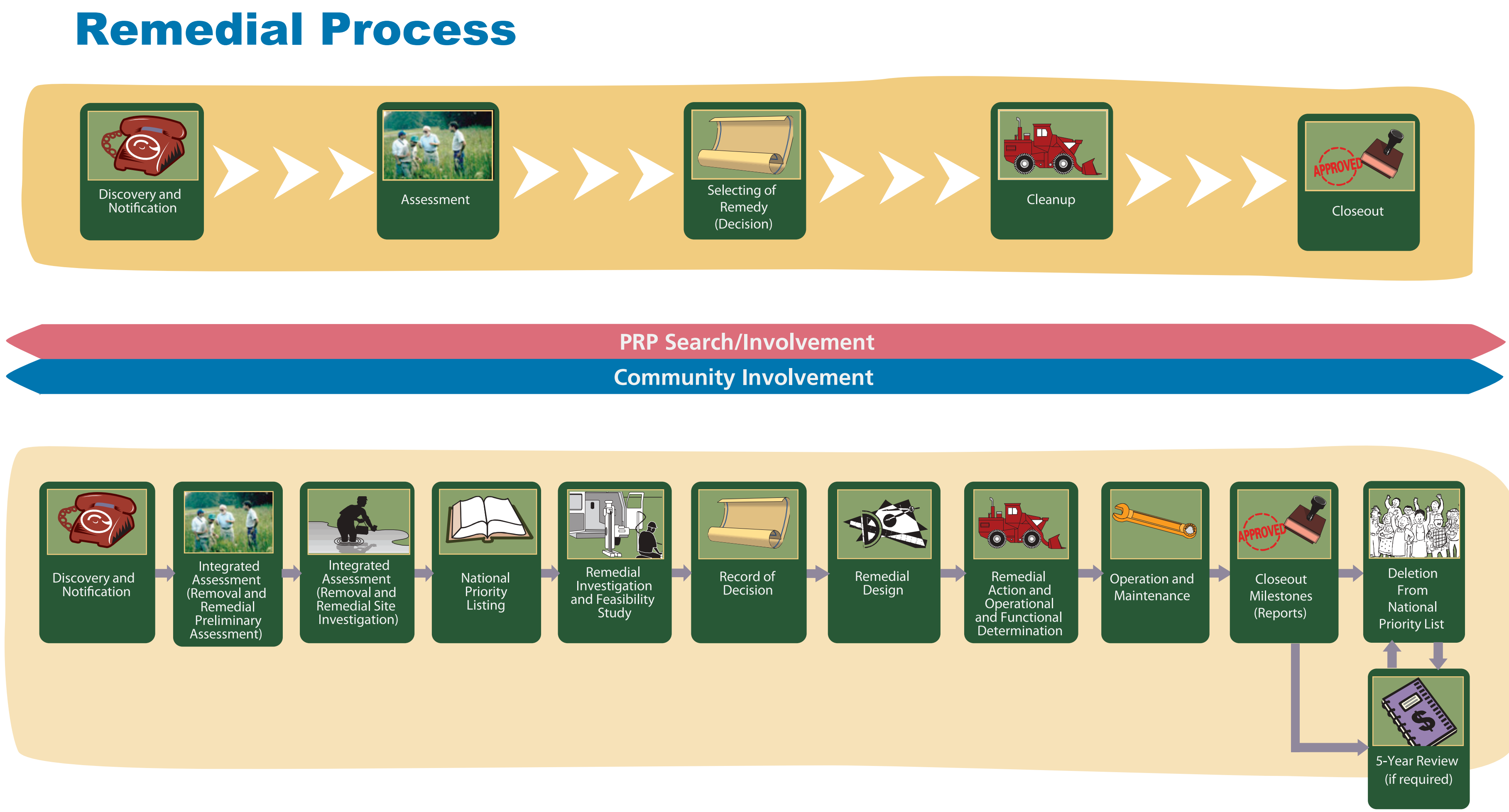


Figure 2-3. CERCLA Remedial Process

The CERCLA Remedial Process

1. ***Remedial Investigation/Feasibility Study.*** Consistent with the NCP, the RI typically is conducted to determine the risk to human health and the environment posed by the site and to gain information required to evaluate the feasibility of remedial alternatives. The RI/FS generally includes baseline risk assessments (human health and ecological), hydrologic studies, ground water studies, treatability studies and any other studies required to determine site conditions, threats to human health and the environment and determine appropriate and cost effective actions to clean up the site. The short- and long-term aspects of three criteria (i.e., effectiveness, implementability, cost), normally will guide the development and screening of alternatives as appropriate. Alternatives that remain after the initial screening generally undergo a detailed analysis that consists of an assessment of individual alternatives against each of nine evaluation criteria. The RI/FS typically considers all known or identified ARARs.
2. ***Proposed Plan (PP).*** The lead federal agency under CERCLA (normally EPA at privately owned sites or the FLM, DoD, or DOE at sites under their jurisdiction, custody, or control) typically issues a PP, summarizing the RI/FS and presenting a recommended alternative. The public (including potentially responsible parties— PRPs) normally is given 30 days to comment on PPs, which may be extended upon request for an additional 30 days (or longer, if appropriate).
3. ***Record of Decision.*** Consistent with the NCP, on the basis of the findings of the RI/FS, the Agency issues a decision describing appropriate actions to be taken to protect human health and the environment. The ROD generally explains the selection of the final remedy based on relevant facts, analyses and policy considerations.
4. ***Remedial Design/Remedial Action.*** The selected remedy may be designed by a potentially responsible party and then submitted to EPA for approval. Generally, the remedy is implemented or constructed according to the selected remedial design. The remedial design and remedial action may be financed and performed by the PRP and/or EPA.
5. ***Maintenance/Monitoring.*** The remedy is maintained for as long as is deemed necessary for protection of human health and the environment. Routine monitoring often is conducted to ensure the remedy is operating according to plan and that risks are being reduced.
6. ***Five-Year Reviews.*** Where hazardous substances are left at a site at levels that do not allow unrestricted use of the property, the Agency conducts an evaluation of the remedy no less often than every 5 years to determine its effectiveness and to determine if it continues to be protective of human health and the environment. The community is encouraged to provide input, and the results are presented to the public.

CERCLA Enforcement Authorities

A key element of CERCLA is its emphasis on enforcement. CERCLA provides EPA with enforcement authorities to get PRPs to implement removal or remedial actions at sites, either through consensual settlements or unilateral enforcement orders. CERCLA also provides EPA (as well as state and local governments and even private parties) the authority to seek reimbursement of its costs from PRPs. EPA's guiding philosophy in implementing the Superfund Program is to pursue *enforcement first* throughout the process. In this way, EPA seeks to compel those who are responsible for hazardous waste sites to undertake the cleanup and to conserve the resources of the trust fund for those sites where no PRPs can be found.

Under CERCLA, a person (which can include a corporation, a governmental entity and a variety of other organizations, as well as individuals) can be liable for response costs where:

- There is a release or a threatened release of a hazardous substance from a facility into the environment that causes incurrence of response costs, and
- The person is included in at least one class of PRPs

Section 107(a) of CERCLA identified four categories of PRPs:

- ***Owners or operators of a site.*** As passed in 1980, CERCLA imposed potential liability on virtually any current owner of contaminated property. In 2002 Congress passed amendments to CERCLA that, among other provisions, allowed those who acquired property after January 11, 2002, and who met and maintained certain conditions (conducted due diligence before acquiring the property and cooperated with government cleanup agencies after acquisition, and so on) to avoid liability. Such parties are termed *bona fide prospective purchasers* (BFPPs).
- ***Owners or operators of a site at the time of disposal.*** Courts have differed as to whether passive migration during one's ownership of a site constitutes *disposal*.
- ***Those who arranged for disposal.*** *Generators* are by far the largest category of PRPs and can include virtually anyone who participated in the chain of disposal of hazardous substances—from the business that generated the wastes, the hauler who removed them and the site owner or operator that moved them around at the site.
- ***Transporters that selected disposal sites.*** This category includes transporters who also substantially participated in the selection of a disposal site.

CERCLA provides EPA with multiple authorities to achieve cleanup and payment for cleanup. Table 2-2 lists those most commonly used.

Table 2-2. Most Commonly used CERCLA Enforcement Authorities

CERCLA	Enforcement Authority
Section 104	While much of section 104 addresses the President's authority to take removal and remedial actions, section 104(e) authorizes EPA to gather information and get access to a site from others and assess penalties for noncompliance.
Section 106	EPA can order, or ask a court to order, PRPs to clean up a site or take other necessary response action when an imminent or substantial endangerment may exist at a site. This section also authorizes penalties for failure to comply with such orders and sets forth procedures whereby a PRP that complies with such an order, yet believes it is not exclusively responsible for the contamination, or that the response action ordered was arbitrary and capricious, can seek reimbursement from the CERCLA Trust fund.
Section 107	Commonly referred to as EPA's cost recovery authority, this section describes the four categories of PRPs from whom EPA (and other parties) can recover cleanup costs. This section (in conjunction with other provisions of CERCLA) also describes certain defenses and exemptions to liability, including the BFPP provisions.
Section 120	Provides that federal facilities must achieve the same degree of cleanup as private facilities, and sets forth the requirements and procedures under which EPA and/or the states supervise such cleanups.
Section 122	Sets forth procedures whereby EPA can negotiate cleanup agreements with PRPs.

Federal Facility Issues

Watersheds typically contain land owned by a variety of private and public owners. EPA's role under CERCLA varies depending on who owns the land. On privately owned lands, EPA may undertake or supervises all response actions. EPA shares CERCLA response authority with the FLMs on land that is under their jurisdiction, custody or control. Thus, EPA generally has CERCLA emergency removal authority on such lands, while the FLMs have nonemergency removal and remedial CERCLA authority. (Note that on federal lands not on the NPL, the state, not EPA, is typically the lead regulator.) At NPL sites, DoD and the DOE typically carry out response actions with EPA oversight, pursuant to CERCLA section 120. EPA also can use authorities other than CERCLA, such as RCRA and the SDWA, to compel DoD and DOE to undertake cleanups on their lands.

Federal facilities, particularly those belonging to DoD and DOE, often pose challenging cleanup issues for various reasons including a broad range of hazardous substances, pollutants or contaminants, facility size and reuse potential. CERCLA generally limits the spending of Superfund money on the cleanup of federal lands, so funding for cleanup typically comes from from DoD, DOE and FLM appropriations. Increasingly, FLMs are taking enforcement actions themselves under CERCLA. CERCLA section 120(a) does provide that federal facilities are subject to, and must comply with, CERCLA in the same manner and to the same extent, both procedurally and substantively, as any nongovernmental entity. Mixed ownership sites (part federal land, part private ownership), often found in watersheds, provide opportunities for EPA and the FLMs to develop creative working relationships. An MOU may be used, but is not required, to define specific roles and responsibilities. Because many federal facilities are also subject to RCRA regulations, a federal RCRA/CERCLA Coordination Policy was developed to reduce duplicative efforts to meet regulatory requirements.

CASE STUDY

American Fork Canyon Home Rivers "Good Samaritan"

American Canyon, Utah

Background

It is estimated that there are more than 500,000 abandoned hard rock mine sites in the West that adversely impact approximately 40 percent of stream headwaters. Federal land management agencies have engaged in efforts to reclaim the most problematic mine sites on federal lands, but there is no federal program or funding directed at the hundreds of thousands of abandoned mines on privately owned lands.

Pacific Mine Site, American Fork Canyon

The American Fork, like many other western watersheds, has been severely impacted over time by a legacy of abandoned mines on both federal and private lands that still threaten fish and wildlife and human health. The watershed is on the Utah list of impaired waters (CWA 303(d) list). The tailings deposits impinging on the North Fork of the American Fork River contain an abundance of heavy metals, including lead at an average concentration of 17,000 parts per million (ppm), cadmium 44 ppm, copper 335 ppm, zinc 6,000 ppm and arsenic at 165 ppm. The potential exists to protect both the fragile population of native Bonneville cutthroat trout that persists in the American Fork and the approximately 1.2 million people who visit this area annually, primarily from the major nearby population centers of Provo and Salt Lake City.

Remediation/Restoration Goals

As part of a Good Samaritan cleanup effort, Trout Unlimited reclaimed four abandoned mine and mill sites in American Fork Canyon, Utah, all on privately owned lands. The waste rock deposits from the four sites were consolidated at one location and a repository was built there with an impervious composite liner to prevent water seepage. The repository was capped with 3 feet of clean, glaciated soils. An interceptor ditch was constructed along the hillside interface to collect and transport any overland flow. All the disturbed sites have been revegetated using a native seed mix, fertilizer and mulch. Project funding was provided by the Natural Resource Conservation Service (NRCS). Additional funding was provided by various sources including foundations, interested parties, land owners, industry, and so on. The estimated total cost was $300,000.

CASE STUDY

(continued)

Innovation

As a Good Samaritan, Trout Unlimited voluntarily completed the American Fork Canyon cleanup on land owned or managed by Snowbird Ski Resort. The organization took the lead in developing and implementing the mine reclamation project under a Memorandum of Understanding (MOU) with Snowbird Corporation. Additionally, Trout Unlimited entered into an administrative order on consent with EPA to perform the cleanup. This order was entered into under the authority in sections 106(a), 107(a), and 122(a) of CERCLA, 42 U.S.C. sections 9606(a), 9607(a), and 9622(a), as amended. The American Fork Canyon demonstration project has the potential to serve as a model for future mine restoration projects throughout the western United States involving the cleanup of waste material from abandoned or inactive mines. However, Trout Unlimited's decision not to voluntarily address the draining adit at same time it addressed the waste material is illustrative of ongoing Good Samaritan potential liability concerns under the CWA in managing and treating contaminated water from adits, tunnels and seeps.

Stakeholders

- Federal agencies – USFS, Bureau of Reclamation (BOR), USDA NRCS, EPA
- State agencies – Utah Department of Environmental Quality (UTDEQ)
- Local government – Salt Lake County
- Environmental groups – Trout Unlimited, True North Foundation
- Industry – Tiffany & Company, Foundation, Snowbird Ski Resort
- Academia – University of Wyoming, Utah State University

More information about the cleanup of federal facilities is available at EPA's Federal Facilities Restoration and Reuse office, **www.epa.gov/swerffrr**, and **www.fedcenter.gov**. *The Yellow Book: Guide to Environmental Enforcement and Compliance at Federal Facilities*, EPA 315-B-98-011 (Feb. 1999), offers a comprehensive summary of the principal federal environmental statutes, and how they apply at federal facilities. (Available at **www.epa.gov/swerffrr/pdf/yellowbk.pdf**.)

Natural Resource Issues

By Executive Order 12580 and the NCP, the President has designated the Secretaries of Defense, Interior, Commerce, Agriculture, and Energy as Natural Resource Trustees (Trustees) for various federal natural resources. Trust resources that are assigned to each Trustee are identified in Table 2-3. State Trustees are assigned by the state governor for state resources and are typically the directors of state departments having related responsibilities (i.e., health, environmental protection, natural resources, parks and recreation). States commonly have more than one Trustee. Trustees for tribal lands are the tribal chair or his/her designee.

Under CERCLA, if Trustees determine that remedial or removal actions are insufficient to restore the natural resources injured by releases from a Superfund site or if use of the resource is lost or curtailed, the Trustees may seek to collect damages from CERCLA responsible parties. Damages may be assessed against a responsible party, but Superfund money may not be used for restoration. Executive Order 13112, February 3, 1999, does support alternative, beneficial approaches using native species for required revegetation as part of the overall remediation at some sites. NRDA is the responsibility of Trustees, not EPA; however, CERCLA and the NCP require that EPA notify and coordinate with Trustees throughout the Superfund process. Because it relates to both CERCLA and the CWA, the NRDA process is described in more detail below.

Additional support for CERCLA assessment and cleanup is available from a variety of agencies, including: USACE, U.S. Coast Guard Strike Force, USFS, DOI (USFWS, BOR, BLM), Department of Labor, and Trustees.

Table 2-3. Federal Natural Resource Trustees

Trustee	Resources
Department of Interior (DOI) Fish & Wildlife Service (USFWS) Bureau of Land Management (BLM) Bureau of Reclamation (BOR) Bureau of Indian Affairs (BIA) Bureau of Mines (BOM) Minerals Management Service National Park Service (USNPS) U.S. Geological Survey (USGS)	• Certain anadromous fish (fish that spend a portion of their lifetime in both fresh and salt water, e.g., salmon) • Certain endangered species • Certain marine mammals • Federally owned minerals • Migratory birds • National Wildlife Refuges and Fish Hatcheries • National Parks and Monuments • Tribal resources, in cases where the United States acts on behalf of the Indian Tribe
Department of Agriculture (USDA) Forest Service (USFS)	• Federal rangeland • Federally managed fisheries • Federally owned or managed farmland • Land enrolled in the Wetlands Reserve Program • National forest land
Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA)	• Coastal environments, including salt marshes, tidal flats, estuaries, or other tidal wetlands • Designated Estuarine Research Reserves or Marine Sanctuaries • Endangered marine species • Marine mammals • Rivers or tributaries to rivers which historically support or presently support anadromous fish (For cases involving resources in coastal waters and anadromous fish streams, DOC acts as a co-Trustee with the DOI.)
Department of Defense (DoD)	• Lands owned by DoD or the Army, Navy, Air Force, and Defense Logistics Agency. These lands include military bases, training facilities, research and development facilities, and munitions plants. May share responsibility with other federal trustees.
Department of Energy (DOE)	• DOE's land-holdings include national research and development laboratories, facilities, and offices. May share responsibility with other federal trustees.

Natural Resource Damage Assessment

Watersheds often include lands held in trust for use by the public. CERCLA and OPA (passed as amendments to the CWA) allow Natural Resource Trustees to assess injuries to such public natural resources, determine damages and require responsible parties (CERCLA PRPs) to provide for restoration of resources injured due to the release of oil and hazardous substances. Natural resources are broadly defined to include "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources." The statutes recognize that when oil or hazardous substances (the term does not include pollutants or other contaminants) enter the environment, they can harm natural resources, reduce the public's use or enjoyment of them or degrade an ecological function that they provide. When the changes to the resource are adverse and measurable, the affected resource is said to be injured. Injury to natural resources serves as the basis for a damage claim under CERCLA and OPA.

NRDA may be performed by Trustees concurrently with other CERCLA actions, including emergency response, removal, PA/SI, and remedial actions, though this is not always the case in practice. Although EPA guidance encourages NRDA activities to occur concurrently with CERCLA or OPA response actions, NRDA can begin after remedial action is underway, or even complete. Additionally, Trustees may pursue compensation for injuries to natural resources even if they are not going to be addressed by CERCLA or OPA response actions. For sites located where cross-programmatic watershed cleanup may be implemented, NRDA may be coordinated with other aspects of watershed assessment and cleanup.

NRDA is described at 43 CFR 11, and additional information is available at **www.epa.gov/superfund/programs/nrd**. The elements of a NRDA include the following:

1. ***Preassessment Screen.*** Readily available data is reviewed to determine whether a release justifies an NRDA. Five questions must be answered affirmatively to proceed with an NRDA:
   - Has a discharge of oil or a release of a hazardous substance occurred?
   - Have natural resources for which the federal or state agency or tribe may assert trusteeship under CERCLA been, or are they likely to be, adversely affected by the discharge or release?
   - Is the quantity and concentration of the discharged oil or released hazardous substance sufficient to potentially cause injury to those natural resources?
   - Is data sufficient to pursue an assessment readily available or likely to be obtained at reasonable cost?
   - Will response actions, if any, not sufficiently remedy the injury to natural resources without further action?

2. ***Assessment Plan.*** Planning, coordination and involvement of the public, PRPs, and Trustees are used to identify and document the methodologies that will be used in the assessment. A preliminary estimate of damages and a Restoration and Compensation Determination Plan are developed to ensure that assessment costs are reasonable compared to the estimated damage.

3. ***Assessment.*** Actual damage assessment is performed in three steps: Injury Determination, Quantification of Service Effects and Damage Determination. The Injury Determination establishes that the resource has been injured as the result of a hazardous substance release. The Quantification of Service Effects quantifies the reduction in natural resource services resulting from the injuries attributed to the hazardous substance release. The Damage Determination values the natural resource damages as the sum of restoration costs, diminution in value of natural resource services between the release and restoration and damage assessment costs.

4. ***Post-Assessment.*** An assessment report is prepared, the claim for damages is presented to responsible parties and a restoration account is set up with the damage payment. A restoration plan is prepared documenting actions that will be taken to restore, rehabilitate, replace or acquire equivalent resources and how the loss of services will be addressed consistent with the damage award.

Similar regulations (15 CFR Part 990) have been prepared by NOAA for NRDAs related to coastal releases of oil and hazardous materials under the CWA, OPA, CERCLA and the National Marine Sanctuaries Act. The NOAA NRDA is performed in three steps:

1. ***Preliminary Assessment.*** The Trustees determine whether injury to public trust resources has occurred. Their work includes collecting time-sensitive data and reviewing scientific literature about the released substance and its impact on trust resources to determine the extent and severity of injury. If resources are injured, Trustees proceed to the next step.

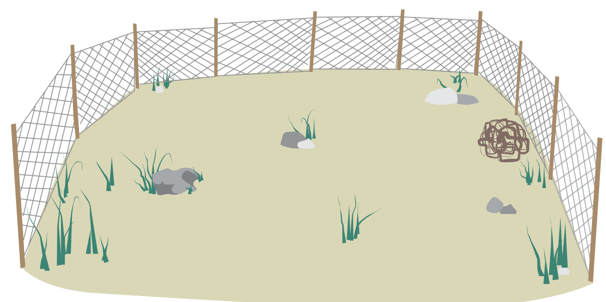
2. ***Injury Assessment/Restoration Planning.*** Trustees quantify injuries and identify possible restoration projects. Economic and scientific studies assess the injuries to natural resources and the loss of services. These studies are also used to develop a restoration plan that outlines alternative approaches to speed the recovery of injured resources and compensate for their loss or impairment from the time of injury to recovery.

3. ***Restoration Implementation.*** The final step is to implement restoration and monitor its effectiveness. Trustees work with the public to select and implement restoration projects. Examples of restoration include replanting wetlands, improving fishing access sites and restoring salmon streams. The responsible party pays the costs of assessment and restoration and is often a key participant in implementing the restoration.

Brownfields

EPA's Brownfields Program is designed to empower states, communities and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up and sustainably reuse brownfields. The program began as an administrative effort within the CERCLA Program and was then formalized under the Small Business Liability Relief and Brownfields Revitalization Act, (Public Law 107-118), enacted as amendments to CERCLA in 2002. EPA's Brownfields Program provides financial and technical assistance for brownfields activities through an approach based on four main goals: protecting the environment, promoting partnerships, strengthening the marketplace and sustaining reuse.

The law defines a Brownfields site as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." The term includes abandoned, idled, or underused industrial or commercial facilities, agricultural and residential land, among other types of uses but does not apply to federal lands, NPL sites or land subject to enforcement actions or certain response actions under CERCLA.



The Brownfields process is tailored to the specific end use of the property. Cleanup standards generally are determined according to the expected property use. Property owners may be able to obtain funding from public programs and private banks and institutions. Sampling plans are flexible and dynamic and allow for adjustments in the field. Generally EPA-funded Brownfields cleanups go through state cleanup programs. While the Brownfields process is flexible, it includes the following general steps:

1. ***Phase I Site Assessment and Due Diligence.*** Obtain background information to determine the extent of contamination and legal and financial risks.

2. ***Phase II Site Investigation.*** Sample the site to identify the type, quantity and extent of contamination.

3. ***Evaluate Remedial Options.*** Compile and assess possible remedial alternatives.

4. ***Develop Remedy Implementation Plan.*** Coordinate with stakeholders to design a remedy implementation plan.

5. ***Remedy Implementation.*** Perform necessary actions to reduce health or environmental risk.

6. ***Begin Redevelopment.***

While EPA provides funding opportunities, state or local redevelopment agencies or private parties typically undertake brownfields investigations and cleanups. EPA Brownfields grants are available to eligible entities[5] to perform site assessments, community involvement, cleanup, job training and workforce development; for capitalization of revolving loan funds; and as state/tribal grants to help in developing state response programs.

[5] e.g., State and local governments

Another program with criteria similar to the Brownfields Program is EPA's Superfund Redevelopment Initiative (SRI). As part of the Superfund Redevelopment Program, EPA has developed a pilot program to help local governments participate in the cleanup and reuse of Superfund sites. Reuse of sites is integrated into the Superfund risk assessment and cleanup. Under the pilot program, EPA provides, or seeks to have PRPs provide, up to $100,000 in financial assistance or services to local governments for specified activities to help determine the future use of their sites. This program also encourages partnerships with states, local government agencies, citizen groups and other federal agencies to restore previously contaminated properties to beneficial use.

Similarly, RCRA Brownfields Prevention Initiative focuses on RCRA facilities not in full use where there is redevelopment potential but reuse or redevelopment is slowed because of real or perceived concerns about contamination, liability or RCRA requirements. The initiative has funded projects that illustrate how innovations and reforms under RCRA can reduce barriers to reuse and redevelopment of RCRA Brownfields sites. The RCRA Brownfields Prevention Targeted Site Efforts Initiative provides support to sites where cleanup has been delayed to prevent them from becoming Brownfields sites. Funding is applicable to sites with significant redevelopment potential and limited EPA support to complete the project.

EPA's UST Fields Initiative was created to encourage the cleanup and reuse of abandoned properties contaminated with petroleum from USTs. *UST fields* are abandoned or underused industrial and commercial properties where revitalization is complicated by real or perceived environmental contamination from USTs.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) (15 U.S.C. 2601 et seq.) was enacted in 1976 to give EPA the authority to track chemicals produced in or imported into the United States. EPA tracks the thousands of new chemicals developed each year and repeatedly screens all chemicals. EPA can require reporting or testing of chemicals that might pose environmental risks or human health hazards and ban the manufacture or importation of any chemicals that could pose unreasonable risks. TSCA supplements the CAA and Toxics Release Inventory (TRI) under the Emergency Planning and Community Right-to-Know Act (EPCRA). In addition, TSCA regulations in the United States (40 CFR Part 761) dictate restrictions on the manufacture, sale, use, disposal, import and export of polychlorinated biphenyls (PCBs). TSCA also includes provisions for allowable uses of PCBs.

TSCA regulations establish a concentration-based hierarchy that governs all aspects of PCB use and disposal and dictates specific behaviors that are necessary for compliance. Regulations and policy specify:

- How PCBs may be used, processed, distributed, manufactured, exported, and/or imported
- Acceptable storage and disposal conditions
- Spill cleanup requirements
- Recordkeeping and reporting requirements

EPA has developed a policy to clarify the implementation of TSCA's PCB Disposal Regulations at Superfund sediment sites.

Stakeholders

The following stakeholders may be part of the WCT.

Federal Government Stakeholders

- EPA
  - Water Programs
  - RCRA
  - Superfund
  - Brownfields
- Natural Resource Trustees (see Table 2-3)
- Land/Resource Management Agencies
  - Department of Interior (BLM, BIA, BOR)
  - Department of Agriculture (USFS, Natural Resources Conservation Service [NRCS], Farm Service Agency [FSA])
  - Department of Commerce (DOC)
- USACE
- Other federal facilities, including DoD and DOE
- Federally established interstate or international coalitions

Federal agencies may provide regulatory authority and responsibility, financial resources, contracting resources and scientific resources. Additional federal agencies that provide invaluable resources for watershed assessment and cleanup are presented in Chapter 3.

State and Tribal Government Stakeholders

State agencies may provide regulatory authority, resources and technical assistance for watershed planning, assessment and cleanup.

- Environment Departments (Water, RCRA, state *Mini Superfunds*, and other programs)
- Watershed Management Groups
- Water Engineers/Water Authorities
- Health Departments
- Fish and Wildlife Agencies
- Natural Resource Agencies (as designated by state governor/tribal leader)

Local Government Stakeholders

The roles of local government stakeholders will vary depending on the watershed issues and local interest. Roles may include implementation of zoning and land use restrictions, accessing funding, encouraging participation and funding from federal and state agencies, lobbying for action and establishing special districts for watershed protection or redevelopment.

- Water, Wastewater, and Stormwater Districts
- City and County Health/Environment Departments
- City and County Planning Departments
- Soil and Water Conservation Districts
- City and County Officials
- Special Districts (e.g., water allocation agencies)

CASE STUDY

Park City Soil Cover Ordinance

Park City, Utah

The Park City Landscaping and Maintenance of Soil Cover Ordinance (Park City Municipal Code) regulates the handling, disposal and capping of mine tailings in a large portion of the city. The city's Building Department enforces the ordinance pursuant to an agreement between Park City, EPA, and the Utah DEQ. These agencies, in cooperation with other stakeholders and the community, are also exploring opportunities for addressing water quality concerns in addition to the mine tailings issues.

In 1985 Park City proactively developed a strategy to isolate mine tailings from human contact by installing a 6-inch clean topsoil cap on all lots within the soils ordinance boundary. The ordinance made capping mandatory for all residential properties with elevated levels of lead. It also established an action level for capping a lot at 1,000 ppm (lead) for existing development and 200 ppm for new landscaping and imported fill. In addition, the ordinance also required that all landscaping, as well as an established vegetation layer on the property, be maintained. With these standards in place, the city's goal is to maintain and have a barrier between residences and the underlying impacted soils.

It should be noted that property owners must pay for the installation of topsoil caps and have a vested interest in their maintenance and integrity. Working with regulatory agencies, Park City closely monitors the progress of capping projects. To support the city in this effort, Jeff Schoenbacher, Park City's environmental coordinator, implemented ArcGIS to track and manage the compliance activities of all properties within the soils ordinance boundary. Such a system was needed for tracking cap compliance, plotting lead levels, planning utility installations, establishing cleanup levels for development, contacting residents and defining the ordinance boundary.

CASE STUDY

New Hampshire Builds Local Capacity to Reduce NPS

New Hampshire

Many New Hampshire planning initiatives and regulatory measures are developed and implemented at the local level. Although municipal officials are often aware of NPS pollution issues in their communities, few have the capacity to implement measures to reduce NPS at the planning and regulatory stages without direct technical assistance and educational support. To address this issue, New Hampshire's Coastal Nonpoint Pollution Control Program (CNPCP) is working with two regional planning commissions (covering 45 municipalities) to develop and support a technical assistance program to address NPS at the local level through municipal land use planning, regulatory review and development and education. The programs are specifically tailored to address NPS issues unique to each region.

Regional planning staff work one-on-one with town Conservation Commission and Planning Boards to review existing land use regulations relative to NPS, discuss NPS sources at the local level and recommend changes to local land use regulations. Discussed and proposed regulations often address stormwater management, shoreland protection, wetland setbacks, conservation subdivisions and site plan design.

As of Spring 2006, local voters approved eight recommended regulations covering erosion and sediment control, road design standards, wetland and shoreland buffers, aquifer protection, impervious surfaces and stormwater management.

Establishing Local Ordinances to Protect Resources

Many communities across the nation face challenges associated with natural resource degradation. Local governments need to have legal authorities in place to shape development and to protect resources. EPA's Model Ordinances to Protect Local Resources Web site (**www.epa.gov/owow/nps/ordinance**) helps local governments by providing the information needed to develop effective resource protection ordinances. Local governments can implement a variety of ordinances including ones that reduce developments on steep slopes, minimize erosion, reduce NPS pollution, control litter, reduce stormwater impacts and protect wetland and riparian buffers.

The Web site includes model ordinances to serve as a template for those charged with making decisions concerning growth and environmental protection. Each model ordinance listed is accompanied by several real-life examples of ordinances used by local and state governments around the nation. The ordinances address matters that are often forgotten in many local codes, including riparian buffers, erosion and sediment control, open space development, stormwater control operation and maintenance, illicit discharges and post-construction controls. The site also features a miscellaneous category containing ordinances that do not fall into the other categories. Finally, the Web site has materials that support particular ordinances, such as maintenance agreements and inspection checklists.

Other resources include: *Protecting Water Resources with Smart Growth*, an EPA publication that discusses 75 water specific model codes (**www.epa.gov/smartgrowth/pdf/waterresources_with_sg.pdf**) and *Using Smart Growth Techniques as Stormwater Best Management Practices* (**www.epa.gov/smartgrowth/stormwater.htm**) that includes model stormwater codes. The American Planning Association has also researched Smart Growth codes under an EPA grant (**www.planning.org/smartgrowthcodes**). The Center for Watershed Protection intends to produce an outline of the key elements of an effective ordinance to protect existing wetlands from the direct and indirect impacts of land development (**www.cwp.org/wetlands/articles.htm**).

Nongovernment Stakeholders

A variety of nonregulatory stakeholders may have an interest in and contribute to the watershed cleanup process. Individuals might also be interested in participating in the watershed cleanup process, so citizens should be notified of the watershed effort at key points in the process. The participation of local and nongovernment stakeholders can positively influence funding decisions of state and federal agencies and can attract funding from a wide range of sources.

Community Action or Watershed Groups

Community action groups have a vital interest in and intimate knowledge of the area. They represent the people who have to live with the problems and solutions and are most concerned about watershed contamination and the issues associated with watershed cleanup. They offer knowledge of local information, community issues and acceptable and unacceptable alternatives. The most effective community action groups will be balanced and represent a wide range of interests in the community. Organizations with a limited focus or perspective should be represented in the primary watershed group but should not dominate the group. Community action groups might pre-exist the watershed effort or can be formed to directly address the watershed issues. EPA maintains a searchable, on-line directory of watershed organizations at **www.epa.gov/adopt** that lists more than 4,000 groups involved in watershed protection activities across the country. This can serve as a useful resource in reaching out to key community groups.

Industry

Industry associations and individual industries may help develop solutions to common problems. The TMDL Program addresses both point and NPSs of pollution; however, the regulatory requirements for implementation fall only on point source dischargers (NPDES permits are required to be consistent with wasteload allocations). These regulated point sources are frequently interested in the development, and implementation of TMDLs and can provide significant resources. Revitalized land can also interest various industry groups.

Educational Institutions

Universities can provide assistance for communities in assessment and cleanup of watersheds and often have previously undertaken relevant research. Cooperative efforts benefit both the university and the community. Universities can provide a high level of expertise at low cost. University studies are often seen in the community as unbiased. The university benefits from community outreach and opportunities for student education. The university also develops relationships with agencies and is seen as a positive influence on the community. Studies and pilot projects can be performed by students under the guidance of experienced faculty and financed by grants from federal environmental programs, the National Science Foundation and other sources. Universities can provide expertise in a wide range of areas including but not limited to study design, sampling, assessment, monitoring, modeling, physical and biological waterbody assessments, volunteer training, mapping and group facilitation.

Environmental Action Groups

Numerous environmental action groups, such as Trout Unlimited and The Nature Conservancy might have an interest in watershed issues such as habitat and resource management. The groups can be a powerful advocate in lobbying for grants and funding. The listed groups are for illustration only. Many of the groups have local chapters that could partner in the actual watershed effort.

American Rivers
Thriving By Nature

American Rivers is a national organization standing up for healthy rivers so our communities can thrive. Through national advocacy, innovative solutions and our growing network of strategic partners, American Rivers protects and promotes our rivers as valuable community assets that are vital to our health, safety and quality of life. Founded in 1973, American Rivers has more than 65,000 members and online supporters nationwide, with offices in Washington, DC and the Mid-Atlantic, Northeast, Midwest, Southeast, California and Northwest regions. **www.AmericanRivers.org**

The Renewable Natural Resources Foundation (RNRF) is a nonprofit, public, tax-exempt, operating foundation established to advance sciences and public education in renewable natural resources; promote the application of sound, scientific practices in managing and conserving renewable natural resources; foster coordination and cooperation among professional, scientific and educational organizations having leadership responsibilities for renewable natural resources; and develop a Renewable Natural Resources Center. **www.rnrf.org**

RNRF

Restore America's Estuaries
working together...
Saving Our Coastal Heritage

Restore America's Estuaries is a national nonprofit organization established to preserve the nation's network of estuaries by protecting and restoring the lands and waters essential to the richness and diversity of coastal life. Work includes on-the-ground restoration projects and production of collaborative tools and resources to guide the restoration process, including *A National Strategy to Restore Coastal and Estuarine Habitat*, *Funding for Habitat Restoration Projects: A Citizen's Guide*, and *Principles of Estuarine Habitat Restoration*. **www.estuaries.org**

Trout Unlimited is a grassroots network formed to conserve, protect and restore North America's trout and salmon fisheries and their watersheds. Trout Unlimited promotes coldwater conservation and protects rivers and fisheries. Trout Unlimited accomplishes this mission on local, state and national levels with an extensive and dedicated volunteer network. The organization employs professionals who testify before Congress, publish a quarterly magazine, intervene in federal legal proceedings and work with the organization's volunteers to keep them active and involved in conservation issues. **www.tu.org**

The Nature Conservancy preserves the plants,animals and natural communities that represent the diversity of life onEarth by protecting the lands and waters they need to survive. The approach is to identify the highest priority places and protect and manage them to ensure their survival. The Nature Conservancy has five priority conservation initiatives to address the principal threats to conservation at the sites where it works, focusing on fire, climate change, freshwater, marine and invasive species. The organization promotes conservation and the participation of communities, businesses, governments, partner organizations, indigenous people, communities and individuals to preserve the world's lands and waters. **http://nature.org**

Other partners might include Ducks Unlimited, the National Association of Service and Conservation Corps, the National Wildlife Federation, the National Audubon Society and the Wildlife Habitat Council.

Volunteer Water Monitoring Programs

Data gathered by River Watch volunteers have been used by state water quality agencies, regional planning commissions, local planning commissions, departments of public works, conservation districts, USFS, EPA, and nonprofit conservation agencies. (**www.rivernetwork.org**) EPA also maintains a national directory of volunteer monitoring organizations at **www.epa.gov/owow/monitoring/volunteer**. In October 2006, EPA's Watershed Academy sponsored a Webcast on *Getting Started in Water Quality Monitoring*. The archived seminar can be downloaded at **www.epa.gov/watershedwebcasts**.

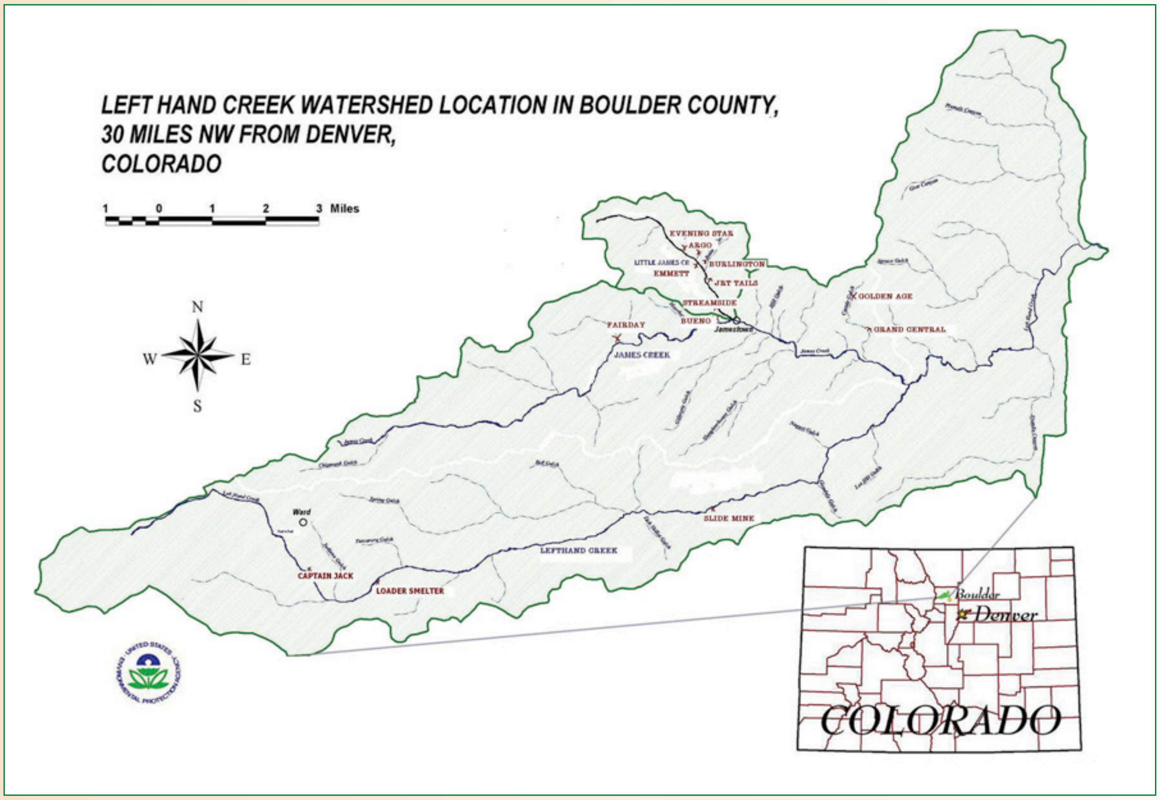
Landowners/Citizens

Landowners have a vested interest in cleanup of their watersheds and can be the best source of information regarding the problems that need to be addressed and solutions that will be effective and acceptable to the community.

CASE STUDY

Integrated Watershed Assessment and Cleanup

Left Hand Watershed, Colorado



Left Hand Watershed—Problem Identification and First Steps

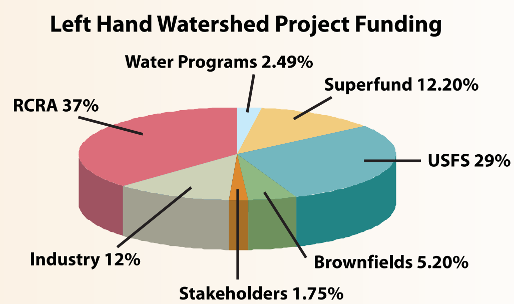
The Left Hand Watershed encompasses approximately 85 square miles in northcentral Colorado on the east slope of the Front Range of the Rocky Mountains northwest of the city of Boulder. The Left Hand Watershed is listed on Colorado's 1998 303(d) list as impaired for not supporting the aquatic life use classification due to metal contamination from historical mining wastes. In May 2002, the Boulder County Board of Health sent a letter to the Colorado Governor's office requesting support for the NPL designation for the Captain Jack Mill site. The site was listed on the NPL in September 2003.

When approached by EPA about the possibility of NPL designation for the Golden Age Mining District and the Slide Mine site to fund cleanup activities within the Left Hand watershed outside the Captain Jack Mill NPL site, the community showed little public support. In response, EPA provided funding to Colorado, which issued a Superfund Block Cooperative Agreement for prelisting activities to the Boulder County Health Department (BCHD) to provide community involvement support and for subcontract work from the Western Center for Environmental Decision-Making, a nonprofit organization. This allowed BCHD to create a community-based task force to explore alternatives to the NPL designation and inform

Subsidence pit pond at Burlington Mine the impacted communities about Superfund and other cleanup options. In 2001 the BCHD helped form the Left Hand Watershed Task Force to assess existing environmental and health data related to the watershed, determine if a cleanup action was necessary and, if necessary, evaluate cleanup options and recommend the preferred options. EPA's Technical Outreach Services to Communities (TOSC) provided an independent study summary to identify the size and levels of impacts and possible pros and cons of cleanup under Superfund. The 2002 Left Hand Watershed Task Force Report indicated that despite numerous individual studies of the watershed, no comprehensive, systematic study of the entire watershed could conclusively establish the exact extent of potential risks to aquatic life and human health, the potential effects to water quality from a catastrophic storm or similar event, the source(s) of contaminants or the appropriate remediation strategies to remove contaminants. As a result of the study, the Left Hand Watershed Oversight Group (LWOG) was formed to direct future efforts at cleaning up mine wastes.

Program Integration

The Left Hand Watershed was selected as a pilot project of EPA's One Cleanup program in 2003 because of its potential for cross-programmatic watershed assessment and cleanup. The Left Hand Watershed pilot is a cross-programmatic, multiagency approach to addressing pollution problems found in a watershed impacted by abandoned mines. The goal of the watershed-based approach was to provide a transparent and efficient cleanup in partnership with the community and local, state and federal agencies. A TMDL specialist within EPA's Water Program was assigned as the program manager for the effort. Key contacts were identified, preliminary data was consolidated and mapped, a fact sheet was prepared and a meeting was held for participants to discuss their interests in the watershed and the resources available to conduct work. Early in the process, commitments were obtained to design and coordinate a novel environmental assessment and cleanup program for this watershed, adhering to a specific plan of action that capitalized on the multiple funding mechanisms and program priorities of all participants. The Left Hand Watershed cross-programmatic effort showed an innovative cooperation strategy among EPA program personnel from the CERCLA Remedial, Removal and Assessment Programs; CWA NPS, and TMDL Programs; SDWA Programs; Brownfields Program; RCRA Program; and the Federal Facilities Program. The initiative also brought together notable non-EPA stakeholder groups including BCHD, University of Colorado (CU), the James Creek Watershed Initiative, Colorado River Watch, Trout Unlimited, USFS Abandoned Mines and Watershed Programs and USFWS. The coordinated efforts eliminated duplication by combining resources to conduct collaborative watershed-wide characterization activities and feasibility assessment. The results were used to prioritize sources of contaminant loading to the watershed and designate responsibility for implementation of cleanup activities at those sites. The resources identified and used for assessment, cleanup and community involvement in Left Hand Watershed activities as of May 2005 are shown on the table at the end of this case study. Contribution of financial resources is shown in the pie chart above.



Region 8 Lab field sampling team

CASE STUDY

(continued)

Collaborative Assessment and Feasibility Analysis

A collaborative watershed assessment program was implemented to allow multiple agencies and programs to gather data to meet the needs of all stakeholders. The EPA Left Hand Watershed program manager worked with state and federal participants to prepare an SAP that incorporated the data quality objectives of all participants and clearly stated the project goals and methods to accomplish those goals. (Appendix A includes the Left Hand Watershed collaborative sampling documents, including the SAP, quality assurance project plan, and sampling worksheet.) Sampling, equipment, training and technical resources were identified, and participating programs and agencies were assigned specific tasks. Key state and federal program participants worked side by side to perform field sampling, with training and oversight provided by the EPA Region 8 laboratory. The sampling campaign was executed by field teams consisting of 15 people per day for an entire week each season. Analysis for metals was provided by the Superfund Contract Laboratory Program (CLP) contract. The EPA Region 8 lab conducted the analysis for sediment, nutrients and macroinvertebrates and measured particle size distributions. The Region 8 NPDES program provided a water quality grant to the LWOG and CU for salt-injection studies and macroinvertebrate tissue analysis. The combined stream flow and metals concentration data provided the information needed to calculate metal loads and apportion source contributions for the TMDL. A database with a spatial interface was developed for the project by the Superfund Technical Assessment and Response Team (START) contractor using EPA Site Assessment funding and provided a tool to display data to allow collaborative decision making among the cleanup team. Evaluation of alternatives for cleanup were streamlined by conducting a site-wide feasibility assessment that included surveying and cost estimation of cleanup alternatives for all significant loading sources in the Little James Creek subbasin. The feasibility assessment was funded by the EPA TMDL contract. The results of these efforts were used to prepare program-specific assessments of cleanup alternatives throughout the basin by the Water, CERCLA, and Brownfields Programs.

Leveraged Resources for Remediation, Restoration, and Reuse

Cross program collaboration has expedited and expanded cleanup, restoration and revitalization within the watershed. This has been most evident in the areas of public participation, assessment and revitalization. Examples of program coordination in revitalization include the state Voluntary Cleanup Program (VCP) coordination with the TMDL program to design the Burlington Mine remediation using the estimated load reductions required to meet WQS. The Brownfields program expanded its Targeted Brownfields Assessment (TBA) support from the initial scope of a single site at the Argo Mine on property purchased by Boulder County for Open Space to include a ground water impact assessment for the entire upper Little James Creek subbasin. The 319 NPS Program provided the community with grants for the development of a watershed management plan and for implementing NPS controls in the watershed and may be a source of cleanup/implementation funding. A TMDL is being developed for the entire Left Hand Watershed that will identify all significant loading sources in the watershed and quantify load reductions necessary to meet WQS. The combined efforts of EPA and USFS expedited assessment and cleanup planning for the Streamside Tailings and Bueno Mine (mixed private/federal ownership) sites. An MOU between EPA Region 8 and USFS Region 2 was developed for the Left Hand Watershed project to describe the roles each program will play in assessment and cleanup of mixed ownership sites (see Appendix D). The MOU will apply to other mixed ownership sites within the regions. One lead agency will be designated for each site, but work will be cooperative unless the agencies prepare an Interagency Agreement to transfer funding for a single agency to perform the cleanup.

Enhanced Community Participation

The BCHD, LWOG, Colorado Department of Health and the Environment (CDPHE), USFS and EPA's Region 8 have effectively engaged citizens in the affected communities. CERCLA provided support through the TOSC Program and a Technical Assistance Grant (TAG). When the Left Hand Watershed

Task Force (LWTF) Report recommendations from the LWTF called for further assessment and remediation under the auspices of the Superfund Captain Jack Mill NPL site and further assessment using alternatives to Superfund throughout the remainder of the Left Hand Watershed, the agencies worked with the community to determine a plan of action. As part of the additional assessment work, Boulder County Open Space requested a TBA from Colorado's Brownfields program and EPA Region 8 Brownfields program leveraged the state's effort to complete and expand the assessment when resources limited its completion. Colorado River Watch Network contributed to the effort with 10 years of monitoring data, using support from the state's water quality program and Colorado Division of Wildlife. River Watch volunteers perform monthly surface water sampling at 13 sampling locations and annual macroinvertebrate and habitat analysis, allowing a continual picture of watershed health. Public interest spurred the USFS to prioritize funding for this project. The USFS proposed the Left Hand Watershed as its priority watershed for the USGS Central Colorado Assessment Project (biological and water chemistry assessment) of the Roosevelt National Forest, in part, because of high community interest in the watershed.

Left Hand Watershed stakeholder meeting

The agencies and programs worked together in public education and participation efforts. For example, program coordinators designed a fact sheet tailored for the Left Hand communities describing the watershed process. The fact sheet was unique in that it did not simply describe the site activity but provided brief descriptions of the various programs, existing and upcoming activities, potential funding opportunities and key contact information. The fact sheet provided stakeholders with a reference document to simplify the myriad of agencies and programs involved in the watershed.

Well-attended community meetings solicited input regarding sampling design and remediation alternatives from across the various programs. Field training was provided for the multiple sampling events. Community members and water district personnel helped with all sampling. A critical component of community outreach was education on the various programs involved in the cleanup. This included meetings to explain the ramifications and opportunities related to such programs as Superfund, Brownfields and TMDL. In addition, a workshop was provided to describe the funding restrictions and opportunities. The LWOG provided suggestions and comments on the sampling plan and site selection, and the LWOG coordinator was a participant in all of the planning meetings and has been a great liaison with the community.

Success of Cross-Programmatic Watershed Cleanup

Synchronizing multiple agencies and programs has streamlined complicated interagency boundaries, provided for timely assessments and interpretation of results, investigation of a range of potential remedies and focus of resources on collaborative cleanup. All the involved programs expanded beyond their typical site/program boundaries to contribute resources to this comprehensive watershed approach. By working together, assessment information will be used across programs rather than being program-specific, which is the more traditional way of doing work at EPA and the state. (Appendix C includes a Left Hand Watershed Fact Sheet.)

CASE STUDY

(continued)

Left Hand Watershed Funding

Partner	Assessment/Cleanup Activity	Funds/ Assistance
Water Program Resources		
Regional Geographic Initiative Funds	Salt-injection study and macroinvertebrate analysis for high and low flow loading analysis by CU.	$20K
TMDL Contract EPA R8	Little James Creek TMDL (complete). Left Hand Watershed TMDL (in progress). Little James Creek Subbasin Feasibility Analysis.	$100K
319 NPS Grant EPA R8	From CDPHE to James Creek Watershed Initiative for CU off-road vehicle recreation study. Phase 1 2001.	$18K
319 NPS Funds CDPHE	James Creek Restoration Project, Phase II. Reclamation of James Creek's riparian corridor.	$66K
319 NPS Base Funds	From CDPHE to LWOG for Watershed Management Plan Development	$25K
Water Quality Cooperative Agreement	Water quality monitoring (synoptic sampling) to characterize all source areas and load contributors within watershed.	$20K
Source Water Assessment	CDPHE source water assessment of raw water sources for each public water system.	$10K
CERCLA Resources		
Superfund Block Community Agreement	Grant from CERCLA to CDPHE Hazardous Materials and Waste Management Division to Boulder County for task force to review existing data and make recommendation on NPL listing and alternatives analysis.	$25K
EPA One Cleanup Program	Preparation of a multiagency, multiprogram watershed cleanup manual.	$38K
EPA One Cleanup Program	Watershed-wide feasibility analysis offering cleanup options to multiple agencies and programs (coordinated with TMDL).	$38K
CERCLA USFS/EPA	Golden Age, Bueno Mine and Streamside Tailings Cleanup. Little James Creek Assessment and Feasibility Analysis.	$500K
EPA Region 8 Laboratory	Laboratory analysis. Personnel for water quality, fish tissue and macroinvertebrate sampling support.	–
CERCLA Remedial	Captain Jack RI/FS. Before NPL designation, two SIs were performed.	$780K
CERCLA Remedial EPA R8	CLP sample analysis of surface water, sediment and fish tissue samples during collaborative sampling events.	$75K
CERCLA Site Assessment	EPA R8 START Contractor for site-wide database with spatial component. Map development.	$35K
CERCLA Site Assessment	To EPA R8 START Contractor for HRS package development for Slide Mine.	$10K
Brownfields Resources		
Targeted Brownfields Assessment	From EPA and CDPHE for surface water and ground water assessment at Argo, Orphan Johnny and Evening Starr mines (owned by Boulder County Open Space) within the Little James Subbasin.	$30K EPA $10K CDPHE
Brownfields Cleanup Grants and Loans	Boulder County Open Space has applied for a Brownfields Cleanup Grant to perform cleanup on three Open Space properties within the Little James Subbasin.	Application is for $200K per site.

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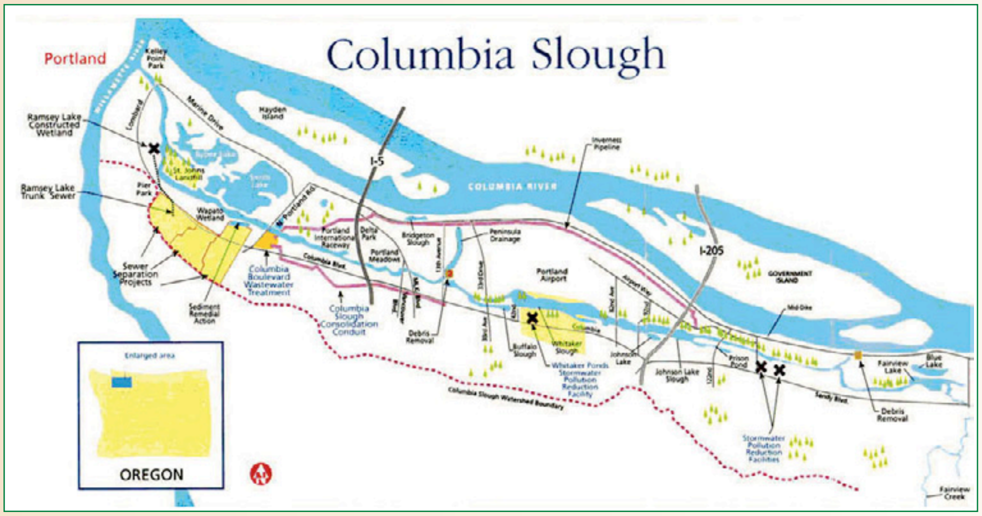
Left Hand Watershed Funding

Partner	Assessment/Cleanup Activity	Funds/ Assistance
RCRA Program		
Raytheon	RCRA RFIs, Interim Remedial Measures, ground water sampling, ground water pumping, vapor extraction and water treatment.	$4.5 Million
DOI Resources		
USFWS, USGS, USFS	Personnel for watershed high and low-flow sampling and macroinvertebrate collection and assessment. Loading assessment.	Field support
USFS—Watersheds Program and Volunteer groups	Revegetate off-road vehicle area impacting James Creek east of Castle Gulch. Equipment and supplies were funded by a grant from the Colorado State Parks Off-Highway Vehicle program. Volunteers from four wheel drive groups.	–
USFS—Abandoned Mines Program	EE/CA for Golden Age was completed this year through AML funds. $600K has been designated for cleanup within the Left Hand watershed. Proposed $2.6M. $600K approved as of 5/05.	$600K
USFS—Abandoned Mines	PA/SI and Engineering Evaluation and Cost Analysis (EE/CA) for Fairday Mine. Planned Removal Action Implementation.	$405K
Local/Industry Resources		
Honeywell—Voluntary Cleanup	Voluntary cleanup to prevent water from contacting waste rock at Burlington Mine, Jamestown.	$1.5 Million
Left Hand Water District	Mitigate impacts of sediment in James Creek. Support for Watershed Coordinator.	$103.5K
Stakeholder Matching Funds	From CU Outreach Committee, REU, Honeywell and in-kind technical advising for water quality assessments.	$53K
Stakeholder Matching Funds	Watershed Management Plan Development ($20K from CDMG, BCHD, LHWD, landowners), Seacrest toxicity study ($30K).	$50K
Stakeholder CU	Study the effect of off-road vehicle recreation. Undergraduate Research Opportunity Grant, NSF Grant. Plus 50 volunteers.	$7K
Colorado River Watch	Monthly volunteer surface water sampling at 13 locations. Annual macroinvertebrate and micro/macro habitat analysis.	–
Colorado Division of Wildlife/ Colorado River Watch	Analysis of monthly surface water samples collected by James Creek Watershed Initiative Stakeholders. Monthly Laboratory metals and Total Dissolved Solids (TDS) analysis of 13 samples. High- and low-flow nutrient analysis.	–

CASE STUDY

Water and Waste Program Coordinated Cleanup, Columbia Slough Sediment Project

Portland, Oregon



In the early 1990s, the Oregon DEQ and city of Portland initiated a project to evaluate and cleanup, as necessary, contaminated sediments in the Columbia Slough. These sediments are a concern because they can adversely impact aquatic life and accumulate in fish tissue to levels that could be harmful to people who eat the fish. Over time, the project has evolved into a more watershed-focused effort.

Project overview

There are three primary components of the slough sediment project:

1. Pollutant source reduction
2. Specific site cleanup
3. Long-term monitoring

The city tied three components together in an FS it prepared for the slough. The FS provided background on previously completed investigations and identified and evaluated measures that could be implemented to reduce sediment contaminant levels. The evaluation provided the basis for a long-term slough cleanup plan.

The proposed approach included activities occurring slough-wide as well as evaluations of each major slough segment: Upper Slough, Middle Slough, Lower Slough, Whitaker Slough, Peninsula Drainage Canal and Buffalo Slough.

Pollutant source reduction

Several efforts are underway or planned to reduce contaminant inputs to the slough. The city removed combined sewer/storm outfalls to the slough in 2001. The city has also installed several pollution reduction facilities at stormwater outfalls to reduce particulate input to the slough. These facilities are typically engineered ponds that allow sediments to settle from stormwater before discharging into the slough. Most contaminants of concern tend to adhere to soil particles, so particulate removal should reduce contaminant inputs.

The DEQ Site Assessment Program continues to identify potential contaminated sites in the slough watershed and refer them to the DEQ Cleanup Program as necessary. Sites are identified using available information indicating a contaminant release occurred on or from the site. This information can include documented waste disposal practices, detections of contaminants on site property, stormwater discharge data and correlated elevated contaminant concentrations in slough sediment.

As resources allowed, the DEQ Hazardous Waste Program developed a plan to inspect and provide technical assistance to industries in the watershed. This ensures that industrial hazardous wastes were being managed protectively.

Coordination between the DEQ Cleanup and Water Quality Programs will ensure that the reduction of pollutants entering the slough via municipal and private outfalls is effectively addressed. DEQ has developed TMDLs designed to meet state WQS and should ensure that sediment cleanup sites are not recontaminated in the future. Because many pollutants enter the slough via stormwater runoff, the TMDL limits were incorporated into a slough-specific industrial stormwater permit. They are also expected to be addressed in the municipal stormwater permits for the slough watershed.

Specific site cleanup

Sites referred to the DEQ Cleanup Program are assigned to a cleanup project manager as resources are available. Depending on the issues identified by the site assessment review, DEQ requires site owners or operators to conduct a PA or RI. Cleanup is required if contamination is identified at levels that pose or are predicted to pose a risk above acceptable levels. In some cases this can involve direct cleanup of contaminated sediment. An example of such a cleanup is provided in the *Feature* section below.

Long-term monitoring

The city has prepared a long-term monitoring plan outline for which DEQ provided comments. Monitoring will include periodic sediment and fish tissue sampling, as well as regular stormwater discharge monitoring.

Database

Slough sediment, water and fish tissue data have been collected by the city, USACE, Multnomah County Drainage District #1, Metro (a regional government agency) and private parties. DEQ and the city initiated a project to create a geographically oriented database containing all existing data and into which future data will be placed. The database plots contaminant concentration data for sections of the slough. It also evaluates trends as long-term monitoring generates data over time.

Feature: Wagner Mining Site Cleanup

In August 2002, Atlas Copco Wagner, Inc. (Wagner), completed sediment and ground water cleanup measures at its site in the Upper Columbia Slough. This was the first private-party sediment cleanup action to be completed there.

Wagner manufactures and tests heavy equipment for the mining industry and has operated at the site since 1961. Under a February 2000 Consent Order, Wagner began working with DEQ to address elevated metals concentrations in slough sediment adjacent to the facility and elevated solvent concentrations in site groundwater. In 2000–2001, Wagner completed an RI of the site, which included the collection and analysis of 32 slough sediment samples.

The investigation found that concentrations of metals (e.g., cadmium, chromium, copper, lead, and zinc), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) in sediments adjacent to the Wagner site exceeded general baseline contaminant levels found throughout the slough. Several of these contaminants can enter the food chain and bioaccumulate in fish at

(continued)

levels that present a concern for people or wildlife who eat the fish. The contamination was also determined to pose a potential threat to sediment-dwelling aquatic life.

In August 2002, Wagner paid the Multnomah County Drainage District to remove contaminated sediments associated with their site. Approximately 300 tons were removed and disposed of at the Hillsboro Landfill, and an additional 1,500 cubic yards of clean sediment were removed for flood control. Confirmation samples indicated that metals no longer pose a toxicity threat to sediment-dwelling organisms. They also showed that, with the exception of one isolated area, PAH and PCB concentrations had been reduced to below analytical detection limits or risk-based screening levels. The remaining area was believed to be contaminated as a result of spillage during the removal activities. Wagner conducted additional removal of approximately 20 cubic yards of sediment from this area in April 2003.

Chapter 3

Resources

Watershed-based cleanups can be accomplished through various funding and other resources available for investigation, cleanup, monitoring and community involvement. This section presents government funding opportunities available to various stakeholders, applicability of funds, accessing the funds and project requirements in use of the funds. Additional sources of funding could be available through state programs and government appropriations. A thorough review of grants and other funding available for specific projects should be conducted to determine potential assistance. A summary of assessment and cleanup financial resources is provided in Table 3-1 at the end of this chapter. One Web site that can help you find federal grants for a variety of tasks and grantees is **www.grants.gov**.

This section also presents nonfinancial resources available through government and nongovernmental agencies, such as scientific resources, contracting resources, facility and manpower resources and analytical resources.

Leveraging Funding

Environmental partnerships enable agencies working together and with communities to face complex environmental challenges on a scale that cannot easily be secured when an environmental program acts alone. Targeting problems at a watershed scale, which include reducing the effects of toxic substances on human health and ecosystems often require leveraging resources across programs, agencies and community-based organizations. Most grant programs encourage collaboration and partnerships. Combining multiple external sources for project support can be a very successful strategy. This can result in a *multiplier* effect, as the different funding sources can provide the match for each other. Multiple objective projects are particularly suited to this practice. Reviewers for grant awards often view this strategy favorably, because it also enhances their *leveraging* (getting more for their money). Different funding sources can be used at a variety of sites; activities supported by different federal programs at otherwise independent sites within a watershed can be coordinated for the benefit of the entire watershed. Funds should be selected on the basis of project objectives (e.g., wetland creation, education, recreation, stream restoration) with multiple compatible objectives increasing the number of potential sources and, thus, potential available funds. Federal sources typically do not allow other federal sources to be used as match. A unique exception includes the Clean Water and Drinking Water State Revolving Funds (CWSRF and DWSRF). The SRFs are made up of federal capitalization grants, state match, loan repayments, interest earnings and leverage bond proceeds. The SRFs allow loans made from funds other than the federal capitalization grants and associated state match to match other federal programs, if allowed by the other federal programs. The following scenario is an illustration of how leveraged funding can work.

Demonstration Scenario: Project for stream restoration with erosion control and wetlands creation and restoration.

Funding opportunities:

1. $3M SRF loan at 4 percent requires $221,000 payment per year for 20 years with no down payment.

2. The $3M is split into three increments:

   - $1M to support a $2M USACE project = $3M
   - $1M to support a $2M Urban Drainage project = $3M
   - $1M to support a $2M state Wetlands Program grant = $3M

This scenario is simplified and hypothetical, but it illustrates how a $3M loan can be leveraged into $9M for a project (or projects). Integrating other objectives or funding sources into this scenario could increase leveraging further. Match requirements can also be fulfilled through in-kind support, which is frequently used in 319 NPS grants and CERCLA community support funds.

Paying attention to the applicability of funds can also maximize available funding resources. Superfund can only be used to fund cleanups necessary to eliminate unacceptable risks to human health and the environment; they cannot otherwise address ecological restoration activities, such as natural resource damage claims and riparian corridor restoration. However, CWA section 319 NPS water program, Natural Resource Damage Assessment (NRDA), and CWSRF funding may support restoration activities that the Superfund program cannot. Put another way, if restoration is an objective of the Watershed Cleanup Team, Superfund dollars could be used for contaminant assessment and remediation, and NRDA, CWA section 319 NPS, and CWSRF funding, if available, could be used to complete restoration. Attempts should be made to coordinate the remediation activities with the restoration goals.

Water Program Funding Resources

Funding is available from EPA and states through EPA's water programs. Loans with advantageous terms can be issued through the Clean Water State Revolving Fund (CWSRF) or the Drinking Water State Revolving Fund (DWSRF), subject to state priorities and eligibility under the CWA and SDWA, respectively. Grants and cooperative agreements are also available. The SRF is a permanent revolving fund to provide loans and other assistance (40 CFR section 35.3115). In addition to using the CWSRF loans for cleanup and watershed restoration, communities may use the money borrowed from the CWSRF as matching funds to meet grant requirements, thus multiplying the value of the funds borrowed. However, communities may use the money borrowed from the SRF as matching funds to meet grant requirements, thus multiplying the value of the funds borrowed. CFDA 66.458. **www.epa.gov/owm/cwfinance**

Water Program Loans

The Clean Water State Revolving Fund (CWSRF) program is managed largely by the states, and makes loans to communities, municipalities, individuals, citizens' groups, and non-profit organizations for high priority water quality activities. Funds are then repaid to the CWSRF over terms as long as twenty years. Funds are typically used to finance large municipal wastewater treatment facilities, but may also be used to help manage NPS pollution, runoff control, wet weather flow control, alternative treatment technologies, and water reuse and conservation projects. Funds may also be used to fund wetland and estuary restoration and creation activities, Brownfields remediation, and polluted runoff abatement projects or implement Comprehensive Coastal Management Plans developed through EPA's National Estuary Program. Brownfield sites that suffer from water quality impairment can use the CWSRF as a powerful financial instrument for planned corrective action.

Brownfield projects that may be eligible for CWSRF funding includes, but is not limited to the list below:

- Excavation and disposal of USTs
- Constructed wetlands (filtering mechanism)
- Capping wells
- Excavation, removal and disposal of contaminated soil or sediments
- Tunnel demolition
- Well abandonment
- Phase I, Phase II, and Phase III assessments

Some potential repayment sources include the following:

- Fees paid by developers on other lands
- Recreational fees (fishing licenses, entrance fees)
- Dedicated portions of local, county, or state taxes or fees
- Property owner ability to pay (determined during loan application)
- Donations or dues made to nonprofit groups
- Stormwater management fees
- Wastewater user charges

Loan eligibility and funding priorities vary from state to state. Typical applicants for wastewater and stormwater projects are municipalities and other public organizations, but nonprofit organizations or private entities can also apply for NPS and estuary protection projects. The loans offer advantageous interest rates and repayment periods. States set funding priorities.

The DWSRF is used to issue loans to communities for drinking water systems improvements. States can customize loan terms to meet the needs of small and disadvantaged communities and for programs that encourage pollution prevention as a tool for ensuring safe drinking water. Loans are available to both publicly and privately owned community water systems, and nonprofit non-community water systems are also eligible for funding. However, some states allow only public facilities to receive funds. Loans made under the program can have interest rates between 0 and market rate and repayment terms of up to 20 years. For communities that qualify for disadvantaged assistance, loans can include principal forgiveness and terms up to 30 years.

States may also reserve a portion of their funds to finance various management tools for source water protection. For example, states may use funds to establish and implement a wellhead protection program to protect ground water. States can also provide loans to water systems for land acquisition, conservation easements, and voluntary, incentive-based source water protection measures. Eligible source water protection measures include capping wells, fencing, restoring riparian buffers, conducting public outreach, applying agricultural best management practices (BMPs), and implementing erosion control practices. Loans provided for source water protection must go to water systems, but communities, individuals, nonprofit organizations, and conservation districts can be co-signatories to the loans to further increase access to funds.

Water Program Grants

Research, investigations, experiments, training, demonstrations, surveys and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution are eligible for water program grants. Activities that are not eligible for water program grants are routine program implementation, implementing routine water quality protection or restoration measures, regulatory compliance or mitigation, land acquisition, recreational features such as hiking trails, purchase of vehicles or completion of work that was to have been completed under a prior grant. Region 8 criteria for their Consolidated Funding Process are summarized at the end of this section. Projects are funded from $10,000 to $200,000 with an average of $45,000.

EPA national or regional priorities, funding levels, current specifications and review criteria for proposals will be identified in the competitive funding announcements. To identify potential competitive funding opportunities for water program funding, see **www.grants.gov**. The competitive announcements will identify proposal/application specifications and evaluation criteria.

To see examples of grants that have been awarded and the types of work they are funding, see the Left Hand Watershed Case Study in Chapter 2.

The Water Program funding sources listed below are managed differently in the various EPA Regions. Because of the regional differences in the management of these funds, a review of regional procedures and priorities should be performed to determine what resources are most useful for a watershed.

Assessment and Watershed Protection Program Grants (AWPPG) and Cooperative Agreements (CWA section 104(b)(3), CFDA 66.480). The AWPPGs provide eligible applicants an opportunity to carry out projects to develop effective, comprehensive programs for watershed protection, restoration and management. The projects that eligible applicants can undertake are diverse. Projects should be innovative or demonstrative in design and contribute to overall development and improvement of watershed programs. In the past, award recipients have pursued a wide range of activities, such as developing management tools, advancing scientific and technical tools for protecting watershed health, improving availability of data and information about watersheds and training watershed managers and the public about watershed management. No cost share or match is required; however, projects with matching funding, in-kind services or other support are favored.

These grants may not be used solely for the operational support of specific watershed projects, for example, support for implementing individual watershed projects or developing TMDLs for specific waterbodies (normally funded under section 106/319 grants) or for in-depth monitoring (beyond traditional volunteer monitoring programs) for individual waterbodies. All projects funded through this program must contribute to the overall development and improvement of watershed programs. Project funding ranges from $5,000 to $80,000.

Water Quality Pollution Control Grants. (CWA section 106) States and interstate agencies are eligible for grants to establish and implement ongoing water pollution control programs. This program takes a watershed protection approach at the state level by looking at water quality problems holistically and targeting the use of limited finances available for effective program management.

Total Maximum Daily Load Program Funds. (CWA section 104(b)(3), CFDA 66.436, Surveys, Studies, Investigations Grants and Cooperative Agreements for Water Quality Projects) EPA funds are available for projects that lead to the completion of a TMDL or contribute toward the development of a TMDL or multiple TMDLs. These funds are referred to as *extramural funds* and can be used for contract support, grants to states or tribes or interagency agreements (IAGs) with other federal agencies (i.e., USFS, USGS, USFWS). State, tribal and interstate agencies interested in using these funds may not receive grants for routine TMDL development purposes normally funded with section 106 or 319 funds. In these cases, projects must be innovative or demonstrative in nature consistent with section 104(b)(3) of the CWA. Reuse of contract funds by state, tribal or interstate agencies may also be restricted in some cases.

Wetland Program Development Cooperative Agreements and Grants. (Clean Water Act, Section 104(b)(3), as amended; Public Law 92-500; 33 U.S.C. 1254(b)(3), CFDA 66.461) States, tribes, and local governments are eligible for wetlands program grants to aid in developing and enhancing comprehensive wetland programs. Projects must demonstrate environmental outputs and outcomes, must result in products/deliverables, should address national and regional priorities, and must demonstrate a 25 percent nonfederal match. While grants can be used to build and refine any element of a comprehensive wetland program, priority is currently given to projects that address the following two priority areas identified by EPA: enhancing wetlands protection/regulations and developing a comprehensive monitoring and assessment program.

Regional Geographic Initiative. (RGI) (CFDA 66.034, 66.424, 66.436, and 66.716) Most RGI grants are awarded under the authorities of section 103 (b)(3) of the CAA or section 104 (b)(3) of the CWA and, therefore, must qualify as a "survey, study, research, investigation, experiment, training, or demonstration." RGI is not a grant program but a pot of funds that the regions receive annually to address high priorities identified each year. The money can be used to fund grants, but there are other funding vehicles used for this money (includes funding contracts, and the like). Each Region has full authority to determine its own priorities for using this money; there are no set dollar amounts identified for water, watershed or waste projects. Grants, cooperative agreements and IAGs can be made available to state water pollution control agencies, interstate agencies and other public or nonprofit agencies, institutions, organizations and individuals to fund unique, geographically based projects that fill critical gaps in EPA's ability to protect human health and the environment. RGI projects

- Address places, sectors, or innovative projects
- Are based on a regional, state, tribal or other strategic plan
- Address problems that are multimedia in nature or fill a critical gap in the protection of human health and the environment
- Demonstrate state, local or other stakeholder participation
- Identify opportunities for leveraging other sources of funding

Projects may receive funding for one or more years but generally will not receive RGI funds for more than 4 years. Each EPA Regional office is responsible for executing the RGI Program within its states. To obtain information about the availability of funds for a project, contact the appropriate Regional RGI coordinator.

NPS Funds. (CWA 319(h)) section 319 grants are awarded to states and territories (referred to as states) for the purpose of helping them implement NPS management programs. Section 319 grants are awarded to state NPS agencies in two categories: base funds and incremental funds. States may use the *base funds* for the full range of activities addressed in their approved NPS management programs. For example, the funds may be used for protection of unimpaired waters, restoration of impaired waters, education and training and staffing or support to manage and implement their NPS management programs. In general, states have great flexibility as to how to use these base funds. States must use $100 million of section 319 funds, referred to as *incremental funds*, to develop and implement watershed-based plans that address NPS impairments in watersheds that contain section 303(d)-listed waters. The watershed-based plan must be designed to achieve the load reductions called for in the NPS TMDL. If a TMDL has not yet been developed, the plan must be designed to reduce NPS pollutant loadings that are contributing to water quality threats and impairments. Up to 20 percent of the base and incremental funds may be used to develop NPS TMDLs and watershed-based plans to implement NPS TMDLs.

The NPS grant to the state requires a nonfederal match of 40 percent. The federal share of the cost of each management program implemented with federal assistance may not exceed 60 percent of the cost incurred by the state in implementing such management program and must be made on the condition that the nonfederal share is provided from nonfederal sources. The nonfederal match can be provided by individuals, organizations, local governments, or state agencies. In-kind donations can also be used for the match—this might involve the use of equipment or space, a donation of time or volunteer services.

Approved state NPS management programs provide the framework for determining what activities are eligible for funding under section 319(h). Examples of previously funded projects include the installation of BMPs to control animal waste from animal feeding operations (not subject to NPDES permit requirements), streambank stabilization and shoreline restoration projects, forest road decommissioning to reduce erosion and sedimentation, basinwide landowner education programs and wetlands restoration projects. Section 319 funds may also be used to fund abandoned mine land reclamations projects and urban storm water activities that are not specifically required by a draft AML or final NPDES permit. Additional details regarding these types of projects are given below:

- Updating and refocusing the state NPS Management Program and NPS Assessments to improve program effectiveness. States may use up to 20 percent of their base section 319 allocation for this purpose. States should refine their programs to reflect their most pressing needs and highest-priority water quality problems. Activities and analyses that may be funded include establishing indicators and milestones, developing TMDLs and watershed plans and improving assessment efforts.
- Implementing ground water protection activities. Ground water activities are eligible for section 319 grants if they are identified in the state's NPS Management Program, Ground Water Protection Strategy or Comprehensive State Ground Water Protection Program.
- Funding urban storm water runoff activities if those activities meet the following conditions: (1) the activities are not specifically required by a draft or final NPDES permit, and (2) the activities do not directly implement a draft or final NPDES permit. Activities that might meet the above requirements include technical assistance; monitoring to address implementation strategies; BMPs; information and education programs; technology transfer and training; and development and implementation of regulations, policies and local ordinances to address storm water runoff.
- Funding AML reclamation projects designed to protect water quality if those activities meet both of the following conditions: (1) the activities are not specifically required by a draft or final NPDES permit, and (2) the activities do not directly implement a draft or final NPDES permit. Activities that might meet the above requirements include remediation of water pollution from abandoned mines or portions of abandoned mines, mapping and planning of remediation, monitoring, technical assistance, information and education programs, technology transfer and training and development and implementation of policies addressing AMLs.
- Implementing lake protection and restoration activities except for in-lake work such as aquatic macrophyte harvesting or dredging unless the sources of pollution have been addressed sufficiently to ensure that the pollution being remediated will not recur. States are encouraged to use section 319 funding for eligible activities that might have been funded in previous years under CWA section 314 (Clean Lakes Program).

Additional Water Program Support

The Watershed and Water Quality Modeling Technical Support Center (Center) provides assistance to EPA Regions, state and local governments and their contractors in implementing the CWA. The Center, which is part of EPA's Office of Research and Development (ORD), is committed to providing access to technically defensible tools and approaches that can be used to develop TMDLs, wasteload allocations (WLA) and watershed protection plans. The Center reaches out to experts throughout EPA and states to bring technical experts together. **www.epa.gov/ATHENS/wwqtsc**

CASE STUDY

Grassroots Watershed Cleanup

Middle Fork Holston, Virginia

The Middle Fork Holston begins near Marion, Virginia, and flows toward Abingdon, Virginia, providing a source of water to these communities. In 1984 a grassroots watershed group known as the Middle Fork Holston Water Quality Committee formed in response to citizen concerns about the taste and odor of their drinking water.

The group's first action was to seek the advice of state water resource management agencies. They learned that little was known about the river, so with the state's encouragement, they asked Tennessee Valley Authority's (TVA) Water Management group to help them review the river's condition. In response, TVA joined an interagency team to evaluate and assess resource conditions. TVA also collected monitoring information and conducted aerial inventories of land use and nonpoint pollution sources.

The Water Quality Committee's primary tasks were to draw public attention to TVA's results and work on convincing landowners of the benefits of agricultural BMPs. The group focused on involving all local stakeholders in setting long-term goals. In the Hutton Creek subwatershed, for example, improving the fishery became a meaningful community goal, because local streams are used more for fishing than for swimming.

Over 16 years, the Middle Fork Holston Water Quality Committee engaged in activities such as river cleanup days, school art and slogan contests and numerous field days to promote BMPs. The group also hosted three community seminars, pilot tested cost-effective streambank stabilization techniques and sponsored an innovative "Adopt-A-Watershed" program that paired high school students and state agencies in activities aimed at solving local water quality problems.

Funding and technical support for their projects came from many areas. State funds and federal section 319 grants contributed more than $750,000. The USDA provided more than $2.5 million for agricultural BMP assistance, and TVA invested approximately $750,000 in technical assistance and seed money for the initial water quality demonstration.

The Watershed Funding Web site provides a comprehensive look at funding tools, databases and information about sources of funding to protect and restore watersheds.
www.epa.gov/owow/funding.html

EPA Central Geographic Information System (GIS) support programs are available in every Region and are usually found in the EPA Regional Information Technology Support Program. They can provide an array of mapping and GIS support, including aerial photography and satellite images access via TerraServer and GlobeXplorer Web services tools within their ArcGIS systems. TerraServer image services include panchromatic Digital Orthophoto Quads down to one-meter resolution. GlobeXplorer image services include both panchromatic and color images, satellite and aerial photos, down to sub-meter resolution. Both image Web services are available to all EPA employees running the ArcGIS software.

Watershed Funding Web site—EPA has created a new Web site, **www.epa.gov/owow/funding.html**, to provide tools, training, databases, and information about sources of funding to practitioners and funders that serve to protect watersheds. The site links to the Catalog of Federal Funding for Watershed Protection as well as other useful information from both the public and private sectors.

Region 8 2006 Criteria to Assist in Selecting Potential Funding Opportunities for Watershed Projects

Region 8 combines their discretionary program grants under one Request for Proposals (RFP), called the Regional Priorities Grants Program (RPGP). The description of the funding programs and the review criteria for the 2006 RFP are summarized below. The Region 8 criteria are based on EPA program-specific guidelines. The priorities and criteria vary in each Region. EPA national and regional priorities and funding levels change over time; the current RFP specifications and criteria should be reviewed before submission of any proposal.

General requirements for outcomes and outputs are outlined in all RFPs. The 2006 guidelines include the following:

In compliance with EPA Order 5700.7 on environmental results, applicants are required to address outcome and output environmental measurements in their proposals. The term *outcome* means the result, effect or consequence that will occur from carrying out an environmental program or activity. Outcomes may be environmental, behavioral, health-related or programmatic in nature but must be quantitative. There are two major types of outcomes—end outcomes and intermediate outcomes. End outcomes are the desired end or ultimate results of a project or program. They represent results that lead to environmental or public health improvement. A change in water quality and resultant change in human health or environmental impacts are examples of end outcomes. Intermediate outcomes are outcomes that are expected to lead to end outcomes but are not themselves *ends*. For example, for an air pollution project, reductions in emissions may be viewed as an intermediate outcome to measure progress toward meeting or contributing to end outcomes of improved ambient air quality and reduced illness from air pollution.

The term *output* refers to an environmental activity or effort and associated work product that will be produced or provided over a period of time or by a specified date. Outputs may be quantitative or qualitative but must be measurable during the funding period. Examples of outputs include, but are not limited to, the number of stakeholder groups involved in the process, the number of facilities participating in a demonstration, the development of a report or training manual, increased monitoring, the number of workshops or training courses conducted and the number of people trained.

Description of Funding Programs

Below are the funding programs for which awards are expected to be made under the Region 8 2006 RPGP. Each of these programs and their expectations for outcomes and outputs is described below.

1. ***Regional Geographic Initiative (RGI):*** RGI funds support projects that have been identified as a high priority by the region, states, tribes, localities or citizen groups due to high or potentially high human health or ecosystem risk, or due to significant potential for risk reduction or avoidance. Two types of projects will be considered for RGI:

   Projects that protect and restore water quality on a watershed basis: Projects must contribute directly to the achievement of the watershed and water body restoration measures under this strategic goal (for more information on the strategic goal, refer to EPA's website at www.epa.gov/water/waterplan/documents/FY06NPGNarrative.pdf). Projects may contribute to meeting the measures by conducting restoration of impacted waters to achieve measurable improvement, or by improving the states' and/or tribes' capacity to target, achieve, measure and report water quality improvement on a watershed basis. Note that RGI funds cannot be used by states or tribes to carry out activities that would normally be funded under water quality (section 106) or non-point source (section 319) State and Tribal Assistance Grants. Projects funded under this program support progress toward EPA Strategic Plan Goal 4, Sub-objective 4.2.1 (Healthy Communities).

a. Examples of outcomes for RGI watershed projects include but are not limited to:
   i. Implemented Best Management Practices (BMPs) and restoration projects that improve riparian and in-stream physical, chemical or biological health. Some examples include miles of stream channel restored, miles of riparian vegetative buffer installed, and pounds of pollutant loading reduced or eliminated as a result of improved practices or restoration activities.
   ii. Improved water quality as measured by pre- and post-project monitoring of water chemistry, physical habitat or biological indicators. EPA recognizes that for most water quality restoration activities, measurable responses in water quality are likely to take longer than the project period.
   iii. Improved capability by a state or tribe to conduct assessment activities that measure effectiveness and environmental results of actions conducted as part of the nonpoint source or other restoration programs, or assistance provided by the state to local partners in measuring environmental results.

b. Examples of outputs for RGI watershed projects include but are not limited to:
   i. A comprehensive characterization of all sources and causes of water quality impairment within a watershed that will allow recipients to develop a restoration plan
   ii. Development of a comprehensive watershed management plan that establishes priority restoration actions needed to address water quality impairments watershed-wide
   iii. A final project report that documents and quantifies BMPs and restoration activities implemented
   iv. Enhanced multi-sector partnerships that are capable of leveraging resources from multiple sources to implement planned restoration actions

Applicants seeking funds from the RGI programs to protect and restore water quality on a watershed basis must address the general and program specific criteria in Section V of this solicitation.

Projects that address community-based air toxics: For air toxics projects, proposals must support and promote the coordination and acceleration of research, investigations, experiments, demonstrations, surveys and studies relating to local air toxics assessment, reduction, and/or elimination projects; however, priority would be given to proposals where the majority of federal dollars go to education and outreach activities related to air toxics and/or demonstration projects which implement mitigation activities. For more information on EPA's community air toxics program go to the web site www.epa.gov/air/toxicair/community.html. Projects funded under this program support progress toward EPA Strategic Plan Goal 1, Objective 1.1 (Healthier Outdoor Air).

a. Anticipated outcomes for air toxics projects include but are not limited to:
   i. Reducing risks from exposure to air pollutants through collaborative action at the local level
   ii. Developing a comprehensive understanding of sources of risk from air toxics and setting priorities for effective action
   iii. Creating multi-faceted partnerships at the local level to improve local air toxics conditions

b. Anticipated outputs for air toxics projects include but are not limited to:
   i. Creation of multi-stakeholder partnerships
   ii. Promotion and establishment of multi-stakeholder partnerships/collaborations
   iii. Knowledge of refined risk information on the local level (improved inventories, modeling)
   iv. Understanding of local areas of highest risk

v. Localized risk information to supplement the National Air Toxics Assessment

vi. Integrating efforts to understand mobile, indoor and stationary sources

vii. Integrating relevant health information

viii. Development of federal/state/local capacities in air toxics assessment

ix. Implementation of air toxics reduction activities

x. Development of means to measure results

xi. Development of outreach and education materials addressing air toxics

xii. Development and conduct of training courses addressing air toxics

Applicants seeking funds from the RGI program to address community-based air toxics must address the general and program specific criteria in Section V of this solicitation.

2. Total Maximum Daily Load (TMDL) Program: This program will evaluate projects for TMDL development for water bodies that have been identified on an EPA approved Clean Water Act Section 303(d) list. States and tribes that receive section 106 grant funding are not eligible to receive TMDL grant funding. Projects funded under this program support progress toward EPA Strategic Plan Goal 2 (Clean and Safe Water), Objective 2 (Conserve and Enhance Nation's Waters), Sub-Objective 1 (Restore and Protect Watersheds).

a. Anticipated outcomes for TMDL projects include but are not limited to:

i. Restore and maintain watersheds and their aquatic ecosystems to protect human health and support recreational activities and provide healthy habitat for fish and wildlife

ii. Improve the quality of water and sediments to allow the safe consumption of fish

iii. Restore water quality to allow swimming safe from waterborne diseases

iv. Attain water quality standards in waters previously identified as not attaining standards;

v. Improve water quality in Indian country

vi. Reduce levels of phosphorous contamination in rivers, streams and lakes

b. Anticipated outputs for TMDL projects include but are not limited to:

i. Development of TMDLs necessary to protect and improve water quality on a watershed basis

ii. Completion of assessments that characterize water quality and pollutant loading in order identify waters that need TMDLs, or to develop TMDLs for waters already listed on a state section 303(d) list.

Applicants seeking funds from the TMDL program must address the general and program specific criteria in Section V of this solicitation.

3. Source Reduction Assistance (Pollution Prevention) Program: The Pollution Prevention Act of 1990 defines "source reduction" to mean any practice that reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal, and reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. Source reduction practices may include equipment or technology modifications, process procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

The term "pollution prevention" means source reduction, as defined under the Pollution Prevention Act, and other practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water, or other resources or protection of natural resources through conservation.

The applicant will have the flexibility of scaling up prior source reduction or pollution prevention projects to generate greater environmental impact. Projects that have the potential to be scaled up must include activities that align with one of the regional priorities.

Projects relating to ENERGY STAR® and renewable energy, and projects that support the Resource Conservation Challenge would be considered under this funding source. Information about the ENERGY STAR® program can be found at www.energystar.gov and information about the Resource Conservation Challenge can be found at www.epa.gov/rcc.

Projects funded under this program support progress toward the following goals in EPA's Strategic Plan:

- Goal 1, Objective 1.5 (Reduce Greenhouse Gas Intensity)
- Goal 3, Sub-Objective 3.1.1 (Reduce Waste Generation and Increase Recycling)
- Goal 5, Objective 5.2 (Improve Environmental Performance through Pollution Prevention and Innovation)

a. Anticipated outcomes for the Pollution Prevention Program include but are not limited to:
   i. Pounds of pollution reduced
   ii. BTUs of energy conserved
   iii. Carbon reductions
   iv. Pounds of waste reduced, recycled, or put to beneficial use
   v. Gallons of water saved
   vi. Dollars saved through pollution prevention efforts

b. Anticipated outputs for the Pollution Prevention Program include but are not limited to:
   i. Number of stakeholder groups involved in a process
   ii. Number of workshops, training, and courses conducted

Applicants seeking funds from the Source Reduction Assistance program must address the general and program specific criteria in Section V of this solicitation.

4. Strategic Agriculture Initiative: The purpose of the Food Quality Protection Act (FQPA) Strategic Agricultural Initiative (SAI) Grant Program is to help implement FQPA and support "transition" efforts by growers to more environmentally-sound pest management practices. The program supports grants for education, extension, demonstration, and implementation projects for FQPA transition and reduced-risk practices for pest management in agriculture. Priority is placed on project proposals that include a "whole systems" approach by integrating pest, soil, and crop management practices; address an array of commodities; focus on sustainable agriculture; incorporate conservation planning; and are submitted by applicants that have a proven track record of grower participation and adoption of sustainable pest management practices. Successful applicants will also have an outreach and extension component to their program. "Sustainable" agriculture refers to farming practices that are environmentally sound, economically viable, and socially responsible. FQPA/SAI funds are not intended to support basic research; however, proposals may include a component for applied on-farm research, as long as they also have demonstration, education, and/or outreach activities. Proposals that maximize the use of resources for "on-the-ground" activities will be viewed more favorably than those proposals with high administrative costs. Measures of success should be linked to reduction of pesticide use/risks, implementation of alternative agricultural practices, and/or similar impacts. For assistance with measuring results of projects, see the SAI Toolbox **www.aftresearch.org/sai** (SAI Grant Applicants, Performance Measures). Projects funded under the SAI will support progress toward EPA Strategic Plan Goal 4 - Healthy Communities and Ecosystems; Objective 4.1 - Chemical, Organism, and Pesticide Risk; Program/Project 92 - Field Programs.

a. Anticipated outcomes for SAI projects include but are not limited to:
   i. Increased number of growers using reduced-risk/Integrated Pest Management (IPM) tools and techniques
   ii. Quantitative and qualitative benefits to human health, the environment, and communities
   iii. Partnerships between crop producers, EPA, other federal/state/local agencies, and other interested stakeholders to implement reduced-risk/IPM programs and to leverage funds from other sources to increase the scope of the FQPA/SAI program

b. Anticipated outputs for SAI projects include but are not limited to:
   i. Educational and outreach materials for growers
   ii. Conservation plans for growers that include reduced-risk pest management
   iii. Conferences, seminars, and on-site field training
   iv. Partnerships established between federal and non-federal programs to provide reduced-risk/IPM programs for crop producers

Applicants seeking funds from the SAI must address the general and program specific criteria in Section V of this solicitation.

Types of Award Agreements

Awards will be in the form of grants, cooperative agreements, or interagency agreements, depending on the source of funds. Interagency agreements are made between two federal agencies for projects that meet the needs and interests of both agencies. Grants have minimal EPA oversight. Cooperative agreements permit substantial involvement between the EPA project officer and the selected applicants in the performance of the work supported. EPA sees its role as providing training, tools, technical assistance and other support. Although EPA will negotiate precise terms and conditions relating to substantial involvement as part of the award process, the anticipated substantial federal involvement for projects selected may include:

- Close monitoring of the recipient's performance
- Collaboration during the performance of the scope of work
- In accordance with 40 CFR Part 31.36(g), review of proposed procurements
- Approving qualifications of key personnel (EPA does not have authority to select employees or contractors employed by the recipient)
- Review and comment on content of publications (printed or electronic) prepared under the cooperative agreement (the final decision on the content of reports rests with the recipient)

Dollar Range of Awards

The estimated dollar range of awards will be between approximately $10,000 and $200,000 depending on the project type, but we anticipate that most projects awarded will be in the $25,000–$75,000 range.

Eligibility Information

A. Eligible Applicants: The types of entities eligible to receive EPA funding vary according to the requirements of each grant program and Catalog of Federal Domestic Assistance (CFDA) number. Table CS-1 specifies eligibility requirements for each of the funding programs and CFDAs. Note that for most funding programs, private individuals and for-profit organizations are not eligible to apply directly to EPA for funding; however, they may be able to participate in a project voluntarily or through a contract mechanism as described below. The only exception is that individual farmers can apply directly for funding under the SAI.

B. Eligible Uses of Funds: RGI and TMDL Program funds may not be used for any activities that the Congress funds from the State and Tribal Assistance Grant (STAG) account. This includes all categorical grant programs, with two exceptions for RGI and only the second exception for TMDL: (1) These funds may be used for section 103 Clean Air Act grants, *if* the purpose of the project is to conduct investigations, experiments, demonstrations, surveys, studies, and training to support program implementation *and* the recipient is either an air pollution control agency or a non-profit organization; (2) These funds may be used for certain activities under section 104(b)(3) of the CWA. (Any submissions that fall in this category will be reviewed on a case-by-case basis.)

In general, EPA funds may be used to pay for personnel, fringe benefits, travel expenses, outreach materials, supplies and equipment (though there are typically limitations on equipment). Awardees cannot use federal funds to purchase land, vehicles or other capital equipment and cannot use federal funds to lobby or to complete work that was to have been done under a prior grant. Funding may be used to contract for services, provided the recipient follows procurement and subaward or subgrant procedures contained at 40 CFR Parts 30 or 31, as applicable. Successful applicants must complete contracts for services and products and conduct cost and price analyses to the extent required by these regulations. The regulations also contain limitations on consultant compensation. Applicants are not required to identify contractors or consultants in their proposal. Moreover, the fact that a successful applicant has named a specific contractor or consultant in the proposal EPA approves does not relieve it of its obligations to comply with competitive procurement requirements. Contracts must follow procurement guidelines.

C. Match Requirements: The Source Reduction Assistance program requires a match of 5 percent. To calculate the appropriate dollar match, divide the amount of EPA funds being requested by .95 for the total, then subtract the requested amount to get the match. For example, $25,000 of EPA funds divided by .95 equals $26,316. Subtract $25,000 from $26,316 and the match required will be $1,316.

For the other programs listed, the match is optional. Leveraging funds from other sources will be considered in the evaluation of proposals. For more information on match requirements, see Table CS-1.

(continued)

Table CS-1. Description of Funding Programs and Eligibility

Funding Program	CFDA[1]	Number Matching	Funds/ Type of Award	Mechanism/ Eligible Applicants
1. Regional Geographic Initiative (RGI)	66.436 or 66.034	Optional	Grant, Cooperative Agreement, or Interagency Agreement	States, tribes, local government, federal agencies, institutions of higher education, community-based environmental and nonprofit organizations.
2. Total Maximum Daily Load (TMDL)	66.436	Optional	Grant, Cooperative Agreement, Interagency Agreement, or contract support	States, tribes, local government, nonprofits, federal agencies
3. Source Reduction Assistance (Pollution Prevention)	66.717	5%	Grant or Cooperative Agreement	States, tribes, local government, school district and higher education, nonprofits, community-based grassroots organizations
4. Strategic Agriculture Initiative	66.716	Optional	Grants	States, tribes, local government, institutions of higher education, nonprofits including commodity groups/ associations, farmers groups and individual farmers.

[1] The Catalog of Federal Domestic Assistance (CFDA) can be viewed on the Web site at **www.cfda.gov**.

[2] EPA's 2003-2008 Strategic Plan goals, objectives and subobjectives can be viewed on the Web site at **www.epa.gov/ocfo/plan/plan.htm**.

EPA's Watershed Academy and Watershed Webcasts—The Watershed Academy is a focal point in EPA's Office of Water for providing training and information on implementing watershed approaches. The Academy sponsors live classroom training, online distance learning modules through the Watershed Academy Web at **www.epa.gov/watertrain**, and most recently, Webcasts on various watershed planning and restoration topics. Topics covered to date include: Sustainable Financing for Watershed Groups, Low Impact Development, Social Marketing, Brownfields, Stormwater Phase II, and Integrating Wetlands into Watershed Planning. For more information, visit: **www.epa.gov/watershedacademy**.

Plan2Fund™ is a Watershed Planning Tool that helps organizations determine their funding needs to meet the goals and objectives of their Watershed Program Plan. **Plan2Fund** walks users through estimating the costs of their Watershed Program Plan's goals and objective, assessing any local matches and determining funding needs. The results from **Plan2Fund** can be used to search for funding sources using the Environmental Finance Center's Internet-based **Directory of Watershed Resources.** **http://sspa.boisestate.edu/efc/Tools_Services/Plan2Fund/plan2fund.htm**

The Volunteer Monitoring Program helps volunteer water monitors build awareness of pollution problems, become trained in pollution prevention, help clean up problem sites, provide data for waters that may otherwise be unassessed and increase the amount of water quality information available to decision makers at all levels of government. Volunteer data provide delineation and characterization of watersheds, screening level assessments for water quality problems and measure baseline conditions and trends. EPA sponsors national conferences that bring together volunteer organizers and agency representatives, manages an e-mail list for volunteer monitoring program coordinators, supports a national newsletter for volunteer monitors, maintains a directory of volunteer monitoring programs and publishes manuals on volunteer monitoring methods and on planning and implementing volunteer programs. Information is at **http://yosemite.epa.gov/water/volmon.nsf**. Regional EPA offices provide technical assistance related to data quality control, serve as contacts for volunteer programs, manage grants to state agencies that include provisions for volunteer water monitoring and public participation, and provide information exchange services for volunteers.

RCRA Funding Resources

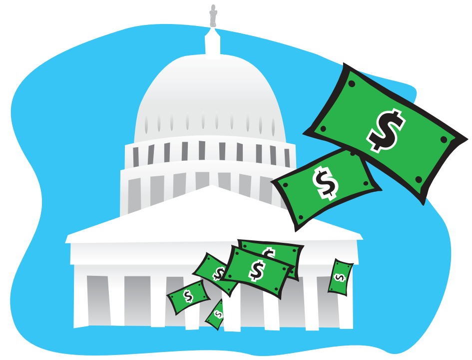
Resources for conducting RCRA assessment and cleanup activities come from business or property owners. RCRA-related Brownfields projects may be funded as described below.

UST/LUST Funds

The 1986 amendment created the Leaking Underground Storage Tank (LUST) Trust Fund to provide federal funds for corrective actions and pay for cleanup at UST sites where the owner or operator is unknown, unwilling or unable to respond or that require emergency action. Revenues for the trust fund are derived from a gasoline tax.

The 2002 Brownfields law authorized EPA to grant funds to states and local governments so they can inventory, assess and clean up low-risk, petroleum-contaminated brownfields. In 2003 EPA provided almost $23 million to state and local governments to help them assess, clean up, and reuse petroleum brownfields. This program complements the USTfields Initiative of 2000 and 2001 for the reuse of abandoned gas stations. A total of 50 USTfields Pilots were awarded up to $100,000 each from the LUST Trust Fund to assess, clean up and ready for reuse high-priority, petroleum-impacted sites.

CERCLA Funding Resources



Funds for assessment and cleanup of CERCLA sites may be provided by EPA CERCLA allocations from Congress or PRPs (the special taxes that Congress enacted to fund the dedicated Hazardous Substance Superfund expired on December 31, 1995, and have not been renewed). EPA's CERCLA Site Assessment Program funds work (its own and states' under co-operative agreements) to assess possible releases at sites. Once EPA has determined that there is a need for CERCLA response action(s), it first considers its enforcement options. Ideally, one or more PRPs agree to perform the work under EPA supervision. (As noted above, federal facilities generally undertake cleanup work under CERCLA at their own facilities, using separately authorized funds.) Where PRPs contribute only money, and EPA performs the work, funds from the PRPs are generally placed in a special account that is used only for work at that site. The NRDA aspect of CERCLA is funded by the Trustees and PRPs.

EPA, states and FLM agencies each manage certain CERCLA activities, but only EPA is empowered to disburse CERCLA funds. CERCLA grants to fund site-specific activities are not available to other agencies to conduct activities except for funding available for communities to meet the community involvement requirements of CERCLA. (Grants under the Small Business Liability Relief and Brownfields Revitalization Act are discussed separately.) This section describes assessment and cleanup resources available through CERCLA.

Pre-Remedial Program

Pre-remedial program funds are used to perform tasks required for site assessment and listing on the NPL. Funding for a specific project is on the basis of annual allocations and priorities of EPA Regions. Projects with high interest from the community or state or federal agencies are often given priority for resources. The amount of funding allocated for a PA or SI at a site is based on the complexity of the site, nature of contaminants, regional priorities and Regional funding available, but is limited by the nature of the studies.

Remedial Program

Remedial activities are funded through the Superfund as supplemented by congressional appropriations as well as by PRPs. For remedial actions funded by Superfund and congressional appropriations, EPA Regions prioritize their sites and then negotiate with EPA headquarters and other Regions to determine what projects will be funded. For remedial actions funded by PRPs, EPA encourages site cleanup teams to establish *special accounts* at each site, allowing payments by PRPs to be used at the site. Additionally, the remedial program may draw on the many CERCLA resources described below, including EPA Regional Laboratories, the CLP, the Environmental Services Assistance Team (ESAT) and the Response Action Contracts (RACs).

Removal/Emergency Response Program

There are three tiers to Removal/Emergency Response funding according to the urgency of the problem.

- ***Emergency Response:*** OSCs have a $200,000 warrant to respond to situations that pose an immediate risk to public health. An action memo must be prepared after the action to document decisions. For expenditures beyond $200,000 in an emergency situation or after the site moves from an emergency to time-critical removal status, the OSC documents the continued threat in an Action Memo (including revised upward budget) and obtains emergency response management and assistant regional administrator approval and enforcement concurrence.

- ***Time-Critical Removal:*** TCRAs may be taken to protect public health. Generally as much as $2 million may be spent after consultation with EPA's Enforcement Program. Additional approval is required for spending above $2 million, or if the removal action will exceed 12 months, and EPA headquarters must approve certain expenditures over $6 million. An action memo must be prepared before project implementation.
- ***Non-Time Critical Removal:*** NTCRAs may be implemented at sites that pose a health or environmental threat for which more than 6 months are available for planning. An EE/CA must be performed to compare removal options. Funding is limited by Regional allocations for the Removal/Emergency Response Program.

Natural Resource Damage Assessment

Under CERCLA and OPA, Trustees assess injuries to public natural resources, determine damages and require PRPs to provide for restoration of resources injured due to the release of oil and hazardous substances. Natural Resource Damages are recovered from PRPs and may be used for assessment and restoration activities.

Funds deposited into the DOI's NRDA and Restoration Fund may be used as nonfederal matching funds for federal grants if the money is deposited pursuant to a joint and indivisible recovery by the DOI and a nonfederal Trustee and the money is transferred to the nonfederal Trustee. The money may not be used for nonfederal matching funds if it is transferred to the federal Trustee agency then distributed to a nonfederal agency.

Superfund Community Involvement Resources

TAGs are awarded by EPA to community groups to contract with independent technical advisors to interpret and help the community understand technical information about the NPL site or proposed site in their community. Groups eligible to receive grants under the TAG Program are those whose members might be affected by a release or threatened release of toxic wastes at any facility listed or proposed for listing on the NPL and where preliminary site work has begun. In general, eligible groups are those groups of individuals who live near the site and whose health, economic well-being or enjoyment of the environment are directly threatened. A group applying for a TAG must be incorporated as a nonprofit (or working toward incorporation). PRPs, academic institutions, local governments or groups established or supported by the government are not eligible for TAG awards. If more than one group applies for a TAG, they are encouraged to form a coalition to apply for the grant (because only one TAG may be awarded). Up to $50,000 is available for the community to participate in decision making at their site. A 20 percent match, which may include donated or in-kind services, must be contributed by the community group. **www.epa.gov/superfund/community/tag/index.htm**

The TOSC Program provides free, independent, nonadvocate technical assistance about contaminated sites. Services and products may include explanation and review of technical documents, help to understand health risks and environmental issues, learning experiences to explain basic science and environmental policy, information about existing technical assistance materials, training for community leaders in facilitation and conflict resolution and assistance to help communities participate in the cleanup decision-making process. **www.toscprogram.org**

EPA Internal CERCLA Resources

The ***Environmental Response Team (ERT)*** is a group of EPA technical professionals who provide EPA regional and headquarters offices; USCG district offices; federal, state and local agencies; and foreign governments experienced technical and logistical assistance in responding to environmental emergencies such as oil or hazardous materials spills. The staff serve as in-house consultants on innovative and emerging technologies and are recognized experts in several fields of science. In addition to its emergency response tasks, the ERT provides remedy recommendations/implementation, technology efficacy/cost-effectiveness, and emerging technology evaluation through bench, pilot and full-scale studies promoting the One Cleanup Program. Members are involved in land revitalization efforts and ecological risk assessment, including ground water to surface water interaction studies as part of ecological risk assessment, as well as revegetation of sites fostering implementation, resulting in a more robust solution. The ERT is also active in policy development, evaluation and implementation in areas such as soil and ground water indoor air vapor intrusion, ecological risk assessment, contaminated sediment remediation and counterterrorism and homeland security.

The ERT can provide a limited amount of technical assistance but requires site funding for large efforts. The ERT operates through EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) but is available for assistance on Brownfields, RCRA, water or other EPA projects.

EPA's Office of Research and Development supports ***Technical Support Centers (TSCs)*** funded by the OSRTI and the Technical Support Project. Site-specific assistance and technical support is available to EPA Regions and to EPA program offices. **www.epa.gov/tio/tsp/tscs.htm**

Technical Support Centers are operated through ***National Risk Management Research Laboratory*** offices in Ada, Oklahoma, and Cincinnati, Ohio. The *Ground Water and Ecosystems Restoration Division* in Ada conducts research and offers technical assistance to provide the scientific basis to support the development of strategies and technologies to protect and restore ground water, surface water and ecosystems impacted by man-made and natural processes. The *Land Remediation and Pollution Control Division* in Cincinnati, Ohio, conducts research, development and demonstration projects on management of hazardous wastes and contaminated media.
www.epa.gov/ORD/NRMRL

Technical Support Centers are also provided through ***National Exposure Research Laboratory*** offices in Cincinnati, Ohio, and Las Vegas, Nevada. The *Microbial and Chemical Exposure Assessment Research Division* in Cincinnati performs research to measure, characterize and predict the exposure of humans to chemical and microbial hazards. The Environmental Sciences Division in Las Vegas operates the TSC for Monitoring and Site Characterization and provides technical support and assistance to regional staff including analytical chemistry; statistical analysis/consultation; ground water/soils modeling, monitoring and fingerprinting; air modeling and monitoring; and reviewing documents. This group works with the Remedial Project Managers (RPMs) and OSCs throughout a site characterization event (i.e., from planning and design to analysis and data interpretation). When on-site work is required, the Las Vegas TSC mobilizes specialized teams of field scientists equipped with portable or deployable instruments to help the Regions with screening-level assessments and site characterization. **www.epa.gov/nerl**

The ***National Air & Radiation Environmental Lab*** performs analyses on samples for a number of radionuclides and hazardous materials. Typical samples include air, water, soil, vegetation, human tissue and food. The laboratory routinely provides analytical and technical support for the characterization and cleanup of Superfund and federal facility sites. It also operates the Environmental Radiation Ambient Monitoring System (ERAMS). The system consists of sampling stations in each state that regularly collect air particulate, surface water, drinking water, precipitation and milk samples for radioactivity analyses. The system can also track airborne radioactivity from any accidental release. If necessary, the ERAMS sampling frequency can be increased to meet the needs of any radiological emergency response. **www.epa.gov/narel**

The ***Radiation and Indoor Environment National Lab*** specializes in developing, demonstrating and employing field technologies. Technical staff support the cleanup of contaminated sites using state-of-the-art fixed and mobile laboratories, monitoring vehicles and an extensive collection of calibrated field instruments. They also conduct field studies in radiation-contaminated areas and provide site-specific computer modeling and dose assessments. The laboratory also provides analytical services for testing and monitoring indoor environments for both radiological and chemical contaminants. **www.epa.gov/radiation/rienl**

The ***Superfund Sediment Resource Center (SSRC)*** helps EPA staff on technical issues related to the cleanup of contaminated sediment sites. The center focuses on providing timely and helpful input on site-specific issues for topics related to sediment site characterization, such as data collection and evaluation; sediment stability; modeling (e.g., hydrodynamic, contaminant fate and transport and food chain); ecological and human health risks; and the efficacy of remedies such as capping, dredging, monitored natural recovery (MNR) and treatment technologies.
www.epa.gov/superfund/health/conmedia/sediment/ssrc.htm

The ***Hazardous Waste Clean-Up Information (CLU-IN)*** Web site provides information about innovative treatment and site characterization technologies to the hazardous waste remediation community. It describes programs, organizations, publications and other tools drawn from various federal and private organizations to be used by federal and state personnel, consulting engineers, technology developers and vendors, remediation contractors, researchers, community groups and individual citizens. EPA developed the site but it is intended as a forum for all waste remediation stakeholders. **http://clu-in.org**

EPA CERCLA Contract Resources

Contract Laboratory Program (CLP)

The CLP provides analytical services for CERCLA-related projects through a nationwide network of laboratories under contract to EPA. The CLP provides a range of state-of-the-art chemical analytical services of known and documented quality on a high-volume, cost-effective basis to support ongoing Superfund enforcement, emergency response and remedial actions, site investigations and state-lead assessments. The CLP provides flexible analytical services to support Superfund field activities from a preliminary site inspection to more complex, large-scale remedial, monitoring and enforcement actions. Routine Analytical Services (RAS) are used for standardized services. Specialized analyses may be performed by the Special Analytical Services Program (SAS). Samples that require lower than standard detection limits or for different media and analytes than typical could require analysis by an independent laboratory using a standard bidding procedure. Funding for the CLP is generally not allocated to individual projects.

Environmental Services Assistance Team (ESAT)

The ESAT contract was developed to expand EPA's existing capabilities for providing hazardous waste sample analysis and related support to Superfund sites. Although primarily a Superfund vehicle, ESAT also supports EPA's RCRA Program and other non-Superfund analytical efforts. ESAT contractors provide multidisciplinary technical teams to each Region within their respective areas. The teams perform chemical and biological analysis; field analytical screen project activities, specialized analytical services support and data validation/data review support; review of site-specific quality assurance, site investigation and sampling plans; support for the development of new analytical methods; and logistical and administrative functions. The ESAT contractor may also provide GIS/mapping support.

Regional Laboratories

The Regional laboratories provide a full range of routine and specialized chemical and biological testing of air, water, soil, sediment, tissue, and hazardous waste for ambient and compliance monitoring as well as criminal and civil enforcement activities. The analytical capacity of the laboratories is enhanced by the presence of the ESAT, a dedicated Superfund contractor. In addition to fixed laboratory analytical support, the Regional laboratories provide significant field sampling and training and field analytical support.

EPIC—Remote Sensing and Mapping Support Contract

EPA's ORD has established a nationwide contract program to provide remote sensing and aerial imagery acquisition and interpretation support to the Program Offices and each of the 10 Regional Offices of EPA. The Environmental Photographic Interpretation Center (EPIC) provides support for site-specific to regional environmental characterization and change analyses, emergency response to hazardous developments, waste site inventories for large geographical areas and topographic mapping of sites.

Superfund Technical Assessment and Response Team (START)

The START contracts provide technical support for EPA's site assessment, response, prevention and preparedness activities. This support includes gathering and analyzing technical information, preparing technical reports on oil and hazardous substance investigations and technical support for cleanup efforts. The scope of the contract involves all types of scientific, engineering and technical support such as sampling and field analysis, mapping and GIS support, EE/CA preparation, PA/SI/HRS support and Homeland Security preparedness and readiness activities.

Response Action Contracts (RACs)

The RACs provide professional architect/engineering services to EPA to support response planning and oversight of activities under CERCLA. Services provided by RACs include program management, RI/FS preparation, remedial action design, EE/CA preparation, issuing and managing subcontracts for construction of selected remedies and engineering services for construction oversight. RACs services also include enforcement support, community relations, sampling and analytical support and predesign investigations. RAC contractors may also provide oversight of remedial activities performed by a state, the USACE, or PRPs identified in enforcement actions.

Emergency and Rapid Response Services (ERRS)

The ERRS contracts provide emergency, time-critical removal and quick remedial response cleanup services for the CERCLA, OPA and UST programs. ERRS contractors may also provide cleanup support for natural disasters, such as floods, pursuant to the National Response Plan, and conduct international/transboundary responses. Regionally based contracts are awarded to provide cleanup personnel, equipment and materials to contain, recover or dispose of hazardous substances, analyze samples and provide site restoration.

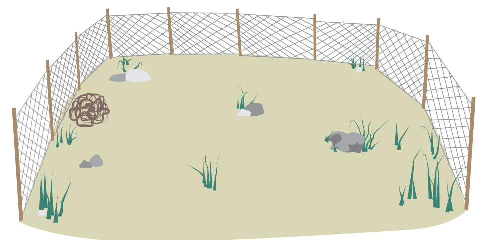
Response Engineering and Analytical Contract (REAC)

The REAC provides scientific support to EPA's ERT. The primary task is to respond to releases of hazardous materials at spills and abandoned waste sites. Response activities include field investigations and report writing for the following types of studies: multimedia extent of contamination, bioassessment, treatability, contaminant transport, engineering/feasibility and risk assessment. These studies are conducted to support EPA OSCs and RPMs for removal and remedial actions, respectively. The REAC contractor also performs evaluation or engineering design studies of innovative, commercially available technologies to confirm and document their performance. The contractor performs air-monitoring studies at hazardous waste sites and incidents of deliberate release of weapons of mass destruction by terrorist groups. To support field and engineering studies, the REAC contractor provides on-site and mobile analytical services, conducts rapid analyses of complex waste mixtures and environmental samples and develops analytical methodologies for on-site and field laboratory equipment.

Brownfields Resources

EPA provides funding to eligible entities (e.g., state and local governments) in the form of assessment grants, revolving loan fund grants for cleanups, direct cleanup grants and job training grants. Additional funds are provided to states and tribes for the establishing or enhancing state and tribal response programs, as well as to perform Targeted Brownfields Assessments (TBAs). Brownfields funding priorities vary from year to year, so community, industry, local, state and federal stakeholders should investigate current priorities. **www.epa.gov/brownfields/applicat.htm**

Brownfields Grants



Brownfields grants or loans may not be used to pay response costs at a brownfield site for which the recipient of the grant or loan is potentially liable under CERCLA section 107. This means that applicants are not eligible for grants or loans at sites for which they are liable parties under CERCLA. Note, however, that CERCLA section 107 does not apply to petroleum sites. In addition, CERCLA provides certain liability protections for owners and prospective purchasers of contaminated properties who are not responsible for the contamination (and not affiliated with a responsible party) and comply with certain specific conditions provided in the statute.

The Brownfields Law clarified the innocent landowner provision and established liability protections for contiguous property owners and bona fide prospective purchasers of contaminated land. Applicants that own or plan to purchase a contaminated site may qualify for one of these landowner liability protections and be eligible for funding. To qualify for the liability protections, landowners must comply with certain obligations to take *appropriate care* after purchasing a property, and prospective landowners must conduct *all appropriate inquiries* before purchasing a property. For more information on these liability protections, see the Brownfields Law and the March 6, 2003, EPA guidance titled, *Interim Guidance Regarding Criteria Landowners Must Meet in Order to Qualify for Bona Fide Prospective Purchaser, Contiguous Property Owner, or Innocent Landowner Limitations on CERCLA* ("Common Elements"). **www.epa.gov/compliance/resources/policies/cleanup/superfund/common-elem-guide.pdf**

To summarize the available Brownfields grant types, criteria, and funding priorities, the 2005 Region 8 Brownfields Revitalization Program Assistance Overview is provided in Table 3-2 on page 109. Please consult the latest proposal guidelines for current information regarding Brownfields Assessment, Revolving Loan Fund, and Cleanup Grants. **www.epa.gov/brownfields/applicat.htm**

Brownfields Assessment Grants (CFDA 66.818) are provided on a site-specific or community-wide basis to conduct inventories, characterization, assessment and cleanup planning. Assessment grants are available to states, local governments, land clearance authorities or similar quasi-governmental agencies under control of local government, government entities created by state legislatures, regional councils and redevelopment agencies chartered by states and tribes (other than in Alaska). Up to $200,000 may be granted for a site with hazardous substances, pollutants or contaminants and up to $200,000 for sites with petroleum-only contamination. A waiver may be granted to allow up to $350,000 per site. No matching funds are required.

Priorities for Brownfields assessment grants, revolving loan grants and direct cleanup grants include the following:

- Projects that stimulate the availability of other assessment and cleanup funding[6]
- Projects that stimulate economic development and address or reduce threats to human health and the environment

[6] The list of entities eligible for Brownfields assessment, cleanup and revolving loan fund grants are at CERCLA section 104(k)(1). Nonprofit organizations are also eligible for cleanup grants.

- Projects that facilitate the reuse of existing infrastructure or create/preserve a park, greenway, undeveloped property, recreational property or other property for nonprofit purposes
- Projects in small or low-income communities without other resources
- Projects that allow for the fair distribution of funds between urban and nonurban areas and provides for community involvement
- Projects that identify and reduce threats to the health and welfare of children, pregnant women, minority or low-income communities or other sensitive populations

Brownfields Revolving Loan Fund Grants (CERCLA section 101(39), section 104(k)(3)(A)(i) and 104(k)(3)(b), CFDA 66.818) are available to states, local governments, land clearance authorities or similar quasi-governmental agencies under control of local government, government entities created by state legislatures, regional councils, redevelopment agencies chartered by states and tribes (other than in Alaska). The funds may be used to capitalize a revolving loan fund or to award subgrants to eligible entities or loans to private entities. Up to $1,000,000 may be available per eligible entity. A 20 percent match is required unless a hardship waiver is granted.

Brownfields Cleanup Grants (CERCLA section 101(39), section 104(k)(3)(A)(ii), CFDA 66.818) are available to states, local governments, land clearance authorities or similar quasi-governmental agencies under control of local government, government entities created by state legislatures, regional councils and redevelopment agencies chartered by states, tribes (other than in Alaska), and nonprofit organizations. Cleanup grants are used to perform cleanup activities on brownfields sites owned by the grant recipient at the time of award. Up to $200,000 is available per site for a maximum of three sites. A 20 percent match is required unless a hardship waiver is granted.

Brownfields Job Training and Workforce Development Grants section 101(39), section 104(k)(6), CFDA 66.815) are available to colleges, universities and nonprofit training centers to bring together affected parties to provide training for residents in communities impacted by brownfields. Projects that facilitate cleanup of brownfields sites contaminated with hazardous materials and prepare trainees for environmental employment are preferred. Up to $200,000 is available with no matching share required.

The Technical Assistance to Brownfields Communities Program helps communities clean and redevelop properties that have been damaged or undervalued by environmental contamination. The purpose is to create better jobs, increase the local tax base, improve neighborhood environments and enhance the overall quality of life. The program provides training regarding leadership, risk assessment, brownfields processes, site assessment, and cleanup alternatives. Technical assistance is provided to stakeholders through Hazardous Substance Research Centers, the Interstate Technology Regulatory Council and the Technology Innovation Program.

Targeted Brownfields Assessments and State and Tribal Response Program Grants

Federal Brownfields funds are also available for TBAs and state and tribal response program grants. States may allocate the funds for site-specific assessments, cleanups of Brownfields, for a revolving fund or for insurance. **www.epa.gov/brownfields/tba.htm**

EPA's TBA Funds (CERCLA section 101(39), section 104(k)(2)(A)(ii), CFDA 66.818) are available through EPA Regional Brownfields offices for federally led environmental assessments. TBA funds may be used for Phase I and Phase II environmental assessments and establishing cleanup options and cost estimates from future uses and redevelopment plans. Priority is given to properties that are abandoned or publicly owned, have low to moderate contamination, include issues of environmental justice, suffer from the stigma of liability, have high potential for cleanup and redevelopment, have strong municipal commitment of resources and community support and for projects that align with other EPA/federal agency initiatives.

CASE STUDY

Combining NPS and Brownfields Resources for Cleanup and Redevelopment

Allis Chalmers Utility Corridor, West Allis, Wisconsin

The Allis Chalmers Utility Corridor is in West Allis, Wisconsin. The Allis Chalmers Company thrived in the first half of the 20th century manufacturing large steel equipment such as turbines and tractors but went bankrupt in the mid 1980s. The Allis Chalmers bankruptcy left behind a large industrial site, a portion of which has been dubbed the "Utility Corridor." The Utility Corridor was historically used as a cooling tower and reservoir, as well as a substation and various utilities associated with the Allis Chalmers operations.


Demolition of existing infrastructure and buildings

The Allis Chalmers Reorganization Trust (ACRT) approached the city with a proposal to create a stormwater quality basin out of the cooling tower reservoir. The city agreed to this proposal and coordinated with the Wisconsin DNR as the official *applicant* for a 50 percent cost share NPS Grant (6217 Coastal NPS Programs), which would cover only costs associated with the design and construction of the water quality basin (not including environmental remediation). ACRT consultants Natural Resources Technology, Inc., (Pewaukee, Wisconsin) and Montgomery Associates: Resource Solutions, LLC, (Madison, Wisconsin) wrote the grant application to the Wisconsin DNR for $518,000 (total project cost of slightly more than $1 million) to provide water quality improvements. The discharge from the site impacts the Menomonee River, which was identified as impaired on the Wisconsin 303(d) list for contaminated sediments. ACRT set up an escrow account for the anticipated project budget including hiring a consultant for the city for review and construction-time monitoring, environmental remediation costs and construction costs associated with the water quality basin construction.

Before beginning construction on the water quality basin, environmental investigation and remediation had to occur. A grant of approximately $50,000 through the Brownfield Environmental Assessment Program (BEAP) was used to fund the environmental investigation on the site to characterize the nature and extent of contaminants. The contaminants that were a concern on the site included the following:

- Lead, oil and grease, and PAHs within the sediment at the bottom of the former cooling tower
- PCBs with abandoned transformers
- Asbestos, lead, oil and grease within abandoned structures on site
- Foundry sand used historically as general fill on the site

Sediment stabilization mixing operation


Retrofitting new storm sewers with old storm sewers

Contaminants within structures and transformers were remediated before starting demolition, with the reservoir sediment stabilization as construction progressed, to provide general fill on the site.

Construction of water quality basin began in 2003. First, existing storm sewer lines that emptied into the reservoir had to be temporarily diverted around the basin. Next, the former cooling tower reservoir was dewatered, which involved discharging 6 million gallons of water to the storm sewer system under an NPDES general permit along with 120,000 gallons discharged to the sanitary sewer system when contaminants reached unacceptable levels for discharge to the storm sewer system. Following the dewatering process, demolition of the existing infrastructure began. Because the basin was already essentially excavated, a trade-off between demolition and burying existing structures with imported fill to minimize overall construction costs was a unique aspect of the project.

The primary technical issue with the sediment stabilization approach was developing an economical sediment mixing design to prevent contaminant leaching, as well as being suitable for future redevelopment potential. The selected mix design consisted of mixing the reservoir sediment with general fill at a 4:1 ratio (soil:sediment) along with 4 percent lime kiln dust. The stabilized sediment was placed as general fill for the embankments of the water quality basin. Approximately 6,500 cubic yards of raw sediment were stabilized. The potential for leaching into surface waters was minimized by burying the sediment by 2 feet of clean general fill in areas subject to inundation. The existing concrete floor from the former cooling tower reservoir was still in adequate condition to provide a barrier to prevent leaching into the ground water.

The storm sewer system on the site was then retrofitted to maximize water quality improvement for the contributing area. Where possible, existing storm sewers were used. Although decades-old schematic utility drawings were available outlining where existing underground infrastructure was, field engineering played an important role in the as-built project.

The performance of the system was analyzed in XP-SWMM, WinDetpond and WinSLAMM. The TSS removal for the project exceeds 80 percent. The basin also meets the stringent detention criteria for additional redevelopment that would occur in the watershed. Meeting the detention criteria helps control peak flows to the storm sewer system and the receiving waters, thereby helping to reduce stream channel erosion and other negative impacts associated with the release of high volumes of storm water during and after storms. The project was completed in 2004.

Basin completed

State/Tribal Response Program Grants (CERCLA section 128(a)) are available to states and federally recognized tribes to establish or enhance the state and tribal Response Program cleanup capacity. CERCLA 128 funds may also be used for assessments conducted by states or tribes. States and tribes may also use these grants to capitalize revolving loan funds. Matching funds are required only if the money is to be used for a Revolving Loan Fund, CFDA 66.817. A variety of information to help tribal governments regarding environmentally related financial assistance programs within EPA is available at this EPA Web page: **www.epa.gov/indian/tgrant.htm**.

EPA Superfund Redevelopment Initiative provides eligible local governments as much as $100,000 in funds or services to support assessment and public outreach to help determine the future use of a site. This program also encourages partnerships with states, local government agencies, citizen groups and other federal agencies to restore previously contaminated properties to beneficial use. **www.epa.gov/superfund/programs/recycle/index.htm**

Brownfields Federal Partnerships

The Brownfields Federal Partnership was formed by EPA and other agencies working together to help communities more effectively prevent, assess, safely clean up and sustainably reuse brownfields. EPA's Brownfields Program has developed a guide describing the brownfields efforts with many other federal agencies: **www.epa.gov/brownfields/partners/federal_programs_guide.pdf**. In addition to EPA's funding of the above programs, the following agreements have been made by participants in the Brownfields Federal Partnership:

- Agreements by the U.S. Economic Development Administration, U.S. Department of Housing and Urban Development (HUD), DOI, U.S. Department of Justice (DOJ), and U.S. Department of Labor to offer funding priority to brownfields communities through their respective grant mechanisms.
- NOAA leads the Interagency Portsfields Partnership addressing brownfields cleanup and revitilization in port communities. Portfields pilots are underway in Bellingham, Washington, New Bedford, Massachussetts, and Tampa, Florida, and technical assistance is being provided to additional port communities. **http://brownfields.noaa.gov/htmls/portfields/portfields.html**
- The Mine-Scarred Lands Initiative is a multiagency partnership including DOI, USDA, USACE and other agencies, helping communities cleanup and revitalize abandoned mine lands. The initiative includes six demonstration projects providing collaborative support addressing land and water issues of mine-scarred lands. **www.epa.gov/brownfields/policy/initiatives_sb.htm#msl**
- USACE's announcement of eight new pilots under its *Urban Rivers Initiative* to address restoration in and around urban rivers. **www.epa.gov/swerosps/bf/partners/federal_partnerships.htm**

Additional EPA Assessment and Cleanup Funding Resources

Targeted Watershed Grants (CWA section 104(b)(3), CFDA 66.439)

Targeted Watershed Grants are available for groups ready to implement actions to protect critical watersheds valued for drinking water, fisheries, recreation and other important uses. Grants are awarded to watershed organizations and coalitions that are in the best position to make on-the-ground improvements to water quality. Grants range from $600,000 to $900,000, with a 25 percent nonfederal match required and are subject to an appropriation. **www.epa.gov/owow/watershed/initiative**

OSWER Innovations Pilot Projects (CEPP, Technical Assistance Grants Program, CFDA 66.810, 66.611)

Innovative Pilot Projects Grants are available to implement creative proposals testing innovative and collaborative approaches to restore contaminated properties to environmental and economic vitality; increase America's homeland security; promote stewardship and resource conservation consistent with the Agency's Resource Conservation Challenge and; encourage voluntary efforts to clean up sites. The assistance agreements awarded will range in value to a maximum of $100,000. The Web site for the Innovations Initiative is **www.epa.gov/oswer/iwg/index.html**.

Community Action for a Renewed Environment (CARE) Grants

(CAA, section 103(b)(3) as amended; CWA, section 104(b)(3), as amended; Solid Waste Disposal Act, section 8001, as amended; TSCA, section 10, as amended; FIFRA, sections 18 and 20, as amended; SDWA, sections 1442(a), and (c)(A), as amended; and Marine Protection, Research, and Sanctuaries Act, section 203, as amended, CFDA 66.035)

The CARE Program, which began in 2005, helps to build broad-based local partnerships for reducing risks from toxic pollutants that come from numerous sources. Under Level I, communities may receive up to $75,000 to establish collaborative partnerships for reducing toxic releases in their environment. Level II offers up to $300,000 to communities that have a broad-based collaborative partnership in place and are ready to implement risk reduction strategies. A range of community groups may apply for funding, including county and local governments, tribes, nonprofit organizations and universities. For additional information on this collaboration between the Office of Air and Radiation (OAR) and OSWER, contact Stacy Swartwood at (202) 566-1391 or e-mail her at swartwood.stacy@epa.gov. For additional information about CARE, projects awarded in 2005 and 2006 or how to apply for the cooperative agreements, visit EPA's Web site at **www.epa.gov/care**.

Five Star Restoration Program

The Five Star Restoration Program of EPA's Office of Wetlands, Oceans, and Watersheds brings together students, conservation corps, other youth groups, citizen groups, corporations, landowners and government agencies in locally driven, on-the-ground habitat restoration projects that address important habitat issues within communities. The program emphasizes a grass-roots, bottom-up approach to provide environmental education and training through projects that restore wetlands, estuaries, and streams. The program provides challenge grants, technical support and opportunities for information exchange to enable community-based restoration projects. EPA funding levels are modest, from $5,000 to $20,000, with $10,000 as the average amount awarded per project. When combined with the contributions of partners, projects that make a meaningful contribution to communities become possible. **www.epa.gov/owow/wetlands/restore/5star**

Environmental Finance Program

The Environmental Finance Program was developed by EPA to assist communities in their search for creative approaches to funding environmental projects. Resources of the Environmental Finance Program include the following:

The ***Environmental Financial Advisory Board*** focuses on environmental finance issues at all levels of government, particularly with regard to impact on local governments and small communities. The Board seeks to increase the total investment in environmental protection by facilitating greater leverage of public and private environmental resources. **www.epa.gov/efinpage/efab.htm**

The ***Environmental Finance Center (EFC) Network*** is a university-based program that provides financial outreach services to regulated communities. Nonregulated community groups such as watershed groups may qualify for assistance in certain circumstances. EFCs educate state and local officials and small businesses on lowering costs of compliance and pollution prevention, increasing investments in environmental protection, improving financial capacity to own/operate environmental systems, encouraging the full-cost pricing of environmental services and identifying and evaluating financing tools and options. **www.epa.gov/efinpage/efcreg.htm**

The ***Catalog of Federal Funding Sources for Watershed Protection*** Web site is a searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects. The Web site provides searches on the type of assistance, eligible organizations, required matching funds and keywords for the type of problem/project. The database does not contain significant information about small, site-specific federal sources or most nonfederal sources. **http://cfpub.epa.gov/fedfund**

CASE STUDY

Making Funding Accessible for Coordinated Watershed Programs

Region 10 Serves as a Model

The Region participates in the national Sustainable Finance Workgroup and has a cooperative agreement with the EFC at Boise State University. This agreement includes Web-based and on-the-ground technical assistance on the following projects:

- Online newsletter that describes current funding issues and related topics, which is found at: http://sspa.boisestate.edu/efc/News/NewsWinter2004.html.
- Online funding workshop to be used for Alaska; advanced workshop in Anchorage, Alaska.
- Directory of Watershed Resources, a searchable database of funding sources in Region 10 states. States from Regions 3 and 4 are also starting to build the directory. This database includes information from federal, state and private funding sources.
- Plan2 Fund, a tool to create a strategic financial plan to fund watershed plans from start to finish.
- Prioritization Tool—Piloted with the Chehalis Basin Partnership, the EFC moved the group closer to implementation by offering a process and Web-based tool to identify decision rule to prioritize plan objectives.
- Agricultural BMP Cost Analysis—Developed with the partnership of various state and federal agricultural agencies, this tool will add a financial cost component to the Idaho One Plan to help landowners identify the cost of conservation practices and how to fund implementation of these practices.

The ***Guidebook of Financial Tools*** is a basic financial reference document for public and private officials with environmental responsibilities and describes financing tools that federal, state and local governments and the private sector can use to pay for environmental programs, systems and activities.

Environmental Justice

In many communities, there are individuals and groups of persons who are disproportionately affected by an environmental burden, but who do not know that they have a right to express themselves or are reluctant to make their concerns known for a variety of historical or cultural reasons. The Environmental Justice (EJ) Program in EPA was created to address such circumstances. The program was formally created in 1994 with the signing of Executive Order 12898, titled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The order directs federal agencies to develop EJ strategies to aid federal agencies identify and address adverse human health or environmental effects of their programs and policies on the nation's populations.

The EJ Program operates to assure that no group of persons bear a disproportionate burden of environmental impacts resulting from the execution of environmental programs. EPA considers EJ while setting standards, permitting facilities, making grants, issuing licenses or regulations and reviewing proposed actions of other federal agencies under the authority of EPA's various programs (e.g., CERCLA, RCRA, CAA, National Environmental Policy Act [NEPA]). To help with this process, EPA supports a staff of environmental professionals who work with staff from all the programs and also engage directly with communities. Calling on this staff simplifies the process of identifying strongly held, but unvoiced, concerns that, if unaddressed, can have a significant impact on the effective cleanup of target watersheds. EJ staff can help identify community concerns early and begin to build trust among what may be disinterested or disaffected members of the community.

The EJ Program offers grants annually to communities for addressing environmental problems from an EJ perspective. In addition, the program works with EPA's operating programs to identify technical, human, and financial resources that might be made available to communities interested in addressing environmental injustices. **www.epa.gov/Compliance/environmentaljustice/index.html**

Department of Interior Assessment and Cleanup Resources

Bureau of Reclamation (BOR)

The BOR stores and supplies water for irrigation and for use in homes and industry. The BOR generates hydroelectric power, provides flood control and helps meet fish and wildlife needs and compliance with WQS. The BOR can assist in watershed cleanups by providing historical and projected stream flow data and by using BMPs during releases to minimize streambank erosion and habitat disruption.

The Water Resources Research Laboratory performs research to improve BOR efforts, including fish protection/screening, fish passage, reservoir release water quality, river restoration and wetland creation/restoration projects. River restoration is an important component of enhancing environmental compatibility of the many BOR structures and activities affecting streams and rivers. Mining, flood protection, land use channelization and many other factors have altered, to some degree, most of America's rivers. In some cases, these activities have greatly degraded the natural riverine environment. The laboratory is working with other federal, state and local organizations to revitalize rivers that have been severely impacted. **www.usbr.gov/pmts/hydraulics_lab**

The Sedimentation and River Hydraulics Group provides many levels of analysis ranging from simple technical advice or a field trip, through a multiyear study integrating with other disciplines and project needs. This group provides hydrologic modeling, including dam removal or modification, sediment studies, integrated geomorphic and sediment studies, river restoration analysis and design, river and reservoir surveys, multiple scope analysis, channel maintenance and stability, hazard classification, flood inundation mapping, flood warning and evacuation time, hydraulic modeling (1D, 2D, 3D), sediment transport modeling and riparian vegetation modeling. The group also performs sediment transport analysis, development of computer models, manuals and guidelines, geomorphic studies and river restoration plans, reservoir sediment management plans and flood inundation mapping and emergency planning. **www.usbr.gov/pmts/sediment**

U.S. Geological Survey (USGS)

The USGS provides scientific information and performs scientific studies in many fields, including geologic mapping, contaminant biology, pollution, water quality, wetlands and environmental studies. Departments that might be useful for watershed cleanup include Contaminant Biology; Cooperative Water Program; Geographic Analysis and Monitoring; Fisheries and Aquatic Resources; Hydrologic Networks and Analysis; Hydrologic Research and Development; Mineral Resources; National Cooperative Geologic Mapping; National Streamflow Information; National Water Quality Assessment (NAWQA); State Water Resources Research Institute; Toxic Substances Hydrology; Terrestrial, Freshwater, and Marine Ecosystems; and Wildlife and Terrestrial Resources. USGS science provides comprehensive, high-quality and timely scientific information about the quantity, quality and availability of natural resources to decision makers and the public. Because it has no regulatory or management mandate, the USGS provides impartial scientific expertise. USGS scientific efforts include long-term data collection, monitoring, analysis and predictive modeling. USGS scientists cover a range of disciplines, including hydrology, geology, geophysics, biology, geography and statistics. Projects within a specific watershed may be funded by grants, interagency agreements, congressional appropriation or occasionally from internal program funding. Water-quality studies may be initiated with the USGS by contacting a state representative to discuss the USGS cooperative funding program.

Through the ***National Water Information System (NWIS)***, USGS provides water data, including real-time water data, surface water flow measurements, ground water measurements and water quality measurements, from more than 1.5 million sites throughout the nation. Since 1991, USGS scientists with the NAWQA Program have been collecting and analyzing data and information in more than 50 major river basins and aquifers across the nation to develop long-term consistent and comparable information on streams, ground water and aquatic ecosystems to support sound management and policy decisions. USGS is available to support development of TMDLs. **www.usgs.gov**, **http://water.usgs.gov/pubs/fs/FS-130-01**, **http://waterdata.usgs.gov/nwis**, **http://water.usgs.gov/nawqa**

In support of the National Forest Plan revisions, which occur every 5 years, the USGS and U.S Forest Service (USFS) coordinate on an assessment of geological resources on USFS lands.

U.S. Fish & Wildlife Service (USFWS)

The USFWS is tasked to conserve, protect and enhance fish and wildlife and plants and their habitats for the continuing benefit of the American people. USFWS is the designated Natural Resource Trustee for certain anadromous fish, certain endangered species, certain marine mammals and migratory birds. Funding to support efforts related to protection of trust resources affected by contamination is available under the Contaminants Program. USFWS has a wide range of technical expertise and has many agreements in place to support ecological assessment and cleanup efforts. One example is preapproved permits for support of fish shocking or other wildlife collection and evaluation efforts.

Through a national agreement between USFWS and EPA, USFWS supports CERCLA and OPA response, removal and remedial programs by reviewing documents and plans and providing technical assistance to the regional Biological Technical Assistance Group (BTAG) or other designated ecological risk assessment program personnel. Coordinating USFWS and EPA risk assessment efforts can allow issues to be resolved in advance and reduce the time and effort required for site remediation and restoration. NRDAs are conducted under CERCLA authority but are not funded by the interagency agreement. USFWS provides scientific expertise and authority for preparation of NRDAs and conducts species and habitat-related research. USFWS may initiate NRDA efforts on behalf of trust resources. USFWS may access funding from the Oil Spill Liability Trust Fund for work related to oil spills.

In addition to CERCLA and OPA responsibilities, USFWS has the authority to act under the ESA, the Eagle Protection Act, and the Migratory Bird Treaty Act.

The ***North American Wetlands Conservation Act Grants Program*** provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada and Mexico. The Standard Grants Program provides funds to Canadian and U.S. partners for projects that focus on protecting, restoring or enhancing critical habitat. Projects must support long-term wetlands acquisition, restoration or enhancement, and partners must minimally match the grant request at a one-to-one ratio. Mexican partners may also develop training and management programs and conduct studies on sustainable use. The ***Small***

Grants Program supports the same kinds of activities as Standard Grants but usually involves fewer project dollars. Except that grant requests may not exceed $50,000 and that funding priority is given to projects that have a grantee or partners that have not participated in an Act-supported project before, criteria for funding a project are the same as for Standard Grants. **www.fws.gov/birdhabitat/nawca/grants.htm**

Partners for Fish and Wildlife is a USFWS Program that provides technical and financial assistance for habitat restoration projects on lands not owned by a state or federal government. State, federal, tribal and private conservation organizations use Partners for Fish and Wildlife to provide watershed management, conservation easements and river restoration in cooperation with voluntary landowners. Priority is given to projects that most benefit USFWS trust resources. The USFWS develops a cost-sharing agreement with the partner; typically a 50 percent cost share is required, and funding from the program is provided after completion of the project. Technical assistance is available. Typically the NRCS, the state fish and game agency or other conservation agencies participate in project planning. **www.fws.gov/partners**

Office of Surface Mining (OSM)

The OSM regulates coal mining facilities. The Surface Mining Law provides for the restoration of lands mined and abandoned or left inadequately restored before August 3, 1977. The Abandoned Mine Reclamation Fund is used to pay the reclamation costs of AML projects.

AML Grants are provided to states with an approved program, or specific Indian tribes, and are funded from fees paid by active coal mine operators on each ton of coal mined. Funds are used to operate a state AML Program, perform construction to reclaim abandoned mine sites and establish trust funds that may be spent by the state for specific targeted purposes. AML grants are 100 percent federally funded. **www.osm.gov/grantsprograms.htm**

The ***Watershed Cooperative Agreement Program*** awards cooperative agreements to nonprofit organizations, especially small watershed groups, that undertake local acid mine drainage (AMD) reclamation projects. These funds are available as part of the Appalachian Clean Streams Initiative. The maximum award amount for each cooperative agreement will normally be $100,000 to help as many groups as possible to undertake actual construction projects to clean streams impacted by AMD.

Bureau of Land Management (BLM)

The BLM is responsible for the management of federal lands under the auspices of the DOI. The BLM engages in hazardous material emergency response actions, site evaluations and prioritization of cleanups in accordance with laws and regulations. This involves working with EPA, state environmental quality departments, counties, and PRPs (both public and private) to fund and expedite the cleanup of hazardous sites. **www.blm.gov/nhp/index.htm**

National Park Service

The National Park Service aims to protect and restore natural resources. The Fisheries Program provides guidance and support in the implementation of the recreational fisheries program, *A Heritage of Fishing*; develops policy and guidance for the protection of aquatic biological resources; coordinates policy review of the fisheries and aquatic resources-related aspects of environmental compliance documents; provides program guidance and technical support for fish population/habitat restoration; provides guidance and technical assistance in the development of fishery management plans; and coordinates with other agencies on fisheries and aquatic resources-related regulatory matters.

The National Park Service monitors water quality vital signs in parks. Concerns include the use of personal watercraft and snowmobiles in parks, source and NPS contaminants, land rezoning and identifying impairment thresholds.

Through the Natural Resource Challenge, the Water Resources Division conducts Watershed Condition Assessments systemwide. Watershed Condition Assessment involves applying a set of descriptive or quantitative technical methods to describe the ecosystem health of a watershed. Typically, these methods develop and integrate assessments of discrete ecosystem components at a variety of landscape scales. Researchers and managers have developed numerous assessment methods for use in various ecosystems and for a wide range of purposes.

The Wetlands Program provides policy and guidance pertaining to park wetlands protection and restoration, identifies and assesses existing and potential threats to park wetland and riparian resources, provides technical assistance to parks for wetland and riparian zone restoration and protection, provides wetland regulatory compliance and review and coordinates with other agencies on wetland-related regulatory matters.

Department of Agriculture Assessment and Cleanup Funding Resources

U.S. Forest Service (USFS)

The USFS performs watershed assessment and cleanup efforts related to USFS managed lands. Assessment and cleanup may be conducted under CERCLA authority/responsibility or as part of enhancing and maintaining healthy watersheds and habitat.

The Watershed Forestry Assistance Program is focused on maintaining healthy watersheds. Data are collected to determine if a watershed within USFS property is impacted, and project implementation is conducted where necessary to ensure watershed health. The Watershed Forestry Assistance Program is allocated a set budget, and this funding is split among the individual national forests. Funding priorities for watershed program activities are determined by the individual forest managers.

The USFS has established an AML Program to support the Watershed Forestry Assistance Program to clean up and reclaim abandoned mine sites on USFS lands. USFS has CERCLA authority for investigations and remediation on nonemergency hazardous waste sites on lands that they manage. The USFS AML Program conducts CERCLA assessment, removal, and remedial actions following the NCP. CERCLA funding is allocated to USFS each year. Funding for specific projects is designated on a case-by-case basis—sites compete for funding of each phase of CERCLA action. In addition to the USFS CERCLA allocation, USDA has an allocated budget each year for hazardous-waste removal. All USDA agencies compete for that allocation to fund AML and other hazardous-waste cleanups. Projects with widespread interest, such as watershed cleanups with a high level of community involvement, are given priority for funding. Community benefits family benefits, and ecological benefits are all factors considered in funding decisions.

The USFS Fisheries and Wildlife Programs perform fisheries improvement and wildlife habitat improvement within national forests. **www.fs.fed.us**

National Resources Conservation Service (NRCS)

Under the 1996 Farm Bill, the NRCS provides assistance for landowners seeking to preserve soil and other natural resources. The Environmental Conservation Acreage Reserve Program (ECARP) authorizes the secretary of agriculture to designate watersheds, multistate areas, or regions of special environmental sensitivity as conservation priority areas that are eligible for enhanced federal assistance. Assistance in priority areas is to be used to help agricultural producers comply with NPS pollution requirements of environmental laws. **www.nrcs.usda.gov**

The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides assistance to farmers and ranchers who face threats to soil, water, air and related natural resources on their land. Through EQIP, the NRCS provides assistance to agricultural producers to promote agricultural production and environmental quality as compatible goals, optimize environmental benefits and help farmers and ranchers meet federal, state, tribal and local environmental requirements. EQIP is reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). Funding for EQIP comes from the Commodity Credit Corporation (CCC). Optimizing environmental benefits is achieved through a process that begins with the definition of national priorities.

The national priorities are as follows:

- Reduction of NPS pollution, such as nutrients, sediment, pesticides or excess salinity in impaired watersheds, consistent with TMDLs where available, as well as reduction of ground water contamination and conservation of ground and surface water resources
- Reduction of emissions, such as particulate matter, nitrogen oxides, VOCs and ozone precursors and depleters that contribute to air quality impairment violations of National Ambient Air Quality Standards
- Reduction in soil erosion and sedimentation from unacceptable levels on agricultural land
- Promotion of at-risk species habitat conservation

www.nrcs.usda.gov/programs/eqip

The ***Watershed Protection and Flood Prevention Program*** provides funding to conservation districts, local governments and state/territorial/tribal agencies for projects in watersheds containing less than 250,000 acres. Up to $10 million is available per project; cost sharing is required. **www.nrcs.usda.gov/programs/watershed**

The ***Conservation Security Program (CSP)*** is a voluntary conservation program that supports ongoing stewardship of private agricultural lands by providing payments for maintaining and enhancing natural resources. CSP identifies and rewards those farmers and ranchers who are meeting the highest standards of conservation and environmental management on their operations. CSP provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life and other conservation purposes on tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture and range land, as well as forested land that is an incidental part of an agriculture operation. **www.nrcs.usda.gov/programs/csp**

Farm Service Agency (FSA)

The FSA ***Conservation Reserve Program (CRP)*** is a voluntary program for agricultural landowners who can receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. The CCC makes annual rental payments on the basis of the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years. The program is administered by the CCC through the FSA, and program support is provided by NRCS, Cooperative State Research and Education Extension Service, state forestry agencies and local soil and water conservation districts. **www.nrcs.usda.gov/programs/crp**

Agricultural Research Service

The Agricultural Research Service is USDA's main in-house scientific research agency. They find solutions to agricultural problems, including sustaining soils and other natural resources, and provide research support to other federal agencies.

Department of Commerce Assessment and Cleanup Funding Resources

National Oceanic and Atmospheric Administration (NOAA)

NOAA conducts research and gathers data about the global oceans, atmosphere, space and sun and applies this knowledge to science and service. NOAA Fisheries is the federal agency responsible for the stewardship of the nation's living marine resources and their habitat. **www.noaa.gov**, **www.nmfs.noaa.gov/habitat/restoration/funding_opportunities/funding.html**

The ***Community Based Restoration Program*** provides funding to regional governmental bodies and public or private organizations including business, community/watershed groups, nonprofit groups, educational institutions, conservation districts, local governments and state/territorial/tribal agencies to restore fishery habitat around the coastal United States. The required 1:1 cost match may be cash, salary, equipment, supplies, in-kind services or labor.

The ***NOAA Fisheries/National Fish and Wildlife Foundation (NFWF)*** Habitat Restoration Partnership funds restoration and educational efforts. The funding is distributed nationally and regionally through a series of NFWF funding initiatives including Chesapeake Bay Small Watershed Grants Program, Living Shorelines Initiative, Pinellas County Environmental Foundation (directed appropriation), Delaware Estuary Program, North Gulf Coast Initiative and the Pacific Grassroots Salmon Initiative.

Other Federal Funding Resources

U.S. Army Corps of Engineers (USACE)

The USACE carries out environmental and natural resource management programs at its projects, managing thousands of square miles as forest and wildlife habitat, monitoring water quality at its dams, operating fish hatcheries in cooperation with state wildlife agencies and, in some cases, restoring the environment at projects built in earlier days. The USACE has significant expertise and experience with water-resource-related projects such as planning, designing, building, operating and maintaining projects that provide river and harbor navigation, flood control, water quality and supply, hydroelectric power, environmental restoration, wildlife protection and recreation.

The USACE has regulatory authority under the Rivers and Harbors Acts for regulating construction, excavation or deposition of materials in, over or under navigable waters, or any work that would affect the course, location, condition or capacity of those waters. USACE also has regulatory authority for permitting construction activities that occur in the nation's waters, including wetlands according to CWA section 404(d). For more details see Chapter 5.

The ***Water Resources Program*** provides several resources for watershed assessment and cleanup.

The ***Institute for Water Resource***s examines water resources problems and offers practical solutions through a wide variety of technology transfer mechanisms. In addition to hosting and leading USACE participation in national forums, technology transfer mechanisms include producing white papers, reports, training sessions, and manuals; developing new planning and decision-support methodologies, improved hydrologic engineering methods and software tools; and managing national waterborne commerce statistics and other information systems. Water resources projects include ecosystem restoration to reestablish the attributes of a natural, functioning and self-regulating system. Over the past 10 years, small ecosystem restoration projects have grown increasingly popular throughout the country. In one of the largest restoration projects ever attempted, the USACE and the National Park Service are cooperating on restoring the hydrologic regime for the Everglades in Florida with funds provided by both agencies. Collaboration has allowed the USACE to expand traditional environmental activities and enhance or restore natural resources at their projects.

The USACE Restoration of Abandoned Mine Sites (RAMS) Program, under authority of section 560 of the Water Resources Development Act (WRDA), provides technical, planning and design assistance to federal and nonfederal interests in carrying out projects to address water quality problems caused by drainage and related activities from abandoned and inactive non-coal mines. Applied engineering and scientific support may be provided to allow the efficient and cost-effective performance of projects intended to manage drainage; restore and protect streams, rivers, wetlands, other waterbodies and riparian areas; and demonstrate management practices and innovative and alternative treatment technologies to minimize or eliminate adverse environmental effects. Support also includes the development and population of a database of remediation technologies. RAMS projects have included developing a stakeholder design and planning manual, watershed-based cleanup, including prioritization, design and implementation; evaluating technologies and successes/failures and lessons learned; and partnering with other federal agencies to combine resources to collectively address pollution created by AMD.

The USACE Floodplain Management Services Program, under the authority of section 206 of the Flood Control Act of 1960 as amended, provides a full range of information, technical services, and planning guidance needed to support and promote effective floodplain management. The USACE provides technical services and planning assistance such as flood and floodplain data development and interpretation on all aspects of floodplain management planning. This program can also develop or supply guides and pamphlets associated with floodplain management. All program services to state, regional or local governments or other nonfederal public agencies are free of charge, within program funding limits. Program services can also be provided with 100 percent of the funds coming from the requesting entity. Federal agencies and private entities are required to provide funds to cover 100 percent of the cost of services provided.

The USACE Planning Assistance to States Program, under the authority of section 22 of the WRDA of 1974 as amended, can provide technical planning assistance in all areas related to water resources development in which the USACE has expertise. These areas include, but are not necessarily limited to flood damage reduction; bank stabilization; sedimentation; dredging; hazardous, toxic and radioactive wastes; navigation; water conservation; water quality; surface water recreation; hydrologic analysis; hydraulic analysis; hydropower; flood hazard mitigation; environmental preservation and enhancement; fish and wildlife; cultural resources; floodplain information; ecosystem and watershed planning; and stream bed degradation. Assistance is available to states, public entities within states and federally recognized tribes for preparing plans for the development, use and conservation of water and related land resources. Assistance is limited to $500,000 in federal funds per state or tribe per year, on the basis of available appropriations. The assistance is reconnaissance level in detail. Most studies are completed within 12 months. Study costs are shared on a 50-50 basis with one (or more) nonfederal sponsors (a state, a public entity within a state or tribe).

The USACE Project Modifications for Improvement of Environment Program, under section 1135 of the WRDA of 1986 as amended, may modify the structures or operations of previously constructed USACE water resources projects to improve the quality of the environment in the public interest. The types of work that can be undertaken under this program are structural or operational changes to existing projects for restoration or enhancement of environmental values, especially fish and wildlife values. Any modifications for environmental improvement must be both feasible and consistent with the authorized project purposes. The USACE coordinates with the appropriate federal, state and local agencies on any actions taken.

If a nonfederal sponsor is interested in sharing the costs of a project, the USACE will pay all the cost to prepare a study proposal. If the study proposal is approved, the subsequent feasibility study, plans and specifications and construction costs are cost shared. The sponsor's share is 25 percent of these costs but is not payable unless and until the project enters the construction phase. In-kind services provided during design or construction can be credited toward a sponsor's share. Sponsors are usually public agencies; however, tribes and national nonprofit organizations such as Ducks Unlimited and the National Wildlife Federation might also qualify as sponsors. A private interest can qualify as a nonfederal sponsor if the proposed modifications do not require future operation and maintenance. A sponsor must provide all lands, easements, rights-of-way, relocations and disposal sites (LERRDs) for required implementation of the proposed modifications. Costs to acquire the LERRDs are credited toward the sponsor's 25 percent share of total costs. The sponsor is responsible for all operation, maintenance, repair, rehabilitation and replacement costs required for the project, although, by subagreement, a third party can provide these responsibilities for the sponsor. Modification costs cannot exceed $5 million (federal costs) per project, unless specifically approved by USACE headquarters. No minimum cost per project has been established; however, the planning and design costs should not exceed the costs of the project modifications.

The USACE Aquatic Ecosystem Restoration Program, under authority of section 206 of the WRDA of 1996, restores historic habitat conditions (aquatic ecosystems) at any location to benefit fish and wildlife resources. The types of work that can be done under this program are structural or operational changes to improve the environment. This includes projects that would reconnect old river channels and backwaters, create wetland subimpoundments on the perimeters of reservoirs, improve water quality through the reduction of erosion and sedimentation, manipulate wetlands and vegetation in shallow headwaters of reservoirs and involve planting woody vegetation in floodplains.

If a nonfederal sponsor is interested in sharing the costs of a project, the USACE will pay all the cost to prepare a study proposal. If the study proposal is approved, the subsequent feasibility study, plans and specifications and construction costs are cost shared. The sponsor's share is 35 percent of these costs but is not payable unless and until the project enters the construction phase. In-kind services provided during design or construction can be credited toward a sponsor's share. Sponsors are usually public agencies; however, tribes and national nonprofit organizations such as Ducks Unlimited and the National Wildlife Federation might also qualify as sponsors. A private interest can qualify as a nonfederal sponsor if the proposed modifications do not require future operation and maintenance. A sponsor must provide all LERRDs for required implementation of the proposed modifications. Costs to acquire the LERRDs are credited toward the sponsor's 35 percent share of total costs. The sponsor is responsible for all operation, maintenance, repair, rehabilitation and replacement costs required for the project, although, by subagreement, a third party can provide these services for the sponsor. Modification costs cannot exceed $5 million (federal costs) per project, unless specifically approved by USACE headquarters. No minimum cost per project has been established; however, the planning and design costs should not exceed the costs of the project modifications.

The USACE Support for Others Program, under authority of the Economy Act and the Intergovernmental Cooperation Act, provides the USACE with opportunities to serve the nation and enhance its capability to accomplish its assigned missions. Any work performed must be consistent with USACE organizational purposes and capability. Work under this program is done generally to provide environmental protection and restoration or to provide facilities and infrastructure.

CASE STUDY

EPA and U.S. Army Corps of Engineers Team Up to Restore Contaminated Rivers

EPA and the USACE signed an MOU, in July 2002, committing them to a partnership for restoring degraded urban rivers. As part of this agreement, EPA and USACE jointly selected eight demonstration pilot projects. A new MOU was signed in 2005 to continue monitoring these projects.

In partnership with state and local governments, tribal authorities and private organizations, the projects focused on improving water quality, cleaning up contaminated sediments and restoring human and animal habitat. The projects demonstrated how coordinated government and private sector efforts can not only restore contaminated rivers, but also revitalize urban environments.

The MOU aimed to improve coordination of hazardous-waste cleanup, water quality improvements, and environmental restoration activities under the CWA, Superfund, RCRA and the various WRDA authorities. (The WRDA is a federal statute that addresses watershed environmental restoration activities under the authority of the USACE.) The original MOU, signed in 2002 is at this Web site:
www.epa.gov/oswer/landrevitalization/download/epa-usace_urban_water_mou.pdf.

EPA and the USACE also signed an MOU in 2004 titled, *Watershed Management Partnership Agreement* which provides a useful tool in promoting agency integration: **www.epa.gov/owow/wetlands/pdf/Watershed_Management_Partnership_Agreement.pdf**.

Work varies from employing one or several of the USACE's skills to using the whole range of the USACE's planning, engineering, real estate, contracting, construction management and legal skills. USACE's capabilities include, but are not limited to, the following areas: environmental planning and compliance, economic and financial analyses, floodplain management, cultural resources management and evaluation and general planning.

Before the USACE can support state and local governments, the requesting government must certify that it cannot obtain the services reasonably and expeditiously from private firms. The technical services that may be provided include studies and planning activities, engineering and design (including plans and specifications), construction management assistance and training. Construction management assistance is limited to technical advice to improve state or local management capability in contract preparation, negotiation and evaluation; contract administration; quality assurance; and supervision and inspection. The USACE may not acquire real estate nor can it serve as the contracting officer for project construction for a state or local government. All USACE costs must be provided by the customer agency. Under the program, the customer retains responsibility for program planning, development, and budgeting. **www.usace.army.mil/cw/cecwe**, **www.fsa.usda.gov/FSA/webapp?area=home&subject=fmlp&topic=landing**

U.S. Department of Housing and Urban Development (HUD)

HUD offers a variety of funding opportunities for projects that involve urban area renewal and economic development. The Brownfields Economic Development Initiative (BEDI) is a key competitive grant program that HUD administers to stimulate and promote economic and community development. BEDI funds are used for local governments and private sector parties to commence redevelopment or continue phased redevelopment efforts on brownfields sites where either potential or actual environmental contamination are known and redevelopment plans exist.
www.hud.gov/grants/index.cfm

Federal Interagency Stream Restoration Working Group

The Federal Interagency Stream Restoration Working Group is an interagency group that has developed a publication (referenced below) to be used as a common technical reference for stream corridor restoration technology.

Participating agencies include the following:

- USDA—Agricultural Research Service, Cooperative State Research, Education and Extension Service, USFS, NRCS
- DOC—NOAA, National Marine Fisheries Service
- DoD—USACE
- HUD
- DOI—BLM, BOR, USFWS, National Biological Service, National Park Service, USGS Biological Resources Discipline and Water Resources Division
- EPA
- Federal Emergency Management Agency
- TVA

Stream Corridor Restoration: Principles, Processes, and Practices. Federal Interagency Stream Restoration Working Group (15 federal agencies of the U.S. government). ISBN-0-934213-59-3. **www.nrcs.usda.gov/technical/stream_restoration**

Nongovernmental Assessment and Cleanup Funding Resources

Voluntary Cleanup Programs (VCP)

Many states have established VCPs to help address properties where the contamination level is low enough that the chance of state or federal enforcement is not as great as with other sites (such as NPLs), but whose site owners (or prospective owners) want to assess and cleanup a site to facilitate property sale, foster redevelopment, or improve value. While each of these programs is different, the following principles generally apply.

A state's VCP typically requires an applicant to submit Phase I and Phase II site studies, which the state reviews and must approve. The applicant then makes a cleanup proposal, which (upon approval) is carried out. The VCP often allows the applicant to choose one of several alternative cleanup standards, which often include meeting statewide established cleanup standards, site-specific risk-based standards, or background. Upon successful completion of the cleanup, the state issues a *certificate of completion*, or similar document, that gives owners and lenders some assurance that no further cleanup will be needed.

A key issue is the extent to which EPA will defer to a state's VCP Program in carrying out its own response authorities under federal cleanup statutes. Typically, EPA enters into a Memorandum of Agreement (MOA) with a state in which both governments set forth their expectations with respect to VCP sites. MOAs typically provide that EPA does not expect to undertake response or enforcement action at sites that have successfully gone through a state's VCP Program, subject to several reservations. For example, such MOAs typically provide that the following categories of sites are not immune from action by EPA, regardless of their status under a state's VCP: property listed or proposed for the NPL, facilities that do or should fall under RCRA regulation (though certain sites may be allowed under certain circumstances), property subject to corrective action under RCRA, property subject to an order under water quality regulations and property subject to UST rules. Additionally, EPA typically reserves its right to take action where new information or changed site conditions necessitate its use of authorities to address imminent and substantial endangerments. **www.epa.gov/superfund/programs/reforms/reforms/2-10.htm**

National Fish and Wildlife Foundation (NFWF)

The NFWF is a private, nonprofit organization dedicated to the conservation of fish, wildlife and plants and the habitat on which they depend. The Foundation meets these goals by creating partnerships between the public and private sectors and strategically invests in conservation and sustainable use of natural resources. The Foundation does not support lobbying, political advocacy or litigation. ***National Fish and Wildlife Foundation Grants*** fund projects to conserve and restore fish, wildlife and native plants through matching grant programs. The foundation awards matching grants to projects that address priority actions promoting fish and wildlife conservation and the habitats on which they depend, work proactively to involve other conservation and community interests, leverage Foundation-provided funding and evaluate project outcomes. Federal, state and local governments; educational institutions; and nonprofit organizations are welcome to apply for general matching grants throughout the year. ***National Fish and Wildlife Foundation Special Grants*** are available with specific guidelines and timelines. **www.nfwf.org**

Volunteer Monitoring Groups

Volunteer Monitoring Groups work under a variety of names including River Watch, River Network, and Watershed Network. Groups have a wide range of involvement in water assessment and monitoring all the way from providing samplers for a single-sampling event under direction of state agency personnel to recruiting, sampling, laboratory analysis and data validation and maintenance of databases and laboratories. Some groups receive state funding through contracts with state agencies, while others must depend on grants. Funding for coordination, laboratory analysis, and supplies may come from state or federal agency grants and allocations.

River Network

River Network helps people establish strong and enduring watershed conservation organizations and programs and provides tools and training they need to be effective. Assistance comes in the form of training and consultation. River Network Programs include the following: Partnership Program, Organizational Development, River Watch, River Protection and Restoration, Health and Environmental Justice, RiverSmart, River Rally and River Heroes. River Network's River Watch Program helps volunteers understand, protect and restore their local rivers, streams, lakes, wetlands, and estuaries. Community-based monitoring programs are carried out by schools, nonprofit organizations, government agencies, and Native American Tribes. They monitor local waters, determine conditions and trends, identify problems and their sources, and develop effective and creative ways to solve existing problems and prevent new ones. River Network's River Watch Program provides guidance and support by helping these groups plan and carry out their programs and work closely with national, regional and state service providers—including other nonprofit organizations, government agencies and academic institutions—to assess the needs of monitoring groups and find the best ways to work together to meet them. **www.rivernetwork.org**

Remediation Technologies Development Forum (RTDF)

The RTDF was established by EPA to foster collaboration between the public and private sectors in developing innovative solutions to mutual hazardous waste problems. The RTDF has grown to include partners from industry, several government agencies and academia who share the common goal of developing more effective, less costly hazardous waste characterization and treatment technologies. The RTDF is designed to foster public-private partnerships to conduct laboratory and applied research to develop, test and evaluate innovative remediation technologies. Through the RTDF, companies, government agencies and universities voluntarily share knowledge, experience, equipment, facilities, and even proprietary technology to address mutual remediation problems. **www.rtdf.org**

Conservation Technology Information Center (CTIC)

The CTIC is a nonprofit, public-private partnership working to equip agriculture with realistic, affordable and integrated solutions to environmental concerns. **www.ctic.purdue.edu**

National Corporate Wetlands Restoration Partnership (CWRP)

The CWRP is a public-private partnership between the federal government, state governments and private corporations to restore wetlands and other aquatic habitats. The CWRP's objective is to protect, enhance, and restore wetlands and other aquatic habitats by partnering to leverage the collective resources, skills and processes of the private and public sectors. The CWRP is facilitated by the Coastal America Partnership in Washington, DC Corporations contribute funds to a participating private foundation or state trust fund. Funds are matched by federal and state agencies to undertake aquatic ecosystem restoration projects. **www.coastalamerica.gov/text/cwrp.html**

Table 3-1. Assessment and Cleanup Financial Resources Summary

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
WATER PROGRAM RESOURCES			
Water Program Loans and Financing			
Clean Water State Revolving Fund	A/C	Varies by state priority list. Generally municipalities and other public organizations. Can be nonprofit organizations or private entity.	Loans for projects that promote water quality. Generally for wastewater treatment facilities, but also for NPS pollution, runoff control, wet-weather control, alternative treatment technologies, and water reuse and conservation projects. May also be used to fund Wetlands, Estuaries, Brownfields Remediation and polluted runoff abatement projects or implement comprehensive coastal management plans.
Drinking Water State Revolving Fund	C	Publicly and privately owned community water systems and nonprofit non-community water systems	Loans for drinking water system improvements
Drinking Water State Revolving Fund Discretionary Set-Asides	A/C/CI	State agencies, public water systems, and communities	Grants and loans for projects and activities that protect drinking water sources
Water Program Grants			
Water Quality Cooperative Agreements	A	State water pollution control agencies, interstate agencies, other public or nonprofit agencies, institutions, organizations and individuals.	\$10K—\$200K for projects related to clean water programs, including the NPDES program, for research, investigations, experiments, training, environmental technology demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution.
Assessment and Watershed Protection Program Grants and Cooperative Agreements	A/C	States, local government, tribes, interstate associations, intertribal consortia, public or private nonprofit groups, nongovernmental institutions and individuals.	\$5K—\$80K to develop and implement effective, comprehensive programs for watershed protection, restoration, and management.
Water Quality Pollution Control Grants	A/C	States, interstate agencies.	Up to \$200K to establish and implement ongoing water pollution control programs.

Table 3-1. Assessment and Cleanup Financial Resources Summary *(continued)*

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
Total Maximum Daily Load Program Grants and Cooperative Agreements	A/C	State water pollution control agencies, Indian Tribes, interstate agencies, other public or nonprofit agencies, institutions, organizations and individuals.	Up to $100K to assist in development of TMDLs, support implementation, or provide additional support in reaching settlements. NOTE: State, tribal or interstate agencies may not use these funds for routine TMDL developmental activities.
Wetland Program Development Cooperative Agreements and Grants	A/C/CI	States, tribes local governments.	Projects must be used to develop and refine any aspect of a comprehensive wetland program and must demonstrate environmental results. A 25 percent nonfederal match is required.
NPS Funds	A/C	State NPS agencies.	Incremental funds: $100 million to develop and implement watershed-based plans and TMDLs for impaired waters. Base funds: staffing and support to manage and implement state NPS Management Program, or support for projects that identify and address NPS problems. Up to 20 percent may be used to develop NPS TMDLs and watershed-based plans to implement NPS TMDLs.
Multi-Media Funds			
Regional Geographic Initiative	A/C	State water pollution control agencies, interstate agencies and other public or nonprofit agencies, institutions, organizations and individuals.	Up to $200K to fund unique geographically based projects that fill critical gaps in EPA's ability to protect human health and the environment.
Additional Water Program Support			
Watershed and Water Quality Modeling Technical Support Center	A/C/CI	EPA Regions, state and local governments and their contractors.	Technical assistance to support development of TMDLs, WLAs and watershed protection plans.
Volunteer Monitoring Program	A	Volunteer water monitoring groups.	Technical assistance to organize and operate effective volunteer water monitoring networks.
EPA CERCLA RESOURCES			
Program Resources			
Pre-Remedial Program	A	EPA.	Funding and resources for assessment.
Remedial Program	A/C	EPA NPL sites.	Funding and a wide array of technical and contracting resources to assess and clean up NPL sites.
Removal/ Emergency Response Program	A/C	Sites with hazardous substances, pollutants or contaminants that pose a threat to public health.	Up to $2 million in EPA/PRP funding to perform assessment and cleanup. More funds if additional findings are made.
Superfund Community Involvement Support			
Technical Outreach Support to Communities	CI	Communities.	Technical assistance about contaminated sites. Assist community participation in cleanup decision-making process.
Technical Assistance Grants	CI	Nonprofit community groups in communities with an NPL site or proposed NPL site.	Up to $50K for community groups to hire technical advisors to help the community understand technical information about the NPL site or proposed NPL site in their community. A 20 percent match is required, but may include donated or in-kind services.

Table 3-1. Assessment and Cleanup Financial Resources Summary *(continued)*

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
Internal Support Resources			
Environmental Response Team	A/C	Superfund programs.	Technical assistance on innovative technologies, land revitalization, revegetation, technology evaluation, and response to environmental emergencies.
National Laboratories	A/C	Superfund programs, sometimes other EPA programs.	Technical assistance on assessment, engineering, and implementation.
Abandoned Mine Land Program	A/C	Superfund programs, federal land management agencies, states, tribes, mine owners and operators and community stakeholders.	Technical expertise in abandoned mine site issues. Coordination with stakeholders on mine research, characterization, cleanup, and redevelopment.
Contracting Resources			
Contract Laboratory Program	A	Superfund programs.	Laboratory analytical services.
Environmental Services Assistance Team	A	Superfund programs.	Contractor for analytical services and GIS mapping.
Regional Superfund Laboratory	A	Superfund programs.	Laboratory analytical services.
Remote Sensing and Mapping Support Contract	A	Superfund programs.	Remote sensing, GIS support.
Superfund Technical Assessment and Response Team	A	Superfund programs.	Technical support for site assessment, engineering, planning and preparedness and emergency response.
Response Action Contracts	A/C	Superfund programs.	Architect/engineering services, RI/FS, remedial design (RD)and actions, EE/CA, construction oversight and enforcement support.
Emergency and Rapid Response Services	C	Superfund removal programs.	Emergency, time-critical removal and quick remedial response cleanup services. Personnel, equipment, and materials for cleanup and restoration.
Response Engineering and Analytical Contract	A/C	EPA Environmental Response Team.	Scientific and emergency response expertise.

Table 3-1. Assessment and Cleanup Financial Resources Summary *(continued)*

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
EPA BROWNFIELDS RESOURCES			
Brownfields Grants			
Brownfields Assessment Grants	A	Local governments, land clearance authorities, or similar quasi-governmental agencies under control of local government, government entities created by state legislatures, regional councils, redevelopment agencies charted by states and tribes.	Up to $200K to conduct inventories, characterization, assessment, and cleanup planning.
Brownfields Revolving Loan Fund Grants	A/C	See above.	Funding to capitalize a revolving loan fund or to award sub-grants to eligible entities. Up to $1 million per eligible entity with a 20 percent match required unless a hardship waiver is granted.
Brownfields Cleanup Grants	C	See above.	Up to $200K to perform cleanup activities on property owned by the grant recipient at the time of award, for a maximum of five sites per owner. A 20 percent match is required unless a hardship waiver is granted.
Brownfields Job Training & Workforce Development Grants	A/C	Colleges, universities, and nonprofit training centers.	Up to $200K to provide training for residents in communities affected by brownfields. Projects should facilitate cleanup of brownfields sites contaminated with hazardous materials.
Technical Assistance to Brownfields Communities	CI	Communities.	Training and technical assistance to stakeholders.
Targeted Brownfields Assessments	A	EPA Regional Brownfields Offices.	EPA Brownfields Program performs or directs assessment.
State and Tribal Response Program Grants	A/C	States, tribes.	Up to $200K per site to supplement state/tribal response programs' cleanup capacity. May be used for site-specific assessment and cleanup.
Brownfields Federal Partnerships	A/C	Various stakeholders.	Grants and other resources from federal agencies to provide support for brownfields assessments and cleanups.
ADDITIONAL EPA ASSESSMENT AND CLEANUP RESOURCES			
Environmental Finance Program	A/C/CI	Communities, agencies.	Resources to find creative approaches to funding environmental projects
Targeted Watershed Grants	C	Watershed organizations and coalitions ready to make on-the-ground improvements to water quality.	$600K–$900K to implement actions to protect critical watersheds
Community Action for a Renewed Environment Grants	A/C/CI	Communities.	Level I—Up to $75K to establish collaborative partnerships to reduce toxic releases. Level II—Up to $300K for communities with collaborative partnerships to implement risk reduction strategies.
Five Star Restoration Program Grants	C/CI	Students, conservation corps, other youth groups, citizen groups, corporations, landowners, and government agencies.	Technical support, education, and up to $20K to complete projects that restore wetlands and streams.

Table 3-1. Assessment and Cleanup Financial Resources Summary *(continued)*

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
DEPARTMENT OF INTERIOR ASSESSMENT AND CLEANUP RESOURCES			
Bureau of Reclamation	A/C	Local, state and other federal agencies.	Technical assistance includes field sampling, analytical testing and data interpretation.
Water Resources Research laboratory	C	Federal, state, and local stakeholders.	Assistance in river restoration.
Sedimentation and River Hydraulics Group	C	Federal, state, and local stakeholders.	Scientific and engineering expertise regarding riverine studies and modeling.
Watershed Protection and Flood Prevention Program	A/C	Conservation districts, local governments, and state/tribal agencies. For watersheds of less than 250,000 acres.	Up to $10 million per project, with cost sharing for watershed protection.
U.S. Geological Survey	A	N/A	Scientific information and expertise in many natural science fields. Data collection, monitoring, analysis and predictive modeling. Water flow and water quality databases.
U.S. Fish & Wildlife Service	A/C	Government, public, private organizations, groups and individuals.	Natural Resource Assistance Grant (**www.fws.gov/grants**). Staff performs contaminated-related studies, frequently in collaboration with other federal agencies.
Partners for Fish and Wildlife	C	Federal, state and local stakeholders.	For habitat restoration on lands not owned by state or federal government. Typically a 50 percent cost share. Technical support available.
North American Wetlands Conservation Act Grants Program	A/C	Organizations and individuals.	Funding for wetlands conservation projects that focus on protecting, restoring, or enhancing critical habitat. 1:1 matching funds required. Up to $50K for the Small Grants Program. Higher funding for larger projects.
Office of Surface Mining	N/A	States with approved programs and specific Indian Tribes, nonprofit organizations	Regulated coal mining operations. AML Grants for states with approved programs and specific Indian Tribes, Watershed Cooperative Agreement Program for nonprofit organizations that undertake local AMD reclamation projects, maximum award typically $100,000. (**www.osmre.gov/grantsprograms.htm**)
Abandoned Mine Land Grants	A/C	States/tribes with approved programs.	To operate a state coal mining AML Program, perform reclamation and establish trust funds.
Watershed Cooperative Agreement Program	A/C	Nonprofit organizations, especially small watershed groups.	Up to $200K for local coal mining AMD reclamation actions.
DEPARTMENT OF AGRICULTURE ASSESSMENT AND CLEANUP RESOURCES			
U.S. Forest Service			
Watershed Forestry Assistance Program	A/C	State foresters and communities, nonprofit groups and owners of nonindustrial private forest land.	Technical assistance on watershed issues on nonfederal forested and potentially forested land.
Abandoned Mine Land Initiative	A/C	Mining sites with hazardous waste on USDA/FS land.	CERCLA assessment and cleanup.
National Resources Conservation Service			
Environmental Conservation Acreage Reserve Program	C	Landowners.	Assistance in compliance with NPS pollution requirements.

Table 3-1. Assessment and Cleanup Financial Resources Summary *(continued)*

Resource	Assessment—(A)/ Cleanup—(C)/ Community Involvement—(CI)	Eligibility	Resources
Conservation Security Program	C	Landowners, communities.	Grants to restore fishery habitat. Requires a 1:1 cost share that may be cash, salary, equipment, supplies, in-kind services, or labor.
Emergency Watershed Program	C	Landowners.	Cleanup from natural disasters.
DEPARTMENT OF COMMERCE RESOURCES			
NOAA			
Community Based Restoration Program	C	Regional government bodies, business, community/watershed group, nonprofit groups, educational institutions, conservation districts, local government, and state/territorial/tribal agencies.	Grants to restore fishery habitat. Requires a 1:1 cost share that may be cash, salary, equipment, supplies, in-kind services or labor.
OTHER FEDERAL RESOURCES			
U.S. Army Corps of Engineers (USACE)	A/C	Nonfederal agencies.	Aquatic Ecosystem Restoration
Restoration of Abandoned Mine Sites (RAMS) Program	C	Communities/agencies.	Technical, planning, and design assistance for projects to address water quality problems caused by drainage and related activities from abandoned and inactive non-coal mines.
U.S. Department of Housing and Urban Development (HUD)	A/C	Urban communities.	Funding for urban renewal and economic development.
NONGOVERNMENTAL ASSESSMENT AND CLEANUP RESOURCES			
Voluntary Cleanup Programs	A/C	Landowners.	Program allows owner to voluntarily assess and clean up property to facilitate sale or redevelopment or to improve value.
National Fish and Wildlife Foundation	A/C	Federal, state, and local governments, educational institutions, and nonprofit organizations.	Various grants and assistance to conserve and restore fish, wildlife, and native plants.
Volunteer Water Monitoring Groups	A	Communities, agencies.	Water monitoring
River Network	A/CI	Communities.	Assistance in developing water monitoring networks.
Remediation Technologies Development Forum	C	Public and private stakeholders.	Assists communities in developing innovative solutions to mutual hazardous waste problems. Voluntary sharing of knowledge, experience, equipment, facilities, and technologies to address common problems.
Conservation Technology Information Center		Agriculture stakeholders.	Assistance in finding affordable and integrated solutions to environmental concerns.
National Corporate Wetlands Restoration Partnership	C	Federal and state agencies and private corporations partner to leverage collective resources, skills and processes.	Funds to perform aquatic ecosystem restoration projects.

Table 3-2. EPA Brownfields Revitalization Program Assistance Overview

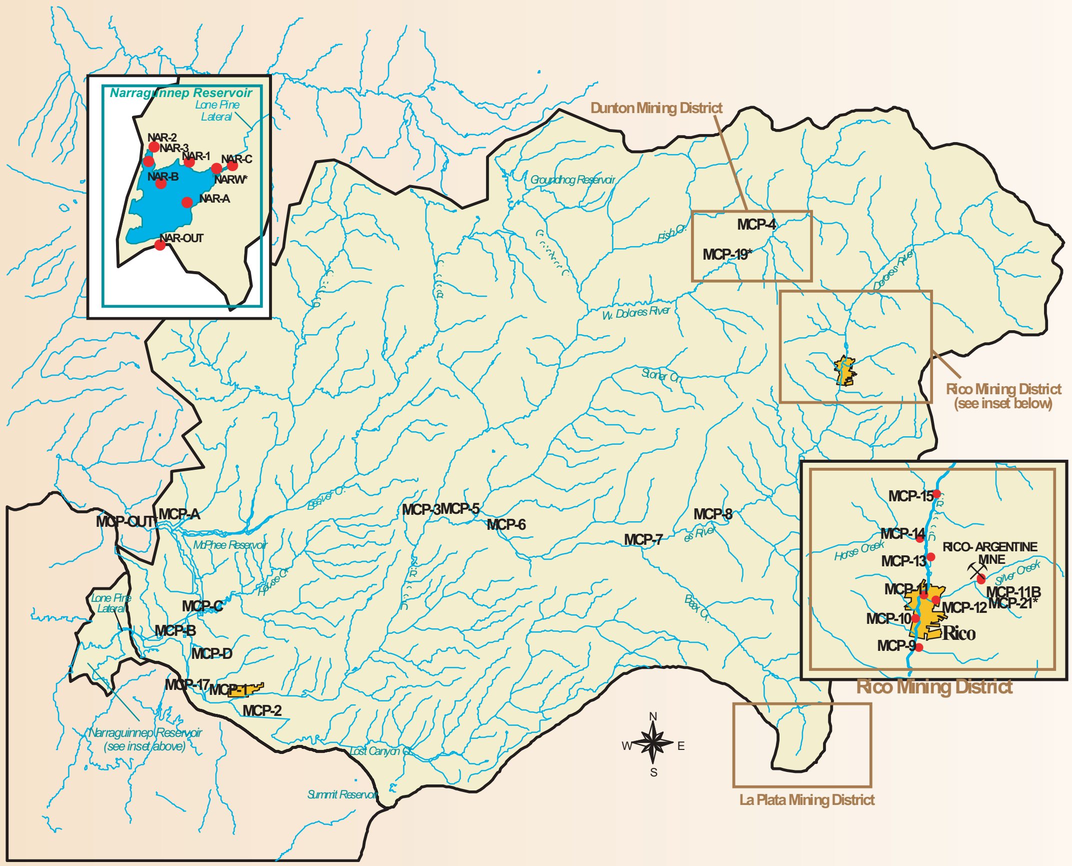
<table>
<tr><th>Grant Program</th><th>Brownfields Assessment Grants</th><th>Brownfields Revolving Loan Fund Grants</th><th>Brownfields Cleanup Grants</th><th>Job Training & Workforce Development Grants</th><th>State/Tribal Response Programs Grants</th></tr>
<tr><td>Purpose & Brownfields Site Definition</td><td colspan="5">Purpose: To promote the cleanup and reuse of brownfields and to provide financial assistance for brownfields revitalization. To establish or enhance state and tribal brownfields response programs.
Definition: Brownfields are real properties, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant as defined in Public Law 107-118.</td></tr>
<tr><td>Eligible Applicants</td><td colspan="2">Local governments, land clearance authorities or similar quasi-governmental agencies under control of local government, government entities created by state legislatures, regional councils, redevelopment agencies chartered by the state, states and federally recognized tribes.
In addition to the above, nonprofit organizations are also eligible for cleanup grant funding only and all eligible entities must own the property to qualify for a cleanup grant.</td><td colspan="2">Colleges, universities, nonprofit training centers exempt from taxation under 26 U.S.C. 501(c)(3), community job training organizations, states, cities, towns, counties, U.S. territories and federally recognized tribes are eligible.</td><td>States and federally recognized tribes, Alaska Native
Regional/Village Corporation and the Metlakatla Indian Community</td></tr>
<tr><td>Grant Objectives</td><td>To assess brownfields sites and to test clean up and redevelopment models (assessments to be done according to American Society for Testing and Materials (ASTM) Standards).</td><td>To capitalize a Revolving Loan Fund. Also, can be used to award sub-grants to eligible entities.</td><td>To perform cleanup activities on a property/ properties owned by the grant recipient at the time of award.</td><td>To provide training for residents of communities affected by brownfields to facilitate cleanup and prepare trainees for future employment in the environmental field.</td><td>To supplement state and tribal response programs' cleanup capacity.</td></tr>
<tr><td>Award Amount</td><td>Up to $200,000 per hazardous substance site; $200,000 per petroleum site.</td><td>Up to $1,000,000 per eligible entity.</td><td>Up to $200,000 per site for a maximum of five sites.</td><td>Up to $200,000.
Additional funding possible.</td><td>Approximately $50 million is awarded annually to states and tribes.</td></tr>
<tr><td>Matching Share</td><td>No matching share required.</td><td>20 percent matching share required (hardship waiver available)</td><td>20 percent matching share required (hardship waiver available)</td><td>No matching share required.</td><td>Matching share required if money is to be used for a Revolving Loan Fund; otherwise no matching share.</td></tr>
<tr><td>Call for Proposals</td><td>Annually (Fall)</td><td>Annually (Fall)</td><td>Annually (Fall)</td><td>Annually (Fall)</td><td rowspan="3">States and tribes can do some limited site-specific work such as assessments and cleanups of eligible brownfields.
Contact EPA Region for more information. (contact information can be found on Web site listed below)</td></tr>
<tr><td>Applications Deadline</td><td>Annually (Winter)</td><td>Annually (Winter)</td><td>Annually (Winter)</td><td>Annually (Winter)</td></tr>
<tr><td>Selections Announced</td><td>Annually (Spring)</td><td>Annually (Spring)</td><td>Annually (Spring)</td><td>Annually (Spring)</td></tr>
</table>

Table 3-2. EPA Brownfields Revitalization Program Assistance Overview *(continued)*

Grant Program	Brownfields Assessment Grants	Brownfields Revolving Loan Fund Grants	Brownfields Cleanup Grants	Job Training & Workforce Development Grants	State/Tribal Response Programs Grants
Priorities	• Projects that stimulate the availability of other funding for assessment, cleanup and reuse. • Projects that stimulate economic development; address, identify or reduce threats to human health and the environment. • Projects that facilitate the reuse of existing infrastructure; create/preserve a park, greenway, undeveloped property, recreational property or other property for nonprofit purposes. • Projects that meet the needs of a community unable to draw on other resources because of the small population or low income of the community. • Projects that allow for the fair distribution of funds between urban and nonurban areas; provide for community involvement. • Projects that identify and reduce threats to the health and welfare of children, pregnant women, minority or low-income communities or other sensitive populations.		• Projects that bring together community groups, job training organizations, educators, investors, lenders, developers and other affected parties to address issue of providing training for residents in communities impacted by brownfields. • Projects that facilitate cleanup of brownfields sites contaminated with hazardous substances and prepare trainees for future employment in the environmental field.		• States and tribes with a Voluntary Cleanup MOA. • State and tribal programs w/out MOA need to establish or enhance the following elements: ▪ Timely survey and inventory of brownfields sites. ▪ Oversight and enforcement authorities or other mechanisms and resources. ▪ Mechanisms and resources to provide meaningful opportunities for public participation. ▪ Mechanisms for approval of a cleanup plan and verification and certification that cleanup is complete. • States or tribes need to establish a public record & update annually.
Prohibitions	No part of a grant or loan may be used for the payment of • A penalty or fine • A federal cost-share requirement • An administrative cost • A response cost at a brownfields site for which the recipient of the grant or loan is potentially liable under CERCLA section 107 • A cost of compliance with any federal law (including a federal law specified in section 101 (39)(B)), excluding the cost of compliance with laws applicable to the cleanup				Prohibitions do not apply to section 128 grants unless recipient uses funding for Revolving Loan Fund activities or if site-specific activities are completed on sites *owned* by the recipient
Web site	National Web site: www.epa.gov/brownfields				

Multiagency, Multiprogram Funding Resources and Cooperation

Dolores Watershed, Colorado



The presence of surrounding mining districts and air deposition of mercury from powerplants throughout southwestern Colorado have potentially affected hundreds of square miles of the Dolores River watershed extending from the San Juan Mountains at an elevation of 14,000 feet in the southwestern part of the state down to McPhee Reservoir. Impacts include residential soil contamination with lead concentrations up to 50,000 ppm, AMD from numerous mines and mercury contamination resulting in a fish consumption advisory. The watershed is on the Colorado list of impaired waters (CWA 303(d) list). A TMDL was completed in 2004 for mercury in McPhee and Narraguinnep Reservoirs. A second TMDL is under development for Silver Creek for cadmium and zinc.

Multifaceted problems and issues have lead the town of Rico, the state of Colorado and multiple federal agencies to use nontraditional solutions including community-based decision making and cross-program coordination to assess the various impacts.

- Voluntary cleanup in Silver Creek
- Site Assessment and the TMDL program conducted ultra-clean sampling for mercury throughout the watershed to determine sources and develop a TMDL

Photo: Grand Canyon Trust

Four Corners Power Plant

(continued)

Sampling of the Dolores River

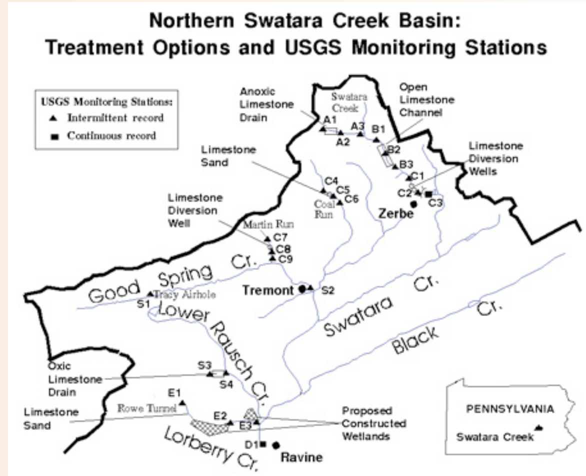
- Colorado modified its Performance Partnership Agreement to encourage coordination between the state Water Quality Division and Air Pollution Control
- USFWS and EPA provided funding for a Mercury Deposition Network (MDN) station at Mesa Verde National Park
- State Air Quality program and TMDL program provided funding to USGS for sampling seasonal snowpack
- USGS collected a core sample from Narraguinnep Reservoir to study the historical pattern of mercury deposition
- USGS, under an IAG from the TMDL program, conducted a source-receptor study
- Superfund Emergency Response has responded to the potential failure of treatment ponds and an abandoned cyanide heap leach area
- Targeted Brownfields Assessment by the state for facilitating cleanup and potential reuse of contaminated properties
- Water monitoring by local participants through an EJ grant
- Mercury sampling conducted by EPA National Laboratory at both high and low flows—joint SAP with TMDL program.
- Air Modeling based on MDN, snowpack and source receptor data funded by the TMDL Program and designed by USGS, Colorado Air Pollution Control and EPA Air Program

Sampling in Silver Creek

CASE STUDY

Stakeholders Combine Resources for Cleanup

Swatara Creek, Pennsylvania



Water Quality Concern:

Coal mine drainage (CMD) from abandoned mines has affected more than 2,400 miles of streams and associated groundwater in Pennsylvania. Approximately half of the discharges from bituminous and anthracite coal mines in Pennsylvania are acidic, having pH < 5.0. Acidic CMD typically contains elevated concentrations of dissolved sulfate, dissolved and particulate iron and other metals produced by the oxidation of pyrite. Such conditions make the water in mine drainage and receiving streams unfit for most uses.

Project Description:

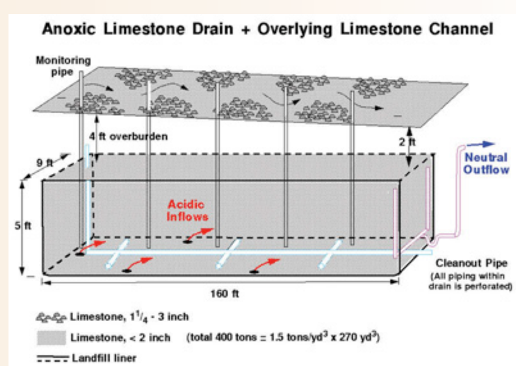
In the northern portion of the 576-square-mile Swatara Creek Basin, surface water losses and CMD from abandoned anthracite mines degrade the aquatic ecosystem and impair uses of Swatara Creek to its mouth at the Susquehanna River 70 miles downstream. To neutralize the acidic CMD and reduce the transport of dissolved metals in the Swatara Creek watershed, innovative passive treatment systems are being implemented and monitored. These treatment systems include limestone-sand dosing, open limestone channels, anoxic and oxic limestone drains, limestone diversion wells and limestone-based wetlands. The performance of these treatment systems is being evaluated using upstream/downstream and before/after monitoring schemes.

Community Outreach:

In March of 1996, a local citizens' group called Citizens Coordinated for Clean Water—now the Swatara Creek Watershed Association (SCWA)—hosted an exposition to highlight activities of various groups throughout the watershed. The exposition resulted in the formation of several committees tasked with pursuing high-priority remediation projects.

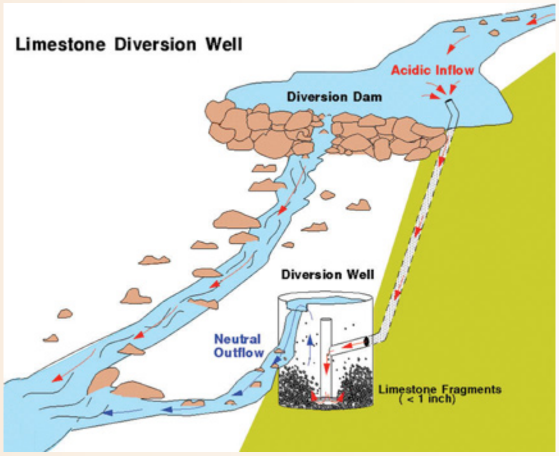
Outreach has been a common thread throughout the restoration effort. Pennsylvania (PA) Department of Environmental Protection (DEP) and the Department of Conservation and Natural Resources (DCNR) helped to plan the exposition and continue to participate in follow-up activities. For example, the agencies continue to meet with their board and regional Conservation Districts to provide information and assistance. The PA DEP Office of Mining also worked with residents in the upper watershed to establish and maintain AMD remediation projects. An Upper Swatara Watershed group has rallied around the effort, providing volunteer labor, equipment and limestone. This group and SCWA have started to look to the future coordination of watershed efforts.

Key Successes and Lessons Learned:



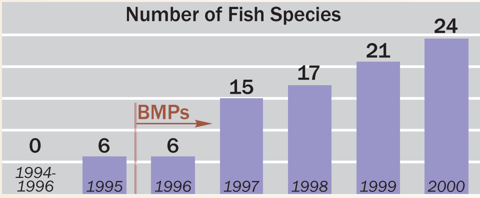
- An anoxic limestone drain near the headwaters of Swatara Creek has shown the greatest benefit to water quality, producing significant improvements in pH and alkalinity that are measurable several miles downstream.
- Diversion wells show great potential to treat stormflow, which generally is more acidic than baseflow. Wetlands attenuated dissolved and particulate metals but had negligible effects on pH, alkalinity and sulfate.

- Alkalinity-producing systems, such as limestone diversion wells or limestone drains combined with wetlands or settling basins, generally were needed to attenuate metals transport.
- Open limestone channel and limestone sand dosing had negligible effect on water quality.
- The precipitation process has a detrimental side effect of putting sludge with high metal content in the bottom of the creeks.



Financial Resources:

Efforts to improve the water quality of Swatara Creek will continue for years to come. Several sample remediation and reclamation projects are described below.



Observed increase in fish species since BMP implementation (Swatara Creek, Pennsylvania)

1994–1996: Stumps Run reclamation project

Three reclamation projects of coal sediment pollution were conducted in lieu of $132,000 in civil penalties and fines assessed by PA DEP's Pottsville District Mining Office. These three projects regraded and removed silt, revegetated affected areas and installed erosion and sediment controls on 24.4 acres.

1995: Swatara Creek diversion wells

Two diversion wells were installed on Swatara Creek 3 miles from the creek's origin. A local businessman offered to fund the project in honor of his father, who was an avid fisherman. Since the project began, it has turned into a community effort involving more than 50 citizens, businesses and agencies. This project paved the way for the formation of the Northern Swatara Creek Watershed Association.

1996: Diversion well on Martin Run

A diversion well was installed to address two abandoned mine discharges. The work was completed with EPA CWA section 319 funds and volunteer efforts from the Pennsylvania National Guard and local citizens.

1996: Study of treatment plants and current water quality of Swatara Creek

(USGS) and PA DEP engaged in a cooperative effort to evaluate the effectiveness of various limestone treatment devices installed on Swatara Creek. This project received funding through EPA CWA section 104 for 1996, 1997, and 1998.

1997: Limestone channel on Swatara Creek

To increase Swatara Creek pH upstream of the diversion wells, a limestone channel was constructed. EPA CWA section 319 funds supported the project.

1997: Anoxic limestone drain on tributary to Swatara Creek

An anoxic drain was constructed on an unnamed AMD discharge at the headwaters of Swatara Creek. The drain was constructed using EPA section 319 funds and donated assistance and materials. USGS designed the project and added numerous testing features to allow monitoring and maintenance. The project has shown a marked improvement in water quality at the discharge and 3 miles downstream at the diversion wells. This project seems to be very effective and the most maintenance-free of all the passive treatment systems.

1997: Pollys Run project

This project, supported by EPA section 319 funds, involved streambank stabilization and rechanneling work on Swatara Creek.

1997: Lorberry Junction wetland project

Two shallow-water impoundments were constructed to provide aerobic wetland treatment of CMD on Lower Rausch Creek. This project was funded partially by EPA CWA section 104 funds and with fines that were assessed against a landfill by the PA DEP Bureau of Waste Management. All of the construction work was completed by the PA DEP Bureau of Abandoned Reclamation. Local industries donated additional materials and equipment. This project is very visible to the public, and it will serve as an educational area as well as a treatment facility.

1998: Development of treatment for Rowe Tunnel discharge, Lorberry Creek

This project was a cooperative effort between the DOE, USGS, PA DEP, and the Schuylkill County Conservation District to develop a treatment system on the Rowe Tunnel discharge, which has an average flow of more than 3,000 gallons per minute. The work is being funded by an EPA CWA section 319 grant and matching USGS and DOE funds.

1998: Swatara Creek designated as an EPA section 319 National Monitoring Program Project

This effort was the first National Monitoring Program Project in the country that focused on mine drainage and the land treatment practices needed to restore water quality. The project will continue some of the aforementioned water monitoring efforts. The data evaluation and the cumulative efforts of the various treatments will be very useful in developing treatment strategies for several streams in the region.

1998: Reconstruction of a stream channel near the John Behm Tunnel

EPA CWA section 104 funds supported this project.

1999: Construction of the Swatara Cooperative Trout Nursery

The Pennsylvania Fish and Boat Commission provided approximately 2,000 brook trout, 1,300 rainbow trout and 100 golden trout to the facility.

Assessment and Data Integration

This chapter presents certain fundamental aspects of water and waste programs—what data are collected and why—and presents opportunities for program integration. It begins with two primary opportunities for integration during watershed assessment: coordinating preliminary data compilation and streamlining additional data collection. A tool for preliminary data compilation, the Comprehensive Preliminary Watershed Assessment, is presented first because of its value in the early stages of cross-programmatic watershed cleanup. Coordinated and collaborative data collection saves agencies and programs time and money while reducing the waste of duplicative sampling efforts. A discussion of strategies for collecting additional watershed data follows. Figure 4-1 presents a guide to initial watershed assessment activities.

To integrate data compilation and collection, the WCT must consider the data requirements of the various programs. Background information is provided about data quality, data evaluation, benchmarks, and data collection strategies. For the data to be useful, it must be available and accessible to all participants and organized in a consistent manner. Therefore, data management issues that must be considered at the onset of a collaborative watershed effort are presented. This chapter ends with a brief summary of typical program-specific data collection efforts and suggests potential opportunities for integration. An example that compares TMDL, Brownfields, CERCLA Site Assessment, Remedial and Removal Program data requirements for water samples collected in a typical mining watershed is presented in Table 4-1. Similar comparisons may be appropriate to help evaluate data integration issues with other pollutants, in other types of watersheds or between other programs.

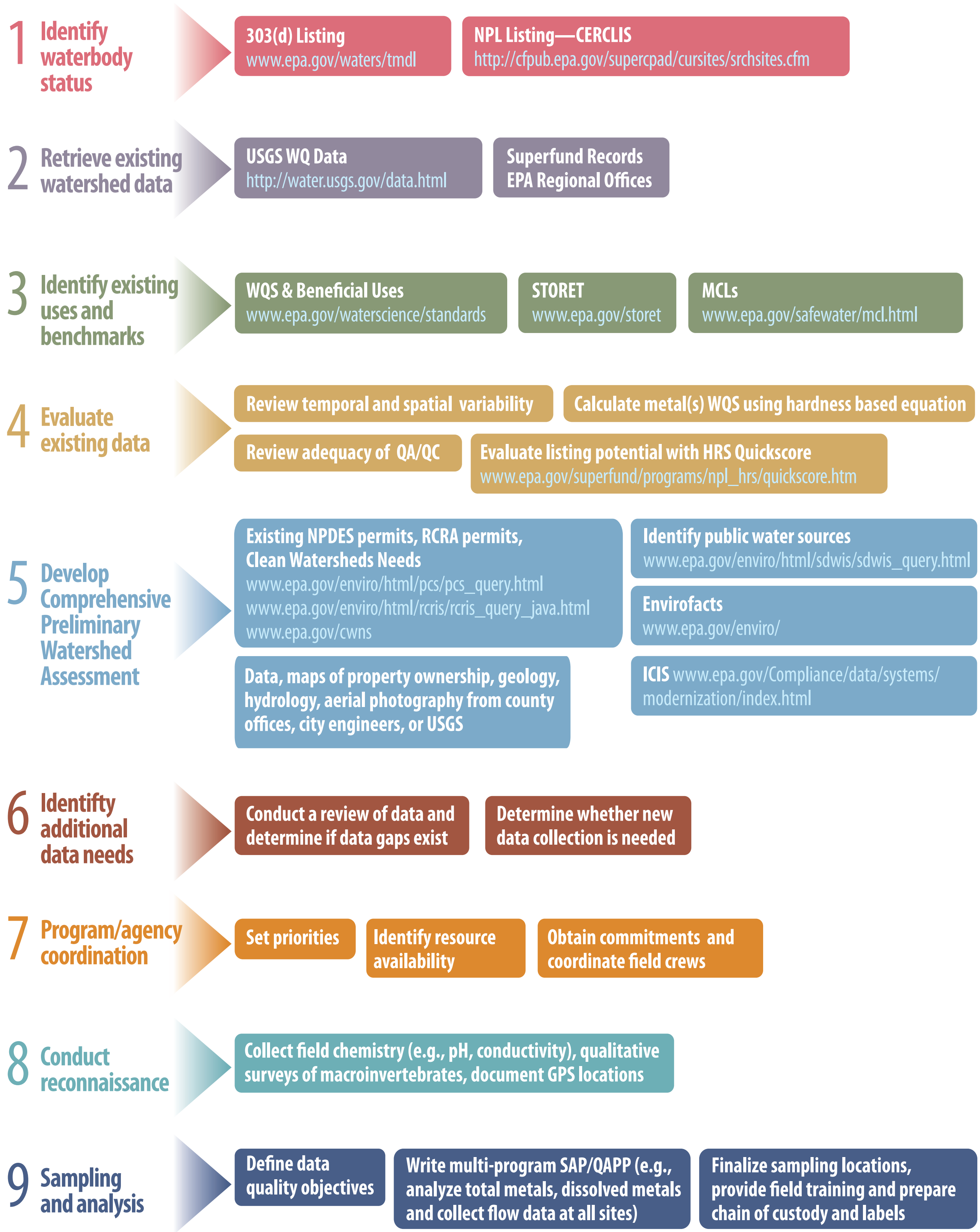


Figure 4-1. Assessment Flow Chart and Overview

Table 4-1. Comparison of Surface Water Related Data Collection and Analysis Requirements for Mining Watersheds

	TMDL Program	Brownfields	Superfund PA/SI	Superfund Remedial	Superfund Removal
Sample Purpose	◗ Identifying all significant sources. ◗ Describe watershed characteristics.	◗ Determination of site risk. ◗ Site characterization.	◗ Only those samples necessary for conclusive determination of whether site scores above 28.5 on HRS. Background samples are required to establish a release and establish ambient conditions.	◗ Site characterization. ◗ Risk assessment.	◗ Identifying human health threat. ◗ Site characterization. ◗ Determine removal alternative feasibility.
Sample Analysis	◗ Dissolved metals, total recoverable metals, pH, conductivity, hardness. Depends on WQS. Water quality criteria may be expressed as dissolved, total, or total recoverable. Must have associated flow data.	◗ Depends on pathway and receptor. Typically metal concentrations, pH.	◗ Depends on pathway and receptor being evaluated. Total metals if values will be compared to human food chain or environmental threat values. Dissolved metals if values will be compared to standards for drinking water threat values.	◗ Flow, pH, temperature, TSS, suspended sediment, salinity and metal concentration.	◗ Metal concentrations, pH.
Detection Limits/ Benchmarks	◗ Below WQS.	◗ Dependent on receptors and exposure pathway. Based on standard values for comparison such as Superfund Chemical Data Matricies (SCDM), Region 3 RBCs, Region 9 Preliminary Remediation Goals (PRGs).	◗ Depends on rationale for sample. Must be adequate to compare results to values in SCDMs. (Samples with high concentrations do not require a low detection limit.)	◗ Varies by factor being evaluated. For Risk Assessment samples, detection limits will depend on toxicity of the contaminant.	◗ Based on standard risk values such as SCDMs, Region 3 RBCs, Region 9 PRGs or other published values indicating toxicity.
Data quality	◗ Based on state requirements.	◗ Screening data for most samples. Definitive data for critical samples.	◗ Legally defensible data is required for samples used to defend HRS score.	◗ Definitive data with high level of QA/QC for risk assessment samples. Variable for other samples	◗ Varies.

Comprehensive Preliminary Watershed Assessment

The Comprehensive Preliminary Watershed Assessment (see box below) is an effective tool that assists in understanding watershed conditions and the development of a preliminary watershed conceptual model. The conceptual model will be used to help identify interested parties and focus the WCT on important issues. The Comprehensive Preliminary Watershed Assessment should include, at a minimum maps and aerial photographs depicting the entire watershed and displaying any property ownership/zoning; identification of WQS for each waterbody within the watershed and current waterbody status in meeting the standards; readily available data (including summaries/references to monitoring data reports collected through various regulatory programs, identification of potential human and environmental receptors [e.g., humans, fish, birds, soil community]); location of historical and current sources of contamination; key findings of previous geological, hydrological, and hydrology studies; NPDES permits (with identification numbers); RCRA facilities and CERCLA/CERCLIS sites within the watershed; Clean Watersheds Needs; and documentation of past, current or planned cleanup activities. The assessment may also include preliminary scoping studies such as a qualitative macroinvertebrate study or watershed-wide contaminant loading study. A reconnaissance field trip may be the culmination of the assessment and provide information to assist in scoping the need for future study.

Potential sources of information for the Comprehensive Preliminary Watershed Assessment include EPA PA/SIs, Removal Assessments, Removal Actions, RI/FSs, TBAs, Emergency Response Actions, water quality agencies and databases, state permitting authorities, county/local health/environmental departments, educational institutions, USGS, federal and tribal land management agencies, existing databases such as STORET, WATERS, NWIS and other potential sources discussed in Chapter 3.

The Comprehensive Preliminary Watershed Assessment should average between 15 and 30 pages, including maps, photos, aerial photography and land ownership. The Comprehensive Preliminary Watershed Assessment may assist in development of a site conceptual model. Figure 4-2 provides an example of a site conceptual model that was developed for a cross-programmatic watershed cleanup effort in the Anacostia River Watershed in Maryland and the District of Columbia.

Comprehensive Preliminary Watershed Assessment

If a cross-programmatic cleanup approach is indicated, the following information should be collected for the entire watershed (or as much as is practical):

- Aerial photographs
- Property ownership/zoning
- Watershed topographic mapping
- GIS mapping of available data
- Identification of WQS
- Determination of waterbody impacts (i.e., exceedance of WQS, NPL scoring)
- Identification of potential receptors
- Key findings of previous studies
- Available data, with GPS locations for all sampling locations
- Relevant background information from previous studies (including all existing data that meets criteria and citing of any other data such as watershed geology or hydrogeology for both a watershed-wide and site-specific basis)
- Hydrologic information (flow data from previous sampling events, and data and associated hydrographs from long term gauging stations)
- Documentation of past, current, or planned cleanup activities by the various agencies/programs
- If the information is not already available, a watershed-wide loading study is essential to determine major contributors to stream contamination.
- Results of field reconnaissance:
  - Confirm preliminary data (e.g., land use, source locations, aerial photography)
  - Collect basic field chemistry (pH, conductivity, temperature, dissolved oxygen)
  - Conduct bioassessment such as qualitative macroinvertebrate surveys, where applicable
  - Identify potential sample locations (GPS and directions to sample locations)
  - Identify additional potential sources

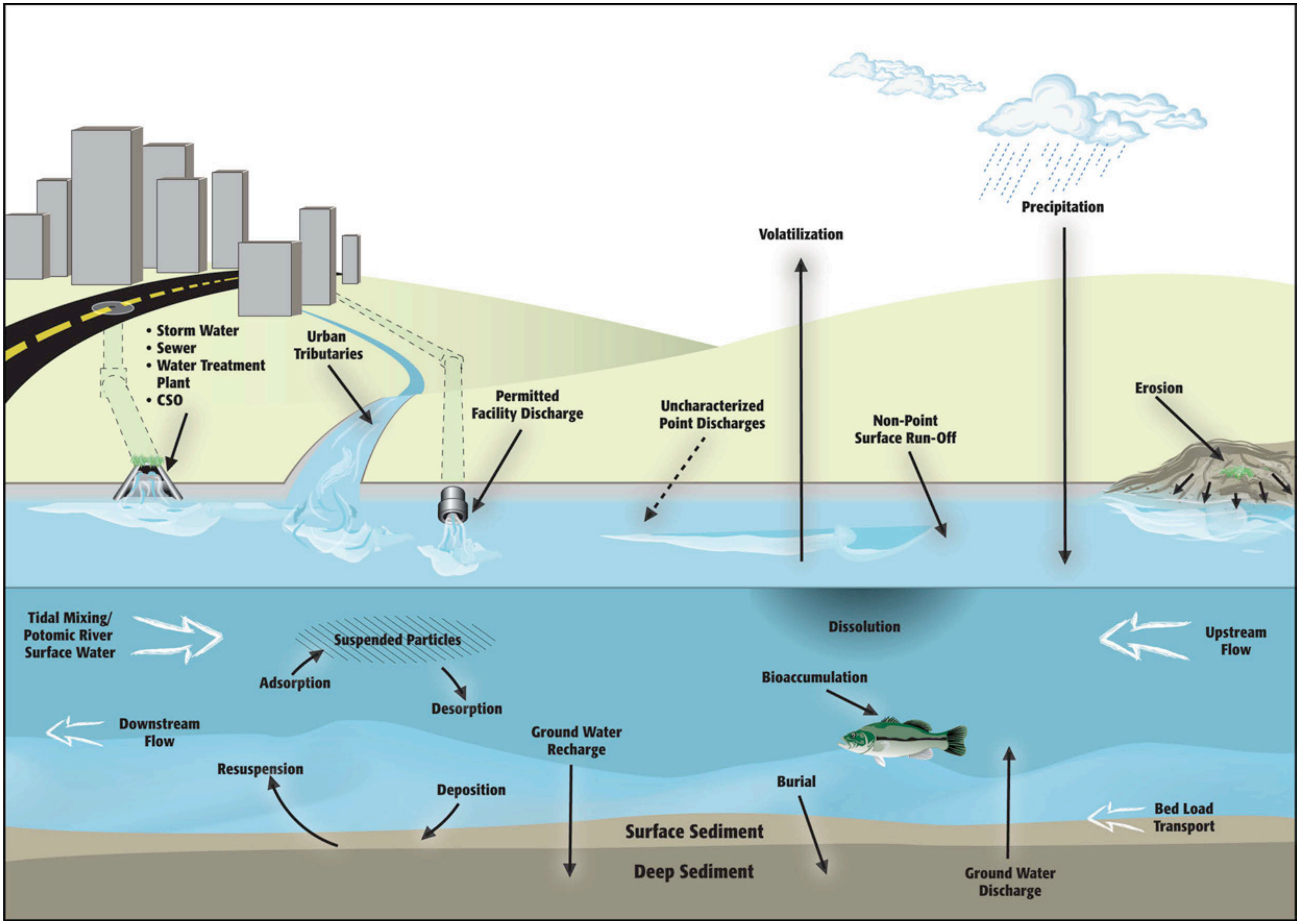


Figure 4-2. Site Conceptual Model, Anacostia River Watershed, Maryland, and Washington, D.C.

From: *Charting a Course Toward Restoration: A Toxic Chemical Management Strategy for the Anacostia River*, prepared by member organizations of the Anacostia Watershed Toxics Alliance and the Anacostia Watershed Restoration Commission (AWRC).

Additional Watershed Data Collection

To save time and money, the WCT might want to consolidate future data collection efforts. Depending on the participants, overlap of data needs, funding, and other considerations, additional data can be collected by individual programs/agencies (cooperative sampling) or a multiagency/stakeholder sampling effort (collaborative sampling). It is likely that a combination of approaches will be used. No matter how data collection is structured, cooperation between WCT programs/agencies will save time and precious resources despite the additional initial planning efforts.

Cooperative Data Collection

In some cases, the WCT may decide that individual agencies/programs will conduct future data collection efforts separately. In that case, the SAP should be available for review by the WCT in advance to maximize integration. An example of the benefit of sharing plans in advance might be at an NPL site where the RI contractor will be collecting quarterly surface water samples at three locations to assess seasonal stream gains from a contaminated aquifer. Because surface water quality and stream flow data are important to most programs involved in watershed cleanup, the plan should be reviewed to determine the applicability of the data to the state water quality data set, the NRDA and the TMDL programs. It might mean that the data collection techniques or analytical parameters are adjusted slightly (i.e., adding flow rate to the field measurements, or collecting samples for both total and dissolved metals concentrations) to accommodate other program needs but might also prevent unnecessary and wasteful duplicative sampling efforts by another program.

Collaborative Data Collection

The WCT may decide to collaborate on some data collection efforts. A common approach and consistent methods should be used to accommodate the needs of the multiple programs involved. A multiagency SAP will be necessary to guide the sampling. Data Quality Objectives (DQOs) will provide the focus for preparing these documents. The SAP should include consensus among stakeholders on site naming conventions, sampling locations, media collected, protocols for sampling and analysis, and detection levels. Preparation of a consolidated SAP may be performed by the Watershed Program Manager if support is not available elsewhere.

Information may need to be gathered on the differences in cost between collecting lower- and higher-level quality data. Discussion will need to occur among all watershed participants who will use the data to be collected regarding what data quality each participant desires and requires, who will pay for higher quality data and when such data needs to be collected.

Before the final selection of sampling locations, a thorough reconnaissance of the watershed should be conducted using the information summarized in the Comprehensive Preliminary Watershed Assessment. The reconnaissance may include stream measurements for conductivity, pH, dissolved oxygen, qualitative macroinvertebrate analysis and GPS readings for all potential sampling locations (including any other appropriate field measurements that will indicate potential sources of the pollutants of concern).

Integrating data types and quality assurance requirements can be challenging, both in determining protocols and in obtaining funding for field work and laboratory analysis. Again, a cooperative approach can provide solutions to some of these problems. Given the example of the RI contractor collecting surface water samples in the cooperative sampling section, the TMDL and NRDA programs could send personnel to assist in sampling in exchange for additional sample analysis or lower laboratory detection limits.

While sampling performed by individual programs is often conducted by contractors, collaborative data collection may be performed by program personnel from several programs and agencies to reduce costs. Such an effort will require planning and the acquisition of field measurement devices, sample containers and preservatives, vehicles, and other site-specific tools. EPA Regional Laboratories may be able to provide some of the necessary items and technical support. Before sampling, all sampling team members must be trained for the activities they will be expected to perform. For example, personnel doing pebble counts should be instructed on the appropriate methodology, and personnel conducting macroinvertebrate surveys should be taught the method and provided with sketches of the organisms that should be present in that geographical location at that time of year.

In general, surface water sampling designs must include flow measurements to provide calculations to quantify loads and help prioritize sites. Water samples should be analyzed for both total and dissolved metals with detection levels below WQS. Sampling should also consider seasonal variations in flow and contaminant loading to determine critical conditions.

Biological Data Collection

In preliminary and subsequent data collection (including SIs and RIs), the importance of biological data collection must be strongly emphasized. Bioassessments can be good indicators of water quality and watershed health. As a preliminary data collection strategy, qualitative macroinvertebrate assessments are simple and quick and may guide selection of potential sampling locations that should be investigated further. Sketches of macroinvertebrate species expected to be found in similar unimpacted sites can be used to rapidly identify the species composition in the study area. Bioassessments may include macroinvertebrate, fish and aquatic vegetation surveys. Rapid Bioassessment Protocols may be used to direct the work. Habitat quality should be evaluated concurrently to determine if any perceived degradation in species number or diversity may be due to habitat limitations rather than contamination.

For more information on this subject, see *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition.* EPA 841-B-99-002. **www.epa.gov/owow/monitoring/rbp/download.html**

Data Quality and Evaluation

When integrating data from various sources or when planning additional data acquisition, data quality is an important issue that can greatly influence the usability of data by the various programs. This is one aspect of a cross-programmatic watershed effort that can cause divisions if not carefully addressed, because the various programs often collect data for different purposes. When planning additional data acquisition within the watershed, a QAPP should be prepared specifying all the procedures that will be used to ensure adequate data quality. Development of DQOs is part the QAPP. Development and use of DQOs will help ensure that the data are of the type, quantity and quality useful for all watershed participants. For cooperative data collection, the QAPP should be reviewed by the WCT along with the FSP. For consolidated data collection efforts, the FSP and QAPP will be prepared collaboratively. As noted earlier, watershed participants should agree on what data quality is needed for the various purposes of the data, the schedule for data collection and who will pay for the collection of such data.

After the field and laboratory data are available, they should be compared against the DQOs to ensure it meets these objectives. The reviewed and validated data are analyzed for trends, compared against benchmarks or used to make program decisions.

Data Quality Objectives

The DQO process is a series of planning steps using scientific methods that ensure that the type, quantity and quality of environmental data used in decision making are appropriate for the intended purpose. EPA has issued guidelines to help data users develop site-specific DQOs. The DQO process is intended to

- Clarify the study objective
- Define the most appropriate type of data to collect
- Determine the most appropriate conditions from which to collect the data
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed and data collection requirements and ensures that analytical techniques are used that will generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. These steps are

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify the inputs to the decision

Step 4: Define the study boundaries

Step 5: Develop a decision rule

Step 6: Specify tolerable limits on decision errors

Step 7: Optimize the design

During the first six steps of the process, the planning team develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves refining the data collection design on the basis of DQOs.

For more information on this subject see *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4. EPA/240/B-06-001. February 2006. **www.epa.gov/quality/qs-docs/g4-final.pdf**

Data Evaluation

During data evaluation, laboratory data are reviewed and validated to determine their usefulness and applicability for further evaluation (site models, statistical analyses) or decision-making. The reviewer examines sampling dates, locations, depths and descriptions; sample collection and preparation techniques; laboratory preparation techniques; analytical methods and analytical results; method detection limits or sample quantitation limits; QA/QC samples; and documentation. The data reviewer reviews data reports for transcription and typographical errors, determines if sampling protocols were appropriate, compares data against field and trip blanks to detect cross-contamination, compares field replicate sample results, reviews laboratory QC (laboratory blanks, method standards, spike recovery, duplicates), reviews detection limits, deletes unusable data, attaches qualifiers to usable data and explains limitations of qualified data. Laboratory analytical packages are validated by a chemist and the laboratory. Validation compares the QA objectives of the user against the laboratory data package. Validation may include evaluation of sample holding times, initial and continuing calibration verification, interference check samples for inorganics, determination of bias (percent recovery), precision (from replicate analyses), detection limits and field conditions that may have modified sampling procedures. A summary of the review and validation processes is preferably provided to the project manager.

After the data are validated, data that meets the requirements may be used to evaluate site conditions. Various numerical and graphical analytical methods may be used to evaluate the data on the basis of the study objectives. For example, the user might need to know if data support statistical assumptions regarding the presence or absence of contamination or biological response to the contamination. At other times, the user might want to determine if there is a trend to the data or correlation between two variables. For some studies, mean or median values and standard deviation or another determination of variance are adequate for the purposes of the study. Environmental data may require transformation before statistical analysis.

The flow and water chemistry loading data should also be reviewed to ensure that they provide enough spatial and temporal variability with regard to high and low flow to determine critical conditions within the watershed.

Benchmarks

Data should be compared against appropriate standards such as those provided in the following table. Values used for comparison will depend on the sample matrix, the contaminant of interest, the contaminant pathway being evaluated, and program requirements. One screening concentration's benchmark of note in the table below is the SCDM—a compilation of values for use in the HRS. Many of the values listed on the SCDM are derived from or applicable to other program benchmarks, so this document is valuable for determining benchmarks that will be used by a variety of programs involved in the watershed cleanup. Criteria and standards for dissolved metals are hardness-based and are typically presented as a hardness-based formula. Table 4-2 presents typical benchmarks for comparison.

Table 4-2. Benchmarks for Data Comparison

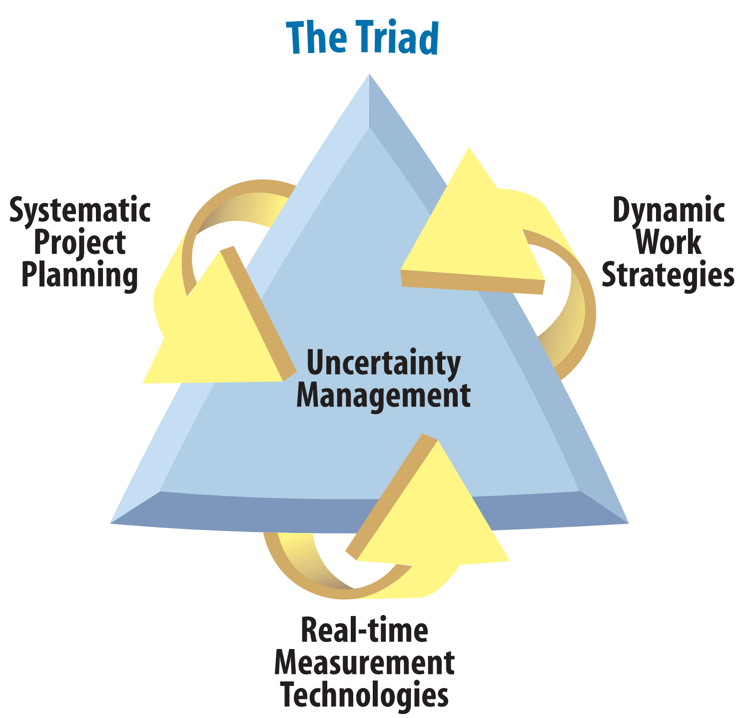
Benchmark	Media	Reference
State and tribal WQS under the CWA (designated uses, water quality criteria, antidegradation policies)	Surface water (some states have also issued ground water standards under state law).	State, tribal and territorial water quality standards. **www.epa.gov/waterscience/standards/states**
MCLs and MCLGs	Ground water, surface water, drinking water.	National Primary Drinking Water Standards. **www.epa.gov/safewater/mcl.html**
Screening Concentrations	Ground water, surface water, drinking water, air, soil, biota.	• Superfund Chemical Data Matrix. EPA. January 2004. **www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm** • Region 3 Risk Based Concentrations. EPA. April 2005. **www.epa.gov/reg3hwmd/risk/human/index.htm** • Region 9 Preliminary Remediation Goals **www.epa.gov/region09/waste/sfund/prg/index.htm** • Soil Screening Guidance: Users Guide. EPA540/R-96/018. July 1996. • Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.
Food and Drug Administration Action Levels	Biota	Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed.
National Ambient Air Quality Standards	Air	National Ambient Air Quality Standards. 40 CFR Part 50.
National Emissions Standards for Hazardous Air Pollutants	Air	National Emission Standards for Hazardous Air Pollutants. 40 CFR Part 61.

Data Collection Strategies

Triad Approach

EPA often uses the Triad approach for planning site assessment activities. The Triad approach allows the field work to be conducted cost-effectively and logically. The Triad approach is a three-step process that includes systematic planning, dynamic work strategies and real-time measurement technologies.

- ***Systematic planning*** includes developing a conceptual site model that shows sources, pathways, and receptors. The planning team uses the seven-step DQO process to ensure that project decisions meet the requirements of the project. Stakeholders are identified in a project organization diagram and can include multiple agencies, community groups, tribal organizations and appropriate experts required for the project, such as a risk assessor. The results of this planning process are documented in the FSP and the QAPP.
- ***Dynamic work strategies*** means using field analytical data generated on-site to determine the direction of subsequent field work, thereby reducing the overall time and cost of site activities and allowing better discretion in sample selection. A combination of less expensive field analytical data and collaborative laboratory analytical data allows for a more cost-effective way to more fully address all of the Data Quality Indicators (DQIs). The three DQIs—precision, accuracy, and sensitivity—must be established to ensure that the data used in decision making are of acceptable quality by quantifying the acceptable amount of error in the data collection and analytical process. Data Quality Assessment (DQA) criteria are defined as part of the DQO process and documented in the SAP. The results of the inspection/assessment, including qualitative and quantitative evaluations of the DQIs, are documented in the Analytical Results Report.
- ***Real-time measurement technologies*** and tools are used to manage data in the field and provide the information, including statistics, to make real-time decisions in the field where applicable. **www.clu-in.org/triad**



Data Management

Organizing data so it can be easily compiled and retrieved is one of the big challenges for multiprogram, multiagency cleanup efforts. The Watershed Project Manager must ensure that data are collected, compiled and managed to allow participants to easily access, query and view important site information. A data management plan may be prepared with the assistance of Regional EPA data management specialists and other WCT members. The following issues are some that should be considered in developing a data management plan:

- Who will manage data and who will map data (internal EPA data management, community action group, contractor, USGS, USACE, others)
- Select single data repository (single point of contact)
- Funding for database development and mapping
- Platform for data management (STORET, other database)
- Standard data submission requirements and tools for all groups submitting data (see Table 4-3)
- Level of effort allowable for existing data compilation
- Mapping platform (hard copy maps only, mapping application, query and view requirements)
- Data display requirements
- Mapped coverages (e.g., roads, streams, towns, topographic features, aerial photos, site features, data points)
- Sampling location naming conventions

Frequently, data will be available from previous monitoring, assessment and remediation efforts in the watershed. In the best case, all participants will readily contribute all available data, but the data may be provided in a variety of formats with varying degrees of usefulness for the project. The level of effort to compile existing data will depend on the format (text tables, spreadsheet data, laboratory electronic deliverables and databases) and completeness of data provided by participants. Clear communication of data formatting needs may reduce the cost of data management. It will often be necessary for the Watershed Project Manager to compile the existing data early in the process.

Data collected after the formation of the WCT should be provided in the standard format decided upon by the project team to ensure funds are not wasted on unnecessary data conversions and time-intensive discussions between data collection groups and GIS or data conversion specialists. *A consistent sample-naming convention should be determined in advance and used by all participants.*

STORET Water Quality Exchange (WQX)

Data mapping may be provided by EPA personnel or contractors or may be performed by other WCT members or contractors, depending on funding, agency capability and data viewing requirements. In some cases, a hard copy of the maps may be provided to participants at the beginning of the projects and at important milestones. In other cases, an easily viewable, queryable GIS application may be needed. Mapping support for Superfund projects is available through EPA personnel and the ESAT contract. Water programs and other programs may access internal GIS personnel or find a mechanism to fund a mapping contractor. Enviromapper is EPA's standard for mapping, however, the program might not provide all the features desirable for the WCT. EPA Region 10 has developed an Arc Internet Mapping Solution (ArcIMS) application for use with STORET. Each EPA Region has standardized coverages available for use in mapping applications.

While a variety of platforms can be used to manage data, EPA's standard is the STORET database. STORET is being redesigned into a new system called the WQX to facilitate easier flow of data into the data warehouse, and ultimately, greater access to the data. The other major national database of water quality information is the USGS NWIS. Other databases are available with regional or local data. These might be useful but should be compatible with STORET. Table 4-3 presents typical data requirements for using sampling data in a site database.

The STORET database is EPA's repository for water quality, biological, physical, soil, sediment, air habitat assessment and field measurement metadata collected by a variety of sources—from state and federal agencies to volunteer monitors. STORET is primarily used by states to report required water data to EPA; however, it may be used to manage all types of data from a variety of sources. Potential data sources include EPA programs such as Superfund, RCRA, and Brownfields; other federal agencies; tribes; state water and environmental agencies; and local/regional groups such as communities, municipalities, watershed councils and volunteer monitoring organizations.

STORET is an ideal way to manage data in a multiprogrammatic watershed cleanup effort for several reasons. STORET's data retrieval functions are Web-enabled so the public can use the Internet to query and download data. Data providers can submit data to STORET via data entry modules that operate on personal computers and are available free of charge to monitoring organizations. Web tools are also available to data providers who would like to submit data to STORET but do not want to use the standard STORET software. See the Region 8 case study on managing data and Web tools below. Data in STORET are available to all in a consistent format that allows mapping, sample location identification and data viewing. **www.epa.gov/storet**

Table 4-3. Sample Data Requirements

Sample Data Requirements	
Project Information	Project name Project or watershed ID Who collected data Why data were collected How data were collected
Location Information	Location ID Latitude/longitude Datum Method to determine lat/long
Results	Sample ID Data type (water, soil, sediment, air, biota, field data, laboratory data) Date Parameter name Parameter value Sample fraction (dissolved or total) Lab and/or validator qualifiers Analytical method Detection limit Sampling method Additional information might be necessary for specific watersheds and pollutants. The project manager and WCT must set up data requirements according to the particular project.

Integrated Compliance Information System (ICIS)

ICIS integrates data that is currently located in several separate data systems. The Web-based system enables individuals from states and EPA to access integrated enforcement and compliance and NPDES data from any desktop connected to the Internet. EPA's ability to target the most critical environmental problems will improve as the system integrates data from all media. The public can access some of the federal enforcement and compliance information in ICIS by using the *EPA Enforcement Cases Search* or the *EPA Enforcement SEP Search*.
www.epa.gov/Compliance/data/systems/modernization/index.html

CASE STUDY

Region 8 Using Web Tools for Data Management

Region 8 requires that data from all samples collected or analyzed using EPA funds be provided in a standardized format for use in STORET. Formatting requirements are presented in *Standard Guidance to Format Sample Results, Field Measurements, and Associated Metadata*. EPA Region 8. December 1, 2003. (See Appendix B.) Region 8 states use the STORET database to meet CWA requirements. Other EPA programs, including Superfund, RCRA and Brownfields programs, also provide site data to STORET. Data collected by other organizations using EPA funding must also be reported to STORET.

Several projects are underway or have been completed to simplify data reporting requirements. A Web STORET Interface Module (SIM) tool to simplify tribal data submission has been developed. CWA section 319 funds were used to create a Web tool and training to facilitate data entry from local groups submitting data from NPS projects. Funding for a Web site to host the Web SIM Tool along with the STORET database and an ArcIMS (ArcInternet Map Server) application and to provide training on the tool has been approved for the Colorado Water Quality Monitoring Council. Through this project, all watershed groups in Colorado will have access to the Web site and receive training for data input and viewing.

Watershed Assessment, Tracking and Environmental Results (WATERS)

WATERS is an integrated information system for the nation's surface waters. Water quality information must be gathered to fulfill the requirements of the CWA and the SDWA, the two main federal laws that protect our nation's waters. The EPA Office of Water has various programs that store data in associated databases. These databases are separately managed, but under WATERS, the program databases are connected to a larger framework. This framework is a digital network of surface water features known as the National Hydrography Dataset (NHD). By linking to the NHD, one program database can reach another, and information can be shared across programs. Databases linked to WATERS include Water Quality Standards Database (WQSDB), National Assessment Database (NAD), National Total Maximum Daily Load Tracking System (NTTS), STORET, NPDES PCS, Clean Watersheds Needs Survey Database, SDWIS, National Listing of Fish and Wildlife Advisories (NLFWA) database, Nutrient Criteria Database, CWA section 319 Grants Reporting and Tracking System (GRTS), and the Beaches Environmental Assessment, Closure & Health (BEACH) Watch database. WATERS provides a Web-based mapping tool, known as EnviroMapper for Water, for viewing where these data are located and generating associated reports. WATERS also provides a Web-based query tool, known as AskWATERS, that produces summary and detailed data reports for watersheds and other areas of interest. **www.epa.gov/waters**

Better Assessment Science Integrating Point & Nonpoint Sources (BASINS)

BASINS is a multipurpose environmental analysis system designed for use by regional, state and local agencies in performing watershed- and water quality-based studies. It integrates a geographical information system (GIS), national watershed data and state-of-the-art environmental assessment and modeling tools into one convenient package. This system makes it possible to quickly assess large amounts of point source and NPS data in a format that is easy to use and understand. Installed on a personal computer, BASINS allows the user to assess water quality at selected stream sites or throughout an entire watershed.

Opportunities for Integration

- A combined or coordinated database is a crucial tool to ensure coordinated assessment, cleanup and monitoring. All relevant site information should be available to each stakeholder so assessment needs and priorities can be readily evaluated. The combined effort will require less effort than the development of individual databases for each program. The combined database will have a more complete dataset, providing additional information for decision making.
- GIS mapping of information in the database allows the watershed team to evaluate data needs, determine focus areas for additional study, see the relationships between sources and stream loads, evaluate cleanup/implementation/restoration alternatives, discuss priorities for site cleanup/implementation/restoration and develop a comprehensive monitoring plan.

This invaluable tool integrates environmental data, analytical tools and modeling programs to support development of cost-effective approaches to watershed management and environmental protection, including TMDLs. **www.epa.gov/waterscience/basins**

Envirofacts

Envirofacts is a single point of access to select EPA environmental data, providing access to several EPA databases and supplying information about environmental activities that may affect air, water, and land anywhere in the United States. Enviromapper for Envirofacts also provides mapping capabilities for the Web site's queries. **www.epa.gov/enviro/**

Cleanups in My Community

Cleanups in My Community is a mapping and listing tool that shows sites where pollution is being or has been cleaned up throughout the United States. It maps, lists and provides cleanup progress profiles for

- Sites, facilities and properties that have been contaminated by hazardous materials and are being, or have been, cleaned up under EPA's ***Superfund***, ***RCRA*** and/or ***Brownfields*** cleanup programs
- ***Federal facilities*** that have been contaminated by hazardous materials and are being, or have been, cleaned up under EPA's Superfund or RCRA cleanup programs

www.epa.gov/enviro/cleanups

Safe Drinking Water Information System (SDWIS)

SDWIS is used to meet the requirements of the SDWA. SDWIS is a database designed and implemented by EPA to meet its needs in the oversight and management of the SDWA. The database contains data submitted by states and EPA Regions in conformance with reporting requirements established by statute, regulation and guidance. A *sister* system, SDWIS/State is a database designed by EPA and the states to help states (and EPA Regions) run their drinking water programs and fulfill EPA reporting requirements. **www.epa.gov/safewater/databases.html**

National Water Information System (NWIS)

NWIS is a database of surface water and ground water data from 1.5 million sites around the country. Current and historical surface water characteristics such as streamflow and stage, plus water quality data such as temperature, specific conductance, pH, nutrients, pesticides and VOCs are included in the database. **http://waterdata.usgs.gov/nwis**

Program Studies

Various programs and agencies conduct studies within contaminated watersheds and of contaminated waterbodies. Primary studies include Surface Water Monitoring, Use Attainability Analyses (UAA), and TMDLs, PAs, SIs, RI/FSs, Risk Assessments and NRDA, RFA, Facility Investigations, CMSs and Brownfields Assessments. This section describes the objectives and focus of each of the major studies and the typical data collected. It suggests opportunities for integration. Because some of these studies are directed at assessment, cleanup, or monitoring the portions of the studies related to cleanup are presented in Chapter 5, where possible.

A variety of other studies might have been or should be conducted within any specific watershed. This section does not intend to be a comprehensive description of all useful studies that can be performed within a watershed.

CWA State Water Quality Monitoring Programs

Water quality monitoring approaches vary from state to state. Degrees of sampling effort and density, and the chemical/physical/biological analyses performed on the samples can vary widely. Efforts are being made to make state monitoring programs more consistent, and states are now required to begin implementation of the strategy described in the recommended *Elements of a State Monitoring Program*. This section describes state water quality monitoring on the basis of this document.

The ten elements of a state monitoring program include:

- Monitoring program strategy
- Monitoring objectives
- Monitoring design
- Core indicators of water quality
- Quality assurance
- Data management
- Data analysis and assessment
- Reporting
- Program evaluation
- General support and infrastructure

Sampling Objective. Monitor state waters to meet state monitoring and assessment objectives.

Sampling Strategy. The most efficient combination of monitoring designs (e.g., fixed station, intensive and screening-level monitoring, rotating basin, judgmental and probability design) to meet state monitoring and assessment objectives are preferred. The state monitoring design should support statistically valid inferences about the condition of all state water types over time.

Opportunities for Integration

- State water monitoring data may be directly incorporated into the combined watershed database.
- The state program may be integrated with TMDL, NPDES, CERCLA and other long-term monitoring efforts. For example, surface water monitoring data collected as part of monitoring an NPL site remedy may be used in the state water assessment program, or data from state surface water monitoring may be used to determine the effectiveness of the remedy if the data collected for each sample meets the needs of each agency.
- The watershed effort generally stimulates community interest. Volunteer monitoring programs, when well-managed, may provide data to meet the needs of state and federal assessment and cleanup agencies.
- Monitoring information will be used for assessing the status of the states' waters; determining trends in water quality and contaminant loadings; implementing pollution control strategies, such as TMDLs and NPDES permits; identifying emerging issues; and developing policies and standards.

Samples and Analysis. A core set of indicators (e.g., water quality parameters) should be designated for each water resource type that include physical/habitat, chemical/toxicological and biological/ecological endpoints as appropriate; that reflect designated uses; and that can be used routinely to assess attainment with applicable WQS throughout the state. This core set of indicators is monitored to provide statewide or basin/watershed level information on the fundamental attributes of the aquatic environment and to assess WQS attainment/impairment status. Previously, chemical and physical indicators were emphasized; however, biological monitoring and assessment should assume a more prominent role in state monitoring. **www.epa.gov/nerl/research/2004/g2-12.pdf**

Supplemental indicators are used when there is a reasonable expectation that a specific pollutant could be present in a watershed, when core indicators indicate impairment or to support a special study such as screening for potential pollutants of concern. Supplemental indicators are often key to identifying causes and sources of impairments and targeting appropriate source controls. These supplemental indicators may include each water quality criteria in the state's WQS, any pollutants controlled by the NPDES and any other constituents or indicators of concern. Table 4-4 lists recommended core and supplemental indicators.

Table 4-4. Recommended Core and Supplemental Indicators

	Aquatic life & wildlife	Recreation	Drinking water	Fish/shellfish consumption
Recommended Core Indicators	• Condition of biological communities (EPA recommends the use of at least two assemblages) • Dissolved oxygen • Temperature • Conductivity • pH • Habitat assessment • Flow • Nutrients • Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: • Eutrophic condition Additional indicators for wetlands: • Wetland hydrogeomorphic settings and functions	• Pathogen indicators (E. coli, enterococci) • Nuisance plants • Flow • Nutrients • Chlorophyll • Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: • Secchi depth Additional indicators for wetlands: • Wetland hydrogeomorphic settings and functions	• Trace metals • Pathogens • Nitrates • Salinity • Sediments/TDS • Flow • Landscape conditions (e.g., % cover of land uses)	• Pathogens • Mercury • Chlordane • Dichlor-Diphenyl Trichlorethane (DDT) • PCBs • Landscape conditions (e.g., % cover of land uses)
Supplemental Indicators	• Water column toxicity • Sediment toxicity • Other chemicals of concern in water column or sediment • Health of organisms	• Other chemicals of concern in water column or sediment • Hazardous chemicals • Aesthetics	• VOCs (in reservoirs) • Hydrophyllic pesticides • Nutrients • Other chemicals of concern in water column or sediment • Algae	• Other chemicals of concern in water column or sediment

Data Quality. Data may be screening or definitive depending on compliance with QA/QC protocols and the sampling objective. States report data in STORET and also maintain the data in their own database. States also provide appropriate geospatial data to enable the use of current GIS tools. The *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (**www.epa.gov/owow/tmdl/2006IRG**) asks states to define the geographic location of assessment units using the NHD.
www.fgdc.gov/metadata/geospatial-metadata-tools

Data Uses. Data are used to meet the needs of the State Water Monitoring and Assessment Program as required by the CWA. Data are used to compile the section 305(b) water quality inventory report and the section 303(d) list and provide information on monitoring and notification programs for coastal recreation waters. Data may also be used for preparing triennial reviews, UAAs, standards revisions, water quality-based effluent limits (WQBELs) in permits, TMDLs, NPS programs and watershed plans.

For more information, see *Elements of a State Monitoring Program*. EPA 841-B-03-003. March 2003. **www.epa.gov/owow/monitoring/elements/elements03_14_03.pdf**

Water Quality Standards—Use Attainability Analysis (UAA)

A UAA is a structured scientific assessment of the factors affecting the attainment of a use that can include physical, chemical, biological and economic factors. The factors are evaluated through a waterbody survey and assessment. They address the current uses, causes of impairment and uses that can be attained on the basis of physical, chemical and biological characteristics.

A UAA is performed by states to determine if the waterbody is able to support quality when the designated use is not included in CWA section 101(a)(2), to remove a designated use that is specified in section 101(a)(2) or to adopt subcategories of a section 101(a)(2) use that require less stringent criteria. A generic UAA may also be performed for groups of similar waterbody segments to determine attainable uses.

Sampling Objective. UAA data collection is conducted to determine factors that limit designated uses, determine if waterbody integrity can be restored, determine the feasibility of modifying the physical habitat and determine if the use can be obtained given the existing limitations.

Sampling Strategy. The sampling approach may be adapted to the waterbody and other state-determined priorities. Available information is evaluated first, then field testing or surveys should be conducted to fill in for lacking or incomplete information and to confirm the existing data. Assessment of factors limiting waterbody use may be simple or complex, depending on the amount of available data, the degree of accuracy and precision required, the importance of the resource, site-specific conditions and controversy associated with the site. The sampling strategy could be to provide a general survey of conditions, to focus on site-specific problem areas, to assist in evaluating trends or to determine a cause-effect relationship between factors. Characteristics that may be evaluated include

- ***Physical Factors*** such as in-stream characteristics (channel size, flow/velocity, annual hydrology, total volume, re-aeration rates, gradient/pools/riffles, temperature, sedimentation, channel modifications, and channel stability), substrate composition and characteristics, channel debris, sludge deposits, riparian characteristics and downstream characteristics. Field measurements and analysis, modeling, and existing information may be used to determine physical factors affecting use. USFWS habitat evaluation procedures (HEP) and habitat suitability indices (HSI) are sometimes used for habitat evaluation;
- ***Chemical Factors*** such as dissolved oxygen, toxicants, suspended solids, nutrients (nitrogen, phosphorus), sediment oxygen demand, salinity, hardness, alkalinity, pH, dissolved solids. Available data, water and sediment samples, or modeling may be used to determine chemical factors affecting use; and
- ***Biological Factors*** such as biological inventory for existing use analysis (fish, macroinvertebrates, microinvertebrates, phytoplankton, periphyton, macrophytes), biological potential analysis (diversity indices, habitat suitability indices, models, tissue analyses, recovery index, intolerant species analyses, omnivore-carnivore analyses) and biological potential comparisons with reference reach.

Data quality. Data quality requirements should be based on the site-specific topics being addressed by sampling.

Benchmarks. Data should be compared to existing WQS, scientific references and data from reference waterbodies.

Data Use. Data should be used directly for assessing the applicability of existing water quality criteria and designated uses and to determine if designated uses can be attained by feasible waterbody improvements.

Opportunities for Integration

- Biological information exchange between UAA, Risk Assessment and NRDA efforts can benefit all programs.
- Results of UAA can impact RCRA, CERCLA and Brownfields cleanup priorities and remedies and TMDL endpoints and Implementation strategy. Partners should work together to align cleanup priorities and ensure cleanup actions complement the UAA.

For more information, see

- Water Quality Standards page on EPA's Web site, **www.epa.gov/waterscience/standards**
- *Water Quality Standards Handbook*. Second Edition. EPA 823-B-94-005a. August 1994. **www.epa.gov/waterscience/library/wqstandards/handbook.pdf**
- *Technical Support Manual. Waterbody Surveys and Assessments for Conducting Use Attainability Analyses*, Volume I. EPA. 1983.
- *Technical Support Manual. Waterbody Surveys and Assessments for Conducting Use Attainability Analyses*, Volume II, Estuarine Systems. EPA. 1984.
- *Technical Support Manual. Waterbody Surveys and Assessments for Conducting Use Attainability Analyses*, Volume III, Lake Systems. EPA. 1984.

TMDL

A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still attain WQS and an allocation of that amount among the pollutant's sources. In other words, it is the sum of the allowable loads of a single pollutant from all contributing point and NPSs. The calculation includes a margin of safety and accounts for seasonal variation in water quality. TMDLs are prepared for impaired waterbodies identified on the state's 303(d) list of waterbodies not attaining WQS.

This section describes the assessment portion of the TMDL. Load allocation, implementation and monitoring are discussed in Chapter 5. Cross-programmatic assessment and implementation of PCB load reductions is demonstrated in the Delaware Estuary case study at the end of this chapter.

TMDL Tasks Related to Assessment

Problem Identification.

1. Identify the applicable WQS (designated/existing use(s) and the numeric/narrative criteria) for the impaired waterbody listed on the state's 303(d) list. (*Existing uses* are defined as those uses that have occurred on or after November 28, 1975.)
2. Collect all readily available water quality data for the impaired waterbody.
3. Conduct necessary sampling to determine sources of pollutant(s) and to calculate pollutant loads (flow multiplied by concentration equals pollutant load or mass of pollutant per time).
4. Document waterbody characteristics (geology, hydrology, land use).
5. Identify pollutant(s) preventing the attainment of designated use.

Opportunities for Integration

- The Problem Identification portion of the TMDL is closely related to the CERCLA PA. Development of the Comprehensive Preliminary Watershed Assessment and the Targeted Brownfields Assessment described in Chapter 3 will assist in problem identification.

Target Analysis. Determine benchmarks that will be used to measure success and state how the measure will be used to track progress. This depends on whether the TMDL goal is to meet a numeric water quality criterion, comply with an interpretation of a narrative water quality criterion or attain a desired condition that supports meeting the designated use. Identify the waterbody's critical conditions such as peak loading seasons or events or critical low flows. Identify appropriate ways to measure progress toward achieving the stated goals. Tie the measures to pollutant loading.

Source Identification and Assessment. List and characterize individual pollutant sources, categories of sources, or subcategories of sources responsible for waterbody impairment. Identify the extent to which each source contributes to the problem: source type, relative location, magnitude of loading, transport mechanisms of concern and duration and frequency of pollutant loading. Many tools are used including existing monitoring information, air photography analysis, simple calculations, spreadsheet analysis using empirical methods and computer modeling. Selection of analysis is made on the basis of the complexity of the problem, availability of resources, time constraints, availability of monitoring data and the management objectives under consideration. Sources can be grouped into categories if appropriate.

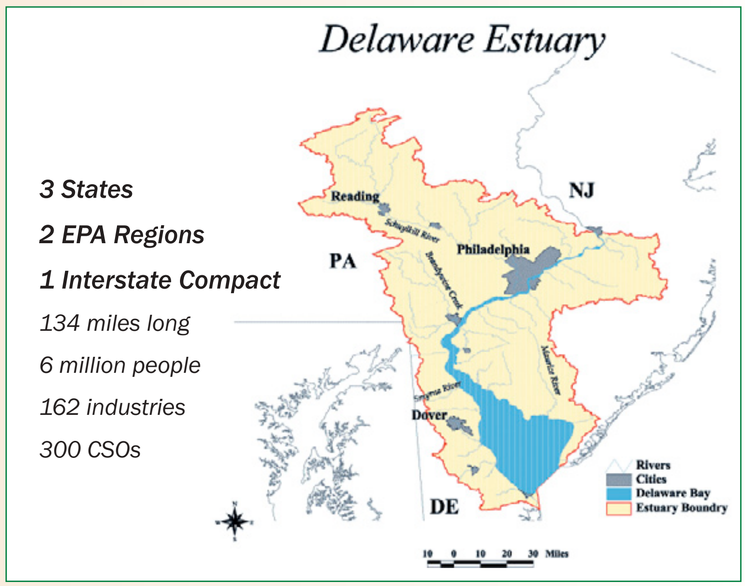
Linking Water Quality Targets and Sources. Compare water quality targets (benchmarks) to pollutant loads. If long-term water quality data are available, it is used to associate waterbody responses to flow and loading conditions. When long-term monitoring data are not available, synoptic sampling is used with analytical tools, including models and qualitative information to define such characteristics as baseline water quality conditions, pollutant source loading rates and waterbody system dynamics.

CASE STUDY

Delaware River Watershed PCB TMDL— Multiprogram Assessment and Implementation

Delaware, New Jersey, and Pennsylvania

The Delaware River presents a set of issues common to many watersheds in the industrialized northeast of the United States: a river bordered by many different communities; a long history of residential and industrial uses whose legacy remains in contaminated sediments and runoff; and a myriad of local, state and regional authorities that share various jurisdictions over it. In response to high levels of PCBs found in fish throughout tidal portions of the river, a tight time frame for development of a PCB TMDL, and a diverse range of PCB sources, a broad coalition of governments and nongovernmental agencies (NGO) has come together to seek innovative, cross-programmatic, collaborative ways to address the problem as efficiently as possible.



The Delaware River is the longest undammed river east of the Mississippi, extending 330 miles from Hancock, New York, to the mouth of the Delaware Bay. The basin covers 13,539 square miles, draining parts of Pennsylvania, New Jersey, New York, and Delaware in 236 individual watersheds, including the Schuylkill and Lehigh Rivers in Pennsylvania. Jurisdiction over the basin is shared by 42 different counties, 838 municipalities, 25 congressional districts, two EPA Regions, the USACE, and 5 USGS offices. The Delaware Bay itself covers 782 square miles. Nearly 15 million people (approximately 5 percent of the nation's population) rely on the waters of the Delaware River Basin for drinking and industrial use, but the watershed drains only 0.4 percent of the total continental U.S. land area.

Much progress has been made under the CWA to reduce the loading of conventional pollutants in the Delaware River, and dissolved oxygen levels rose appreciably throughout the 1980s and 1990s. But some pollutants remain a problem, particularly PCBs. *[PCBs are a class of synthetic compounds that were used in hundreds of industrial and commercial applications, including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; in pigments, dyes and carbonless copy paper and many other applications. Although banned from* *manufacture since the late 1970s, PCBs are still in use because of the extended life span of equipment in which they were used. Additionally, PCBs are hydrophobic and thus tend to bind to organic particles in sediment and soils. Because of their chemical stability, PCBs tend to persist in the environment. PCBs enter fish and other wildlife through absorption or ingestion and accumulate in their tissues at levels many times higher than in the surrounding water and at levels unsuitable for human consumption. EPA has determined PCBs to be a probable human carcinogen; they also have been shown to have an adverse impact on human reproductive and immune systems and might act as an endocrine disruptor.]*

Delaware River Zone Locations

In the late 1980s, the Commonwealth of Pennsylvania (through its Pennsylvania DEP), and the states of Delaware (Delaware Department of Natural Resources and Environmental Control [DNREC]), and New Jersey (New Jersey DEP), began issuing fish-consumption advisories for portions of the Delaware Estuary because of elevated concentrations of PCBs measured in fish tissue. In 1996 water quality criteria for toxic pollutants including PCBs were adopted for Zones 2–5 of the river. The criteria generally decrease as one moves down the river, from 44.4 picograms per liter in Zones 2 and 3, down to 7.9 picograms per liter in lower Zone 5. (The criteria in Zone 6 is higher.) The more stringent criterion in the lower estuary reflects the different water uses that are made within the different zones, particularly with respect to fish consumption. As a result, achieving the necessary reductions in the lower zones will require much larger reductions in the upper zones than would otherwise be necessary. Significant reductions are required throughout the estuary because ambient concentrations of PCBs in the waterbody exceed the criteria by two to three orders of magnitude. In 1998 all three states included Zones 2–5 on the lists of 303(d) impaired waters under the CWA, requiring establishment of a TMDL for PCBs. Today, the states' fish consumption advisories cover the entire estuary and bay, ranging from a no-consumption recommendation for all species taken between the C&D Canal and the Delaware-Pennsylvania border to consumption of no more than one meal per month of striped bass or white perch in Zones 2 through 4.

Hybrid striped bass

Given the variety of government agencies with jurisdiction over the river, in 2000 the relevant states and EPA Regions 2 and 3 agreed that the Delaware River Basin Commission (DRBC) should take the lead in developing the PCB TMDL. The DRBC is a federal-interstate compact agency created by the United States and the states of Delaware, New Jersey and the Commonwealth of Pennsylvania to jointly manage water resources within the basin. The DRBC, under its independent authority, had issued water quality criteria for toxic pollutants that have been largely adopted by the states. To aid its work the DRBC formed a Toxics Advisory Committee (TAC), a 13-member group composed of representatives from the States, the two EPA Regions, municipal and industrial dischargers, academia, agriculture, public health, environmental organizations and fish and wildlife interests. The DRBC also initiated an extensive program of scientific investigations and data collection efforts. Additionally, several coalitions of NPDES permitted dischargers were formed, one of which provided technical support in the development of the water quality model.

A number of factors made the preparation of a PCB TMDL for the Delaware River difficult, including the different types of PCBs present in the river with varying characteristics (209 PCB compounds can exist, depending on the distribution of chlorine atoms); differences in fish consumption advisories among the states; the large, widely dispersed source load of PCBs in runoff, contaminated ground water, sediments, air and other sources; the particularly diverse group of affected stakeholders (industrial and municipal point and NPSs, most of whom also relied on the basin's waters); extremely low detection limits for PCBs and the ubiquity of PCBs at these levels; the fact that the original sources of PCBs are often not the same as the Loading Source categories; and questions over the dynamics of tributary loading and sediment redistribution.

Two aspects of the PCB problem in the Delaware River made a cross-programmatic, multistakeholder approach particularly useful: the short timeframe that was required to develop the TMDL, and the predominance of nonpoint discharge sources of PCBs in the river.

PMPs Rely on Adaptive Management

- While PMPs must be detailed and cover specific topics, the PMP Rule is not prescriptive.
- Premise: dischargers know their facilities better than regulators
- Ensures that each facility takes a thorough look at its operations and conditions
- Wide flexibility for achieving reductions
- Different facilities will have different approaches
- What works for one may not work for another
- Encourage creative solutions
- Periodically reevaluate measures being implemented and advances
- PCB reduction strategies and technologies

Short Time Frame for TMDL Development

Pursuant to provisions of a 1997 consent decree, the states (or EPA) were required to establish a PCB TMDL by December, 2003. Given the short time frame, a two-phase approach was adopted. In the first stage, TMDLs (for the different zones) were established, comprising individual WLAs for 142 potential PCB point sources; a load allocation (LA) for NPSs; and an MOS, on the basis a simplified methodology and extrapolations from data and model simulations for one category (or *congener*) of PCBs. Because of the predominance of NPSs of PCBs in the river (discussed below) as well as uncertainties associated with the loading calculations, EPA agreed with the NPDES permitting authorities that it was appropriate for the potential PCB point sources to receive nonnumeric WQBELs, to be implemented at their 5-year NPDES permit renewal point. Stage 2 TMDLs, which will include additional individual WLAs (including numeric or nonnumeric limits for NPDES permit holders) and LAs for NPSs, will be developed in the future and will be based on all the PCB groups. The Stage I PCB TMDL was the product of extensive collaboration with a number of stakeholders, which resolved conflicts over competing loading models and avoided undue adversarial processes. The December 2003 Stage I PCB TMDL did not specify how its allocations were to be achieved and encouraged other agencies such as the DRBC and the states to implement PCB reduction strategies using their independent authorities.

To help implement the PCB TMDL, a TMDL Implementation Advisory Committee (IAC) was established by the DRBC. This unique group, again composed of representatives from a variety of governmental and nongovernmental agencies and interests, was tasked with developing creative and cost-effective strategies for reducing PCB loadings from all sources to help achieve the PCB TMDLs. The IAC's recommendations are submitted to the DRBC, which considers them in consultation with all regulatory agencies whose approval is required to implement them. Each regulatory agency is also represented on the IAC.

As a result of the IAC's work, in May 2005, the DRBC issued regulations requiring the preparation of Pollutant Minimization Plans (PMP) for toxic pollutants, and also announced a goal that point and NPS PCB loads be reduced by 50 percent within the next 5 years. Under the PMP Rule, an identified potential source of PCB discharges is required to describe its facility, identify known and potential sources of PCBs, identify procedures for tracking down unknown sources of the pollutant and identify and implement strategies for minimizing or preventing releases from all identified sources. Dischargers will measure and periodically report progress made in reducing loadings. A PMP must also contain a *good faith commitment* by a high-ranking official to implement the PMP. Initially, 60 point source dischargers will be required to develop and implement PMPs and to monitor their PCB discharges. Recognizing the importance of contributions of PCBs from NPSs, the rule allows the DRBC to require PMPs for contaminated sites where releases are not being addressed entirely through other state or federal regulatory programs.

The PMP Rule embodies the principle of adaptive management, which encourages experimentation, measurement, and readjustment depending on the results of the actions taken. It reflects an awareness that while dramatic reductions in loadings from all source categories will be required to achieve the PCB TMDLs over several decades, uncertainty as to the effectiveness of any reduction activity currently remains.

The PMP Rule states that as individual NPDES permits come up for renewal on their five year cycle, the requirements of the rule will be incorporated by the various state permitting authorities. The DRBC's PMP Rule also provided that a peer review advisory committee would be established to evaluate the PMPs and advise regulators on their anticipated effectiveness. The committee will also provide advice on additional measures that might be practicable.

Identifying NPS PCB Loading to the Delaware River: Major Collaborative Steps to DelTRiP Implementation

Step 1: DelTRiP will identify contaminated sites in each State within the basin using EPA and state databases, including but not limited to Superfund listings (NPL and CERCLIS), RCRA, EPCRA TRI and state brownfield and hazardous-waste sites. Other listings, such as those developed by fire departments or building inspectors or through municipal wastewater treatment plant trackdown programs, might also be used to identify sites.

Step 2: Sites identified from *other listings* will be referred to the appropriate federal/state agencies for consideration.

Step 3: DRBC will locate and incorporate identified sites into GIS.

Step 4: State and federal agencies will quantify the PCB loads being released or that have the potential to be released from contaminated sites identified above.

Step 5: DelTRiP will develop criteria to rank each site (i.e., to determine its significance and to decide if it is to be prioritized for tracking and reporting).

Step 6: DelTRiP will prioritize the contaminated sites that significantly contribute, or have the potential to significantly contribute, to the PCB load to the basin.

Step 7: DRBC will assemble status information for each prioritized site and track the remediation progress and other actions taken to reduce the releases to the Basin from the contaminated waste sites.

Step 8: DRBC will publish an annual report detailing measurable reductions and the status of implementation activities at each prioritized contaminated site, highlighting key milestones and accomplishments.

There are early signs that the PMP adaptive management approach can work. In Wilmington, Delaware, a rail facility demonstrated an approximate 90 percent reduction in PCBs in surface runoff after implementing erosion control; and a chemical company demonstrated an initial 22 to 32 percent load reduction by making changes in its handling of raw materials, processes, and settling and sand filtration, with significantly more reductions expected by 2007. A refinery in southeast Pennsylvania had removed PCB equipment years ago, but after developing a PMP, identified and removed contaminated sediments in a stormwater drainage ditch.

NPSs of PCBs

The second aspect of the Delaware River PCB TMDL that made a cross-programmatic, multistakeholder approach important was the fact that much of the PCB load comes from NPSs. Current data suggest that NPSs, including contaminated sites and stormwater discharges, are the largest categories of PCB loadings in the Delaware River. The CWA's NPDES and TMDL programs fall most directly on point discharges; NPSs are typically more difficult to measure and address. There is often a wealth of data that EPA and state programs gathered as part of their assessments of and responses to contaminated lands, yet historically it has been difficult to feed this information into those same governments' water protection programs for use in restoring waterbodies.

To help identify and prioritize for response contaminated sites and other NPSs that are contributing PCBs and other toxics to the Delaware River, the Delaware River Toxics Reduction Program (DelTRiP) was created in 2004 as a joint effort of DNREC, New Jersey DEP, Pennsylvania DEP, EPA and the DRBC. DelTRiP's goal is to cull information held by federal, state and local programs (CERCLA, RCRA, EPCRA TRI, Brownfields programs, and so on) regarding contaminated sites, and then identify, prioritize, track and report the status of such sites within the basin that do or could significantly contribute toxic loadings to the Delaware River Basin. EPA and the various state programs each play a role in ensuring that the information held by one program gets to others.

Delaware River

Difficult issues remain with respect to NPSs of PCBs in the Delaware River, because the different EPA, state and regional environmental programs do not always use the same approaches to achieve their common goals.

TMDL Sample Collection

The preferred method for TMDL development is to use long-term monitoring data; however, adequate data are not always available, especially in watersheds with primarily NPS and background pollutant loading. When data are not available, sampling may be conducted to support any aspect of the TMDL, including determination of benchmarks, loading estimates, loading allocations and monitoring. Examples of data that may be collected for the TMDL are flow rates, water chemistry/toxicity, physical habitat evaluation, biological community structure, source loading studies such as tracer studies and qualitative macroinvertebrate studies.

Sampling Objective. Sampling is conducted to determine concentrations of contaminants in the waterbody, seasonal variation in contamination and acceptable pollutant loading that protects designated uses; identify sources of pollution and the amount of pollutant each source contributes; and determine mass loading from various sources so pollutant loads may be allocated to sources and limited to achieve water cleanup goals. Samples may be collected to monitor progress toward meeting WQS.

Sampling Strategy for Monitoring. Episodic samples are collected to ensure the waterbody is meeting or is making progress toward meeting water quality criteria. Water quality samples are collected, and the flow rate is measured at each sampling point within the watershed. Samples are analyzed for contaminant(s) of interest (dissolved analysis for metals), and the analyses from the sample data and the water flow rate are used to calculate pollutant loads. Samples are collected at appropriate times of the year to determine the seasonal variation in pollutant loading and seasonal TMDL requirements. Physical and biological samples and data may also be collected as necessary to relate TMDL activities to WQS.

Laboratory Analysis: Samples are analyzed for the TMDL pollutant and associated indicators

Data Quality. Data must be shown to be reliable and in accordance with applicable data collection or QA/QC program requirements. Data quality requirements are variable; for example, samples collected for water quality analysis generally have a high-level of QA/QC, while samples collected for source identification and assessment may have lesser data quality requirements.

Data Uses. Data are used to determine acceptable pollutant loads on the basis of the designated water use, the maximum amount of a pollutant that a waterbody can receive and still meet WQS on a seasonal basis, where and how pollutant loading must be reduced and if the TMDL is achieving the desired goals.

For more information, see

- *Guidance for Water Quality-based Decisions: The TMDL Process*. EPA 440-4-91-001. April 1991. **www.epa.gov/OWOW/tmdl/decisions**
- *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. Office of Solid Waste and Emergency Response (OSWER). EPA-540-R-05-012. OSWER 9355.0-85. December 2005. **www.epa.gov/superfund/health/conmedia/sediment/guidance.htm**
- *Technical Support Document for Water Quality-based Toxics Control.* EPA/505/2-90-001. PB91-127415. March 1991. **www.epa.gov/waterscience/methods/det/faca/mtg20051208/excerpt-detectionlimits.html**
- *Compendium of Tools for Watershed Assessment and TMDL Development.* EPA841-B-97-006. 1997. **www.epa.gov/OWOW/tmdl/comptool.html**
- *Protocol for Developing Sediment TMDLs, First Edition.* EPA 841-B-99-004. October 1999. **www.epa.gov/owow/tmdl/sediment/pdf/sediment.pdf**
- Stressor Identification Guidance. EPA 822-F-00-012. December 2000. **www.epa.gov/waterscience/biocriteria/stressors**

RCRA Facility Assessment (RFA)

RCRA studies are performed at sites that actively manage hazardous wastes. The RCRA process is similar to the CERCLA process, but the responsible party performs the work under EPA and state supervision. To facilitate expeditious site evaluation and cleanup, the assessment requirements are procedurally flexible and only the elements required to make good cleanup decisions are required. The following are elements common to most contaminated RCRA facilities.

Opportunities for Integration

- Developing combined assessment and monitoring programs with consistent sampling and analysis protocols can be useful to multiple programs and agencies.
- Multiple programs and agencies can conduct seasonal basin loading studies to assist in source identification and prioritization, wasteload and load allocations and appropriate cleanup/implementation strategies.
- Source identification may identify sites that are subject to CERCLA, RCRA or Brownfields authorities. Conversely, sites already investigated by those programs may be included in the TMDL.

Similar to a CERCLA PA, the RFA is performed to determine the existence of continuous or non-continuous releases of hazardous wastes. Information is gathered on solid waste management units and other areas of concern. The information is evaluated to determine the need to proceed to a RFI. The RFA does not generally include sampling and analysis.

RCRA Facility Investigation (RFI)

Similar to a CERCLA RI, the purpose of the RFI is to gather data to fully characterize the nature, extent and rate of migration of hazardous wastes. The agency(s) conducting the investigation uses the data to determine the need for corrective measures and to help select and implement the measures.

CERCLA Site Assessment

Preliminary Assessment (PA)

Objective. The purpose of the PA generally is to determine if a site has the potential to pose a threat to human health and the environment. Information normally is collected also to determine whether an SI is warranted. Figure 4-3 illustrates the usual decision-making process for conducting a PA/SI.

Data Collected. PA data collection may be limited to desktop research but often includes a brief site visit. Data collected for the PA usually includes the following:

- ***General Site Information.*** Location, ownership, type of facility, years of operation
- ***Source and Waste Characteristics.*** Source types and locations, size of sources, waste types and quantities, hazardous substances present, plant processes
- ***Ground Water Use and Characteristics.*** General geology, aquifer characteristics, locations of private, municipal, and drinking water wells, wellhead protection area, blended systems
- ***Surface Water Use and Characteristics.*** Nearest waterbody and other surface waterbodies within 15 miles downstream, flood frequency, sensitive environments, wetlands, fisheries, surface water flow characteristics and surface water intakes
- ***Soil Exposure Characteristics.*** Populations, schools, facility workers, sensitive environments

Information normally is gathered from searches of federal, state or local records, site sketches, inspection reports, aerial photographs, databases and any other available source. Data generally are used to calculate a preliminary HRS score to determine the need for further investigation.

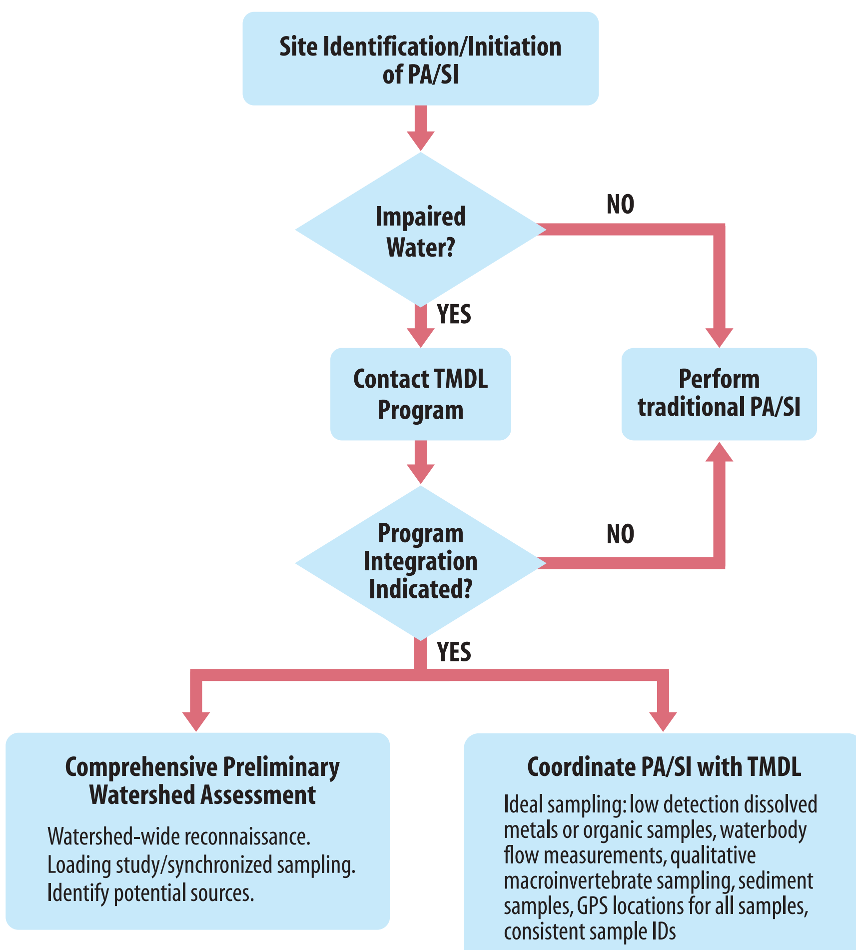


Figure 4-3. PA/SI Decision Tree

Opportunities for Integration

- An amended approach to the UPA may be appropriate for sites within a contaminated watershed. Proposed additions to the Region 3 UPA requirements may include identification of existing water flow and water quality data and identification of the CWA 303(d) status of the watershed (available in EPA databases). If the site is within an impaired or potentially impaired watershed and has a potential pathway to surface water, additional data collection should be specified, including collecting land use and ownership data, maps and aerial photography for the entire watershed.

Unified Phase Assessment (UPA)

EPA Region 3 has developed and tested an initial environmental assessment tool, the UPA, to organize information about a site in a way that can be used for purposes of CERCLA, RCRA and USTs, (*Unified Phase Assessment Guidance Manual*, EPA Region 3. Hazardous Sites Cleanup Division, September 15, 2004). Under the UPA process, a site may be referred to the most appropriate program without repeating the PA process, thereby increasing the speed and effectiveness of SI and cleanup. Typically, the UPA contains three parts:

1. A single page quick reference
2. The primary assessment containing elements common to all initial assessments
3. Program-specific data including QC information, large maps and other data and background information

Data applicable to individual programs are included in program-specific attachments. The UPA can be completed in two phases, similarly to the PA method: UPA I is an initial assessment of the site, and UPA II delineates on-site contamination, possible off-site impact of the contamination and the impact of contamination migrating onto the site from off-site sources. Additional information is developed for potential purchasers/stakeholders in making further decisions concerning the development potential of the property. UPA II may involve site sampling and possible limited off-site sampling. A limited hydrogeologic investigation may be included in the UPA II.

Site Inspection (SI)

Sampling Objective. The objective of an SI generally is to gather site-specific information to support a decision about the need for further Superfund attention. Data usually are collected to determine the nature of contamination, investigate the exposure of potential targets, establish background concentrations and establish a pathway between the contamination and targets on the basis of data gaps identified during the PA. The full extent of contamination at the site normally is not investigated, and a risk assessment usually is not performed. Pathways investigated can include ground water, surface water, soil exposure and air. Targets can include wells and surface water intakes supplying drinking water, populations, human food chain organisms, sensitive environments, wellhead protection areas and resources.

Sampling Strategy. The Triad approach can be used to direct sampling activities. Soil, source material, surface water, ground water, sediment and air may be sampled, depending on the nature of the site, contaminants and pathways. Generally, all media are not sampled for each SI, only those that the PA indicates might be needed to provide a decisive HRS scoring package. Additional sampling can be performed when, for example, it could help establish a link of the contamination to the site or to support the HRS scoring package. Background samples can be needed to establish a release of a hazardous substance or representative ambient concentrations.

Samples. Water samples may be filtered or non-filtered, depending on the contaminant and the HRS factor being evaluated. Filtered samples can allow comparison to drinking water benchmarks and unfiltered samples typically are used to compare with surface water environmental benchmarks. Ground water sampling should be conducted in a manner that minimizes disturbance and turbidity so that filtering is not necessary unless it is specifically required for geochemical speciation modeling.

Laboratory Analysis. Analytical parameters vary significantly depending on source materials and the potential threats of those materials to the identified receptors. Detection levels for each sample/analyte are dependent on the specific HRS factor being evaluated and the benchmark that will be used for comparison. The detection levels might not match the Contract Required Quantitation Limits (CRQL) or the Contract Required Detection Limits (CRDL).

Data Quality. The minimum data quality requirements for each analysis depend on the chemical and the specific HRS factor being evaluated. Data used to document the site HRS score should be included in the administrative record and be legally defensible. Data used for determining source dimensions, for example, may be screening level data. The following describes the typical process used. Proper sample collection and handling procedures are used and quality control samples are collected, including field duplicate, field blank, trip blank and field rinsate samples. Samples are sent to CLP laboratories or non-CLP laboratory services. Data are validated. Field screening data are used only for discrete source samples that do not require a background sample in the HRS.

Data Uses. Data generally are used in the HRS models to determine if the site should proceed to a potential NPL listing. Listed sites may then move to the remedial stage where more thorough site investigation is performed (RI) and solutions determined (FS).

Table 4-5 indicates the benchmarks for each exposure pathway threat.

For more information, see:

- *A Guidance for Performing Preliminary Assessments Under CERCLA.* EPA/540/G-91/013, September 1991.
- *A Guidance for Performing Site Inspections Under CERCLA.* EPA 540-R-92-021, Directive 9345.1-05, September 1992.
- *Hazard Ranking System Guidance Manual.* EPA 540-R-92-026. November 1992.
- *Unified Phased Assessment Guidance Manual,* E.S. EPA Region 3—Hazardous Sites Cleanup Division. September 15, 2004.

Table 4-5. Typical PA/SI Benchmarks

HRS pathway/threat	Benchmarks
Ground Water	MCLs MCLGs Screening concentrations
Surface Water	Drinking water threat • MCLs • MCLGs • Screening concentrations Human food chain threat • Food and Drug Administration action levels • Screening concentrations Environmental threat • Ambient water quality criteria • Ambient aquatic life advisory concentrations
Soil Exposure	Screening concentrations
Air	National Ambient Air Quality Standards National emissions standards for hazardous air pollutants Screening concentrations

CERCLA Remedial Investigation/Feasibility Study (RI/FS)

The RI/FS generally is conducted to characterize the nature and extent of risks posed by NPL sites and to evaluate potential remedial options. The objective of the RI/FS process typically is to gather information sufficient to support an informed risk management decision regarding which remedy (combination of treatments) appears to be most appropriate for a site. The RI normally includes site characterization and risk assessment. The FS usually provides an evaluation of potential remedial alternatives. The following discussion presents the typical site characterization portion of the RI/FS. Risk Assessment is discussed in the following section, and the FS is discussed in Chapter 5.

Site Characterization

The site characterization portion of the RI/FS normally includes collecting of a wide range of information regarding the site, setting, contaminants, source areas and contaminant fate and transport. Treatability studies may be performed to help select and evaluate remedial alternatives. Developing the RI/FS may be an iterative process, and data collection may be performed throughout the process, becoming increasingly refined as the understanding of the site conceptual model is refined. The following data may be collected, depending on site-specific conditions:

- ***Site Geology Information*** includes unconsolidated soil/sediment and bedrock geology, including the influence on aquifers and contaminant fate and transport. Data are collected from available information, site reconnaissance mapping and subsurface explorations.
- ***Soil and Vadose Zone Information*** consists of soil characteristics (type, holding capacity, temperature, biological activity and engineering properties), soil chemistry characteristics (solubility, ion speciation, adsorption coefficients, leachability, cation exchange capacity, mineral partition coefficients and chemical and sorptive properties) and vadose zone characteristics (permeability, variability, porosity, moisture content, chemical characteristics and extent of contamination). Data are collected from existing information, borehole sampling, laboratory analysis and measurements, aquifer tests, tracer tests, leaching tests, laboratory experiments and other specialized testing.
- ***Surface Water and Sediment Information*** refers to drainage patterns (overland flow, topography, channel flow pattern, tributary relationships, soil erosion, and sediment transport and deposition), surface waterbody information (flow, channel width, water depths, channel elevations, flooding tendencies and physical dimensions of surface water impoundments), water structures, surface water/ground water relationships and surface water quality (pH, temperature, TSS, suspended sediment, salinity and specific contaminant concentrations). Numerous samples of surface water and sediment are generally collected directly downgradient of the site as well as upstream to evaluate the site's impact on the surface waterbody. In tidally-influenced sites, sampling should be conducted at different stages of the tidal cycle. The number of samples collected should be enough to calculate the background concentration with a specified Upper Confidence Limit (e.g., 90 percent). Data are collected from existing information including aerial maps, ground surveys, topographic maps, data from public agencies, water level measurements and modeling.
- ***Ground Water Information*** includes data on occurrence (aquifer boundaries, locations, and ability to transmit water), ground water movement (direction and rate of flow), recharge/discharge (locations and rates), and ground water quality (pH, TDS, salinity, and contaminant concentrations). Data are collected from existing literature, pumping and injection tests, monitoring well installation and testing, water level measurements, geophysical studies, modeling, slug tests, tracer tests, pump tests, calculations from soil and geological data and field mapping.
- ***Atmospheric Information*** describes local climate (precipitation, temperature, wind speed and direction, and presence of inversion layers), weather extremes (storms, floods, and winds), release characteristics (direction and speed of plume movement; rate, amount and

temperature of release; and relative densities). Data are collected from existing information and on-site measurements.

- ***Ecological Information*** consists of land use characteristics, water use characteristics, ecosystem components and characteristics, critical habitats and biocontamination. Data can be collected from existing information, agency reports, ground and aerial surveys and sample collection.

- ***Source Information*** refers to facility characteristics (source location, type of waste/chemical containment, integrity of waste/chemical containment, drainage control, engineered structures, site security, known discharge points, mapping and surveying) and waste characteristics (type, quantities, chemical and physical properties and concentrations). Data can be collected from existing information, previous studies, site surveys, remote sensing, surveying and sampling and analysis).

Additional data can be collected to evaluate potential remedial actions. Treatability studies often are conducted to provide sufficient data to allow complete evaluation of treatment alternatives and to reduce the cost and performance uncertainties of a specific treatment alternative.

Sampling Strategy. Samples generally are collected for a variety of purposes, and the strategy used to determine the type, quantity and locations of samples will vary accordingly. For example, the location of samples collected to determine the nature of source material may be determined judgmentally, while the locations of samples collected to determine the extent of ground water contamination may be determined using a stratified random approach. Data may be collected in multiple sampling efforts to use resources efficiently—the level of accuracy may increase as the focus of sampling is narrowed and depends on the use of the data.

Laboratory Analysis. Chemical analysis normally will include contaminants of potential concern and degradation products plus characteristics that may affect contaminant fate and transport or potential remedial alternatives.

Benchmarks. Remediation goals generally are media-specific, site-specific and developed either in conjunction with, or following completion of, the Risk Assessment. Standardized criteria, such as those listed in the SCDM, Soil Screening Levels (SSLs) or Region 3 RBCs, may also be used.

Data Quality. Data quality requirements for RI sample analysis may vary according to data uses. Data that will be used to support enforcement or cost-recovery actions or establish risk could require a higher level of confidence than data collected for planning, monitoring or implementation activities. The DQO process should be followed for all samples collected to ensure the sampling and analysis protocols meet the data use requirements. DQOs can be revised as the site model is refined.

Opportunities for Integration

- Data linking ground water and surface water interactions normally will be helpful to identify and assess sources and to link sources to loads in the TMDL.
- The RI/FS may provide mapping and aerial photography that includes the site plus areas upgradient and downgradient of the site.
- Integration between programs and agencies can streamline collection of the extensive site characterization information required for the RI. Conversely, RI data can be useful for several aspects of TMDL development.

For more information, see

- *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents.* EPA 540-R-98-031. July 1999.
- *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA—Interim Final.* OSWER Directive 9355.3-01. October 1988.
- *Hazardous Waste Cleanup Information* (CLU-IN) Web site **www.clu-in.org**
- Superfund Policies and Guidance, **www.epa.gov/superfund/policy/guidance.htm**

CERCLA Human Health and Ecological Risk Assessment

Baseline Human Health and Ecological Risk Assessments typically are part of the RI; they typically are used to determine how threatening a hazardous-waste site is to human health and the environment and can help determine appropriate cleanup strategies. Risk assessment generally is performed to facilitate and support defensible, site-specific risk management decisions, including identification and characterization of current and potential threats from a hazardous substance and identification of cleanup levels that would protect human health and the environment. Risk assessors generally seek to determine a safe level for each potentially dangerous contaminant present. For humans, this typically is a level at which health effects are unlikely and the probability of cancer is very small. For ecological receptors, determining the level of risk can be more complicated and is normally a function of the receptors of concern, the nature of the adverse effects caused by the contaminants and the desired condition of the ecological resources.

Risk Assessments are conducted on a site-by-site basis. The process is typically conducted in four steps: data collection and analysis, exposure assessment, toxicity assessment and risk characterization. The exposure assessment typically includes analysis of contaminant releases, identification of exposed populations, identification of potential exposure pathways estimation of exposure concentrations for each pathway, and estimation of contaminant intakes for each pathway. The toxicity assessment normally includes collection of qualitative and quantitative toxicity information and determination of appropriate toxicity values. Risk characterization generally investigates the potential for adverse effects and the related uncertainty. Standardized assumptions may be used to streamline the assessment. These can be very conservative assumptions and may not be applicable to every site, so site-specific information is often useful to provide the most reasonable estimation of risk to determine the most appropriate cleanup strategy.

Note: The Risk Assessment process requires experienced personnel with specialized knowledge and a thorough understanding of contaminant fate and transport, ecosystem structure, receptor biology, risk evaluation methods and many other topics. For the purposes of this manual, only portions of the Risk Assessment process directly related to the watershed assessment and cleanup efforts of other programs and agencies are presented. For more detailed presentation of the Risk Assessment process, please see references from this section. Regional BTAGs are available to provide guidance and support to RPMs. The BTAG will communicate with Trustees to ensure continuity between the remedial and restoration processes.

Sampling Objective. Samples typically are collected to identify and characterize the toxicity and levels of hazardous substances present in relevant media; environmental fate and transport mechanisms within specific environmental media; potential human and environmental receptors, potential exposure routes and extent of actual or expected exposure, extent of expected impact or threat and the likelihood of such impact of threat occurring; and the level of uncertainty associated with each element.

Opportunities for Integration

- Risk Assessment personnel should be included in RI/FS scoping meetings to ensure integrated data collection and reduce duplication of effort.
- Ecological Risk Assessments and NRDA have several common components. A Risk Assessment does not complete the requirements of a NRDA, but it might establish the causal link between site contaminants and specific adverse effects on ecological receptors, and thereby might be useful in the NRDA process. If a NRDA can be performed at the site, NRDA personnel should be included in Risk Assessment site decisions to prevent duplicative efforts. For an example of integrating Risk Assessment and NRDA efforts, see *Integrating Natural Resource Damage Assessment and Environmental Restoration Activities at DOE Facilities*, Office of Environmental Guidance, Washington, DC, October 1993.
- Risk Assessment and TMDL may integrate efforts for water sampling, toxicity testing, accumulation and tissue residue studies and population/community evaluations.

Sampling Strategy. A site conceptual model normally is prepared and used to identify which points or assumptions in the risk assessment include the greatest degree of conservatism or uncertainty. Field sampling typically is performed to quantify the risk model parameters that have the most important effects on the risk estimates. Samples may be collected to establish a pathway to the receptor (determine exposure) or to determine effects of exposure on specific populations; therefore, soil, water, air, sediments or biota samples may be collected from on-site, upgradient and downgradient locations. The number, type and locations of samples usually are determined using the type and duration of possible exposures, potential exposure routes and key exposure points for each medium and the relative importance of each. Sample quantity generally is determined by the size and complexity of the site and the need to perform a statistical evaluation of risk. The Ecological Risk Assessment frequently includes field studies for bioaccumulation and tissue residue studies, population/community evaluations and toxicity testing.

Laboratory Analysis. In addition to analysis of physical and chemical characteristics such as temperature, pH and chemical concentrations, field sampling or laboratory analysis can be performed to determine such information as biological community structure, toxicity to various organisms and impacts on growth or reproduction. Laboratory detection limits generally must be low enough for comparison with toxicity reference values. Required detection limits are generally based on the SCDM but could also need to account for additive values and carcinogenic and noncarcinogenic effects. Reference values can be lower than CRDLs or CRQLs, so pre-planning for the appropriate level of analysis normally is essential. Field screening techniques typically are used only to streamline the sampling and risk assessment process by indicating if and where more detailed sampling should be performed.

Data Quality. Data collection and analysis techniques are usually very specific. Definitive data generally are required for use in the risk assessment. QC samples are collected. Data normally are validated using strict criteria.

Benchmarks. Benchmarks or measurement endpoints typically are specific to the site contaminants, potential receptors, and likelihood of exposure. Risk assessment endpoints usually are based on statutory mandates and are specific to the receptor, contaminant and other site-specific criteria. Typical benchmarks are from the SCDM, SSLs, Region 9 TMDL or Region 3 RBCs.

Data Uses. Data normally are used to determine the statistical risk to human health and environmental receptors. The results of the risk assessment typically are used to determine what level of cleanup is required to achieve an acceptable level of risk from the site.

For more information, see

- *Risk Assessment Guidance for Superfund (RAGS), Volume I—Human Health Evaluation Manual, Part A.* EPA/540/1 - 89/002. December 1999. **www.epa.gov/oswer/riskassessment/ragsa/index.htm**
- *Risk Assessment Guidance for Superfund (RAGS), Volume I—Human Health Evaluation Manual, Part B, Development of Risk-based Preliminary Remediation Goals.* EPA/540/R - 92/003. December 1991. **www.epa.gov/oswer/riskassessment/ragsb/index.htm**
- *Risk Assessment Guidance for Superfund (RAGS), Volume I—Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives.* OSWER/9285.7-01C. October 1991. **www.epa.gov/oswer/riskassessment/ragsc/index.htm**
- Risk Assessment Guidance for Superfund (RAGS), Volume I—Human Health Evaluation Manual, Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments. OSWER/9285.7-47. December 2001. **www.epa.gov/oswer/riskassessment/ragsd/index.htm**
- *Risk Assessment Guidance for Superfund (RAGS), Volume I—Human Health Evaluation Manual, Part E , Supplemental Guidance for Dermal Risk Assessment*. EPA/540/R/99/005. September 2001. **www.epa.gov/oswer/riskassessment/ragse/index.htm**

- *Human Health Toxicity Values in Superfund Risk Assessments.* OSWER/9285.7-53. December 2003. **www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf**
- *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* EPA 540-R-97-006. June 1997. **www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm**
- *Guidance for Data Useability in Risk Assessment.* EPA/540/G-90/008. September 1990. **www.epa.gov/oswer/riskassessment/datause/index.htm**

Natural Resource Damage Assessment (NRDA)

Under the CWA, OPA, CERCLA and other environmental laws, Trustees perform an NRDA to determine compensation for injuries to natural resources that have not been nor are expected to be addressed by response actions conducted pursuant to the NCP. As stated in Chapter 2, DOI and NOAA each have regulations for NRDA preparation.

DOI NRDA Process

DOI's regulations provide a framework and standards for the NRDA process in coastal and marine environments (Type A) and other environments (Type B). The Type A process involves using a computer model to assess damages in a standard and simplified manner that result from chemical or oil discharges in coastal and marine environments. The Type B process is used in situations that require an individual approach. Because the Type A process does not include additional site assessment activities, the following descriptions are for Type B NRDAs. The regulations require Trustees to coordinate the assessment efforts, including the pre-assessment screen, with the lead response agency in any situation where response activity is planned or underway at a site [40 CFR 11.23(f)].

Data collected in the pre-assessment screen determine whether an injury has occurred and a pathway of exposure exists. This determination is often made using existing information. The Assessment Plan/Implementation Phases include data collection necessary to quantify injuries and determine damages. Laboratory and field studies are used to quantify injuries by identifying the functions or *services* provided by the resource, determining the baseline level of such services, and quantifying the reduction in service levels that result from the impacts. In the post-assessment phase, the results of the assessment are presented, and a reasonable number of restoration alternatives, including natural attenuation, are proposed. A preferred alternative is selected on the basis of technical feasibility, relationship of costs to benefits and consistency with response actions. **www.epa.gov/superfund/programs/nrd/nrda2.htm**

NOAA NRDA Process

In the preliminary assessment, the Trustees determine whether injury to public trust resources has occurred. Their work includes collecting time-sensitive data and reviewing scientific literature about the released substance and its impact on trust resources to determine the extent and severity of injury. If resources are injured, Trustees proceed to the next step. During Injury Assessment/Restoration Planning, Trustees quantify injuries and identify possible restoration projects. Economic and scientific studies assess the injuries to natural resources and the loss of services. These studies are also used to develop a restoration plan that outlines alternative approaches to speed the recovery of injured resources and compensate for their loss or impairment from the time of injury to recover. The final step, Restoration Implementation, is to implement restoration and monitor its effectiveness. Trustees work with the public to select and implement restoration projects. Examples of restoration include replanting wetlands, improving fishing access sites and restoring salmon streams. The responsible party pays the costs of assessment and restoration and is often a key participant in implementing the restoration.

Although the concept of assessing injuries may sound simple, understanding complex ecosystems, the services these ecosystems provide and the injuries caused by oil and hazardous substances takes time—often years. The season the resource was injured, the type of oil or hazardous substance, and the amount and duration of the release are among the factors that affect how quickly resources are assessed and restoration and recovery occurs. The rigorous scientific studies that are necessary to prove injury to resources and services—and withstand scrutiny in a court of law—can also take years to implement and complete. But the NRDA process described above helps to ensure an objective and cost-effective assessment of injuries and that the public's concerns and resources are fully considered.

Opportunities for Integration

- Integration example: Whenever possible, NOAA works cooperatively with the parties responsible for the injury. By working with responsible parties and co-Trustees to collect data, conduct assessments and identify restoration projects, NOAA avoids lengthy litigation and achieves restoration of injured resources more efficiently.

www.darrp.noaa.gov

Removal Assessment and Cleanup

A removal site evaluation consists of a removal preliminary assessment and, if necessary, a removal site inspection. Provided that there is a substantial threat at a site and a removal action is necessary, the PA and the SI may be combined into a removal site evaluation. The removal PA is done using readily available information such as source identification, nature of the release or threatened release and an assessment of the threat to public health including the magnitude of the threat and the factors necessary to determine the need for a removal action. The PA determines if there is a need for additional data. A removal preliminary assessment of releases from hazardous waste management facilities can include collection or review of data such as site management practices, information from generators, photographs, analysis of historical photographs, literature searches and personal interviews, as appropriate.

If there is a need for additional information, a removal SI is performed to help determine the need for and urgency of response. The evaluation determines if a release has occurred. If such a release of a hazardous substance has occurred, the OSC shall determine whether the release results in a substantial threat to the public health or welfare of the United States. Factors to be considered by the OSC in making this determination include, but are not limited to, the size of the release, the character of the release and the nature of the threat to public health or welfare of the United States. Upon obtaining relevant elements of such information, the OSC will conduct an evaluation of the threat posed, on the basis of the OSC's experience in assessing other releases, and consultation with senior lead agency officials and readily available authorities on issues outside the OSC's technical expertise.

The following are examples of information presented at the conclusion of a removal site evaluation:

- Identification of the nature and source of the release
- Evaluation of the threat to public health
- Evaluation of the magnitude of the threat
- Evaluation of factors necessary to make a determination of whether a removal is necessary
- Determination of whether a nonfederal party is undertaking a proper response

If the lead agency determines that a removal action is appropriate, action begins as soon as possible. Not all actions considered to be removal actions will be equally urgent. For example, situations involving risk of fire or explosion or contamination of a drinking water reservoir may require more prompt and expeditious attention than certain drum removals or cleanups of surface impoundments. The three categories of removals are classic emergencies, TCRAs and NTCRAs.

Removal Assessment Sampling Objectives. Samples may be collected to determine site characteristics, nature and extent of contamination, contaminant properties, targets affected by site and information required for risk evaluation. In some cases, a treatability study may be performed to evaluate one or more treatment alternatives. In that case, samples may be collected to test the ability of the technology to meet treatment objectives.

Sampling Strategy. Samples are collected to meet sampling objectives; this might not provide a comprehensive evaluation of all site characteristics.

Data Quality. DQOs should be established to ensure that the data provide the information necessary for effective site decisions. Data that may be used in subsequent site studies or evaluations should be of a quality that sampling and analysis need not be duplicated.

Data Uses. Data are used to evaluate site risk, determine removal objectives, and evaluate treatment alternatives.

For more information, see *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*. OSWER 9360.0-32FS. EPA/540/F-94/009. December 1993.

Brownfields Assessments

Brownfields assessments focus on evaluation of a property to determine the needed actions to allow redevelopment and reuse without unacceptable risk to the community.

Phase I Site Assessment. A Phase I site assessment is the process of evaluating a property's environmental conditions and assessing potential liability for any contamination. EPA's Final Rule on All Appropriate Inquiries, effective November 1, 2006, establishes standards and practices for conducting Phase I Site Assessments that satisfy CERCLA liability protections. The updated ASTM E 1527-2005 standard, *Standard Practice for Environmental Site Assessment: Phase I Environmental Site Assessment Process*, may be used to comply with the provisions of the rule.
www.epa.gov/brownfields/aai/assessappr.htm

Phase II Assessment Site Investigation. A Phase II assessment site investigation is performed to confirm if contamination exists at the site, locate the contamination, characterize the nature and extent of contamination and determine if there are unacceptable environmental conditions at the site that would be cost-prohibitive to eradicate. Possible threats to the environment or to any people living or working nearby are important. The results can be used to determine cleanup goals, quantify risks, determine acceptable and unacceptable risk and develop effective cleanup plans. The investigation takes into account any issues the community has raised regarding site contamination or reuse. If contamination is found that may pose significant threat to local residents, compliance with other programs such as RCRA or CERCLA may be required if the site is not cleaned up voluntarily by the site owner.

Sampling Strategy. Samples are collected to determine the nature, extent, source and significance of contamination and to assess physical, geophysical and ecological site conditions. Samples may also be collected for a site-specific risk assessment. Efficient, innovative sampling and analysis methods are encouraged. The Triad approach to sampling is preferred but is not always applied at brownfields sites.

Typical Samples. These include soil, soil gas, ground water, surface water, sediment and air. Migration pathways are examined. A baseline risk assessment may be performed. Samples collected depend on the site-specific DQOs.

Sample Analysis. Alternative analytical technologies that expedite field work are encouraged but should meet the site-specific data quality requirements. Screening level data are collected to facilitate site decisions. Collaborative samples are collected and submitted for definitive analysis to confirm the results of screening level data for critical samples.

Benchmarks. Data are compared against an accepted source of cleanup standards such as the Region 3 Risk Based Concentrations, or the Region 9 Preliminary Remediation Goals are used in the site-specific risk assessment to determine site-specific goals.

Data Quality. DQOs are site-specific—the DQO process is a key component of the *systematic planning* portion of the Triad assessment approach to brownfield investigations. High-quality screening level data are generally acceptable for the intended use, and real-time analysis or field testing is performed where appropriate to streamline field sampling. The type of data collected is dependent upon the conceptual site model developed and planned end uses for the site.

Data Uses. Data are used to identify and evaluate the applicability of various site assessment and cleanup technologies and to help determine whether the property can be cleaned up to the level necessary for the intended reuse. Samples collected for a site-specific risk assessment may be used to identify site-specific cleanup levels if there are no existing standards or alternative cleanup standards also may be appropriate. Also, each state has developed VCPs where specific cleanup standards may be designated, and to eliminate any future risks, property owners may receive assurance from the state that the site has been cleaned up.

For more information, see

- *Tool Kit of Information Resources for Brownfields Investigation and Cleanup*. EPA 542-B-01-001. **www.clu-in.org/products/toolkit99/pages/middle.htm**
- *Soil Screening Guidance: Users Guide.* EPA540/R-96/018. July 1996. **www.epa.gov/superfund/health/conmedia/soil/index.htm**
- *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* OSWER 9355.4-24. December 2002. **www.epa.gov/superfund/health/conmedia/soil/index.htm**
- *Superfund Chemical Data Matrix.* EPA. January 2004. **www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm**
- *Region 3 Human Health Risk Assessment: Risk-Based Concentration Table*. EPA. October 2006. **www.epa.gov/reg3hwmd/risk/human/index.htm**
- *Region 9 Preliminary Remediation Goals* **www.epa.gov/region09/waste/sfund/prg/index.htm**

Abandoned Mine Land Initiative Assessment

An interagency task force of federal land management agencies (BLM, NPS and USFS) and the Interior Science Bureaus (USGS and staff of the former BOM) has developed a risk-based watershed approach to achieve mitigation of water quality problems from AMLs on federal lands. The watershed approach fosters collaborative work across federal and state government administrative boundaries, facilitates solutions to the problem of mixed ownership of sites within watersheds, addresses important problem sites first and greatly reduces the total cost of mitigation compared to cleaning up every mine site. The watershed approach focuses on cooperation among federal land managers in partnership with the science bureaus; prioritizes, watershed by watershed, specific waterbodies within each state that are affected by discharges from AMLs; and allows cleanup to proceed on a risk-based priority.

The land management agencies provide overall program management, determine land status, coordinate with state and federal agencies, facilitate public participation and ensure compliance with environmental laws. Land management agencies coordinate efforts with other federal agencies and states. The science bureaus provide technical support to land management agencies, develop technology and apply engineering principles and perform risk/economic benefit analyses in support of water quality improvement. A description of tasks performed in each phase of the watershed process is provided below.

Statewide Analysis/Watershed Prioritization. Land management agencies collect information relevant to the risk prioritization of watersheds with support from science agencies and states and set priorities for characterization of watersheds. The science bureaus compile and analyze existing data on statewide AML sites, stream sediment and mine dump geochemistry, mineral deposit locations and water quality; develop a regional environmental geology map portraying units with varying acid neutralization and acid generation potentials; and with state and federal agencies, develop a statewide GIS including locations of mineral districts, AML sites, mineral deposit types, environmental geology features, precipitation and storm event data and water quality characteristics.

Watershed Characterization. The land management agencies set objectives, protocols and performance criteria for watershed characterization in cooperation with science agencies; provide oversight of the watershed characterization work performed by science agencies; on completion of watershed characterization, select sites for mitigation with input from other federal land managers and science agencies; and develop mitigation plans with support in research and engineering performed by science agencies. The science bureaus conduct total watershed monitoring to identify contaminant sources and sinks, relative source contributions and contaminant budgets on the basis of ambient, storm and seasonal events; conduct remote sensing surveys of the watershed to characterize contaminant sources and their distribution and to identify stressed ecosystems; conduct AML site-specific field analyses including geochemical, geophysical and hydrologic surveys of sources and pathways to identify environmental impacts; conduct site-specific geologic mapping and subsurface geophysical and mineralogical characterization of host and waste rock materials; identify technologically feasible options for site-specific water quality improvement, including the possibility of re-mining; and develop benefit and cost analyses of options. These analyses will identify the potential environmental and economic benefits of the mitigation options on the basis of environmental risk technical feasibility and cost.

Site Characterization and Mitigation. The land management agencies implement AML mitigation with technical assistance from science bureaus. The science bureaus prepare mineral-related scientific, engineering and economic information to meet the land management agencies' requests for proposals and assist in technical monitoring of mitigation contracts. Where economically or technically feasible mitigation options do not exist, the science bureaus define the research that might result in such options and include an evaluation of the potential benefits and costs of the research. In consultation with the federal land managers and states, they mitigate various sites to demonstrate mitigation options and new technologies. Where appropriate, the science of bureaus identify and evaluate potential re-mining sites; participate in the review of the scientific, engineering, economic and policy efficacy of the watershed permitting approach; and model ambient chemical conditions and effects of mitigation efforts on surface water quality in the watershed.

Monitoring. The land management agencies monitor the post-construction site and, in cooperation with the state and with technical assistance from science agencies, monitor the effectiveness of site-specific mitigation and watershed quality improvement. The science bureaus help land management agencies develop technically sufficient and cost-effective monitoring plans, provide monitoring training and provide analytical support for interpretation of monitoring results.

Table 4-1 on page 119 provides a comparison of surface water data collection and analysis requirements in mining watersheds for the TMDL Program, Brownfields Assessments and several Superfund actions.

Implementation and Monitoring

This chapter describes a cross-programmatic approach to selecting and implementing watershed remediation/restoration activities and providing long-term monitoring. It discusses integrated watershed cleanup topics such as WFAs, the *3-Rs* Approach and WCT task assignments. It also discusses integrated monitoring and program requirements for determining remediation and restoration actions and for long-term monitoring of watershed conditions and concludes by addressing additional topics that should be considered in a watershed cleanup. Three case studies demonstrate the use of integrated remediation, restoration, reuse and monitoring.

Integrating Watershed Cleanup

Integrating cleanup efforts requires both cross-program cooperation and careful allocations of funding. Coordination between agencies and programs provides the potential for streamlining and reducing the cost of watershed cleanup, restoration and, where appropriate, redevelopment. This section discusses some of the practical aspects of integrating cleanup implementation and post-remediation monitoring. Because Regions and states operate with different priorities and programmatic tools, the ideas presented here might not work for all watersheds, but similar coordination and careful planning can allow the stakeholders to use various programs, laws and resources to successfully fulfill program requirements and achieve efficient, effective and comprehensive results.

The WCT should cooperatively set remediation, restoration, and reuse goals. If feasible, the team should ensure that the goals are met by project implementation by using applicable authorities and available funding mechanisms within the various schedule, budget and other constraints of the programs that will address the watershed contamination. Goals should be consistent with the overall Watershed Management Plan, where applicable.

CASE STUDY

Using Dollars Wisely

Utah DEQ: Prioritizing 319 Spending

The Utah Division of Water Quality (DWQ), part of the DEQ, administers the TMDL Program in conjunction with its Watershed Planning Program. Utah uses CWA section 106 funding to provide contractual support in the development of the CWA section 319 watershed management plan and the TMDL, which includes an implementation plan. Utah then prioritizes the expenditure of its 319 NPS funds toward implementation projects or activities identified in the TMDLs. In addition, DWQ has used 319 NPS funding to support establishment of locally sponsored watershed coordinators to not only enhance the planning effort, but to initiate and implement projects identified in the approved TMDLs or 319 plans.

Watershed Feasibility Assessment

Cleanups under CERCLA and RCRA, as well as TMDL allocations and implementation plans, share a common element: an evaluation of alternative strategies for reducing pollutant loading and risks to human health and the environment. In the watershed approach, it will be beneficial to all programs if a WFA is conducted to accomplish this same goal. EPA Region 8 developed a *WFA* protocol as part of its coordinated watershed restoration efforts that is proving to be broadly applicable. The WFA can be a natural part of an NPS Watershed Management Plan; it can also be conducted during the development of the TMDL. TMDL Program funds and NPS funds may all be potential sources of funding for a WFA.

The WFA uses the three screening criteria used by the Superfund Program to assess remedial alternatives: effectiveness, implementability, and cost. For each source category, potential cleanup alternatives are evaluated and compared according to feasibility, cost, anticipated reduction in load, and a rough cost/benefit analysis. The WFA might not fulfill all the requirements of the various programs (i.e., a CERCLA FS or EE/CA, TMDL WLA, or a 319 NPS implementation plan) but could provide an initial, common framework to guide the data needs for each of these documents. Fine-tuned assessment and design would be performed in subsequent steps according to the processes of the program facilitating cleanup/implementation at each location. For example, Superfund remedies within the watershed will need to be chosen on the basis of a detailed alternatives analysis under each of the nine Superfund remedial action selection criteria described in Chapter 2.

A WFA provides critical information regarding significant sources that have been identified and quantifies their associated loads to surface water. The analysis suggests remediation alternatives and assigns costs associated with specific load reductions. Typically, an FS conducted under CERCLA applies only to individual sites or operable units (OU). Thus, a WFA can cover a much broader geographic area and includes alternatives for all categories of sources.

Significant value can be leveraged by applying various programs' funds to conduct a WFA. With this approach, the WCT will be able to effectively rank sources by their contribution of contaminant loadings on a scale much larger than is typically accomplished under individual programs. Quantitative comparisons can then be made of the potential effectiveness of the proposed cleanup alternatives for sites throughout the watershed.

The WFA provides a tool that federal and state programs and local watershed groups can use to review and prioritize cross-programmatic cleanup opportunities in the watershed. The assessment would be used by the WCT to help determine which organization could be best suited to address the contamination from each source and to set priorities for the allocation of cleanup resources. For example, if the necessary estimated load reduction to meet WQS is 12 tons per year, and Project A costs $100,000 and reduces loading by 5 tons per year, Project B costs $1.1 million and reduces loading by 5.1 tons per year, and Project C costs $200,000 and reduces loading by 7 tons per year, the cleanup priorities might be Project A and Project C. Such watershed-wide considerations are often more difficult to undertake using other, more facility-specific programs such as RCRA and CERCLA.

The WFA can also be used to maximize available funding sources. The ability to implement projects concurrently to reduce contaminant loading would increase as the cost is shared by several applicable programs/agencies, and funding sources would be maximized by spreading the cost over several programs and agencies and by collaborating to provide documentation required to access funding. Additionally, if cleanup activities in the basin are coordinated, there is potential for consolidating waste, establishing joint waste repositories and minimizing the disturbance to the community by accelerating the cleanup. The WFA can also be the basis for TMDL load allocations. The study can be used to prepare grant applications (Brownfields and 319 NPS) and as the framework for programmatic documentation requirements (TMDL allocations and implementation plan, CERCLA EE/CA or FS, RCRA CMS), thus streamlining the efforts of all programs. Projects that are supported by a variety of stakeholders and agencies and implement TMDLs frequently receive priority for grant and program funding. The WFA and subsequent prioritization of projects by the WCT requires the participation and concurrence of the stakeholders, which will improve the likelihood that a project will be funded. This can also increase the level of technical support provided by agencies such as USGS, BOR and USACE and help identify nontraditional funding sources.

Opportunity for Integration

- The WFA can provide the preliminary costs and alternatives for a variety of programs and agencies to estimate remedial costs and prepare grant applications for funding. The analysis provides the necessary data to allow program managers to prioritize and coordinate cleanup activity.

CASE STUDY

Little James Creek Feasibility Assessment

How a Subbasin Study Can Lead to Watershed-wide Cleanup

A WFA was conducted for Little James Creek Subbasin of the Left Hand Watershed in Colorado as part of the TMDL development. The study included surveying, mapping and evaluating a limited set of alternatives to remediate specific sources in the watershed. Specifically, the assessment included the following elements:

1. A description of the individual sites (e.g., mine waste volume and surface area, topo-graphic mapping showing relationship of mine waste piles, adits and other features).
2. Feasibility level plans illustrating the application of the alternatives at each site.
3. Cost sheets providing feasibility level estimates (+50 percent to -30 percent) for each alternative. Costs included capital costs and long-term O&M costs, where applicable.

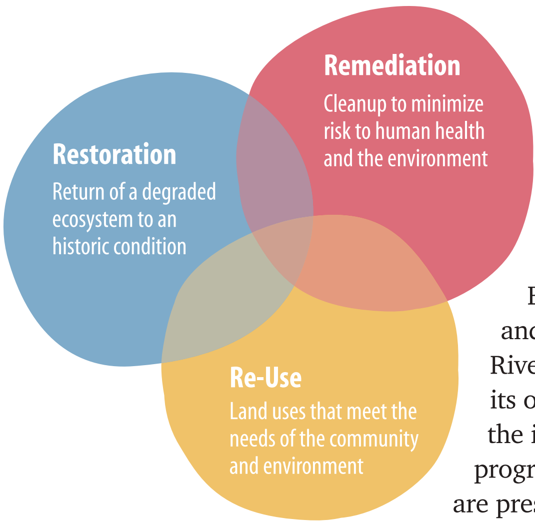
The Little James Creek feasibility assessment has already been used to

- Prioritize sites for coordinated USFS/EPA removal projects and to expand the previously identified scope of work
- Apply for Brownfields cleanup grants for Argo and Evening Star Mine sites
- Assist the Left Hand Watershed Oversight Group in making decisions regarding cleanup priority and approach
- Develop the TMDL Implementation Plan

The findings may be used to develop a cleanup/implementation approach for the entire watershed, not only the Little James Creek Subbasin.

Remediation + Restoration + Reuse = Revitalization

Watershed cleanup can be summarized by the 3-Rs: **R**emediation, **R**estoration and **R**euse. These 3 Rs were coined for EPA Region 8's Land and Water Revitalization Initiative, but they also fit with national EPA priorities and are applicable to watersheds throughout the nation. Under the 3-Rs, a set of criteria guides resource decisions and identifies the most important steps to fully realizing revitalization goals. They include the following:



- Early, planned multiprogram integration of cleanup activities
- Innovative approaches for revitalizing sites, communities, watersheds and ecosystems
- Planning for reuse at the beginning of projects
- Measurable environmental and human health benefits

Programs most likely to be included are NPDES, Wetlands, Superfund, Brownfields, RCRA, UST, Federal Facilities (including Base Realignment and Closure and Formerly Used Defense Sites), One Cleanup Program, Urban Rivers Restoration and Ecosystem Protection. Each of these programs has its own specific roles and responsibilities, but the actions conducted under the individual programs can be tailored to meet the needs of cooperating programs in a watershed cleanup. Some examples of integrated site activities are presented in the following paragraphs. These are examples only and should not be considered a comprehensive listing. With a little planning and cooperation between programs and agencies, watershed remediation, restoration and reuse can be accomplished in innovative ways.

Opportunity for Integration

- While integrating the concepts of cleanup, revitalization and reuse of abandoned, inactive and formerly contaminated waste sites, RPMs can incorporate the use of sustainable redevelopment in their cleanup and redevelopment activities. *Green* requirements can include stormwater management, energy efficiencies, native vegetation, recycling, preservation or creation of open space, and such, that reduce the environmental footprint of the development. For more information about "green" redevelopment, visit **www.epa.gov/greenbuilding**

Superfund-Restoration Integration

One of Superfund's goals is to conduct response actions that reduce contamination to levels that are protective of human health and the environment (which might or might not be *background* or a pristine condition). EPA's response actions are distinct from restoration activities associated with natural resource damages, which generally are handled by trustee agencies; nonetheless, EPA's CERCLA response actions should be carried out in a manner that is consistent with any restoration activities. The following discussion reviews opportunities for ensuring that CERCLA response and restoration activities are consistent, from data gathering through cleanup implementation.

Reviewing the status of the watershed assessment early in the CERCLA process at a site within the watershed can identify opportunities for sharing information. For example, the WCT can collect information in the area of the CERCLA cleanup that can help identify additional sources. Also, early coordination during CERCLA's Site Assessment and RI efforts (especially with regard to ecological impacts) can often make it possible for the resulting data to be useful for subsequent watershed restoration efforts.

EPA guidance provides that reasonably anticipated future land use should be considered at various stages of the remedy selection process, including the risk assessment phase of the RI/FS, which analyzes site-specific human health and ecological risks. Thus, it might be appropriate to consider prospective reuse plans as part of the RI/FS. The remedial action must meet or waive ARARs, and if WQS are considered ARARs for the selected remedy, the remedial action generally should be designed to support the designated use (i.e., recreational use, aquatic life, industrial). Toward this end, remedial actions should normally be selected and described in the ROD that are consistent with the designated use and can also provide, for example, land use restrictions that are consistent with the designated controls. For example, wildlife easements, measures designed to ensure BMPs, and monitoring to assure compliance with particular zoning classification may be appropriate components of a remedial action that is consistent with ecological recovery or community revitalization within the bounds of Superfund.

> ***Opportunity for Integration***
>
> - Watersheds with Superfund activities often include waters listed as impaired due to parameters not related to the Superfund site. Typical pollutants found include dissolved oxygen, nutrients, or sediment. The remedy selected at a Superfund site can potentially be consistent with the instream restoration of the waterbodies necessary to achieve WQS. For example, alternatives to achieve bank stabilization can include reestablishment of riparian geomorphology or riprap. The first alternative will provide habitat; the other will take it away. Coordinating remediation with the TMDL implementation activities often will not increase costs but can complement the watershed activities, provide ecological restoration and reduce the overall cost of the project, resulting in a value added to the overall watershed revitalization.

Prior to NTCRAs or remedial actions, the EE/CA or FS must evaluate ARARs, and the ROD or Action Memo should state how they will be met or waived. To assure protectiveness and comply compliance with ARARs, Superfund dollars may be used to remediate ecological resources. For example, compliance with ARARs like CWA section 404 can lead to mitigation of wetlands and riparian buffers.

Tasks that the WCT determines are appropriate but that are not required under CERCLA (i.e., not required to achieve protectiveness or meet ARARs) that are nevertheless *restoration* could be conducted with Brownfields (at qualifying sites), 319 NPS, and NRDA funding. Tasks that are necessary to promote redevelopment may be left for actions funded by local redevelopment agencies, private developers and Brownfields loans and state grants. Note that identifying proposed restoration and redevelopment tasks during the RI/FS stage can allow for synchronization of NRDA restoration activities and remedial tasks.

CASE STUDY

Using Alternative Techniques to Save Dollars and Riparian Habitat

Stabilizing Streambanks on the Upper Arkansas River

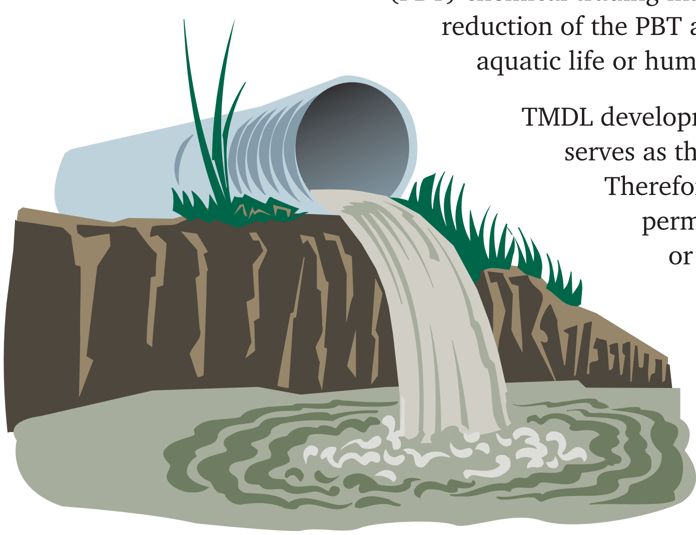
Fluvially deposited tailings from historic mining operations were capped using soil amendments and revegetation as part of a Superfund removal action in the Upper Arkansas River. The project required streambank stabilization in some locations to prevent erosion of the existing banks that might expose tailings that could then be washed downstream. State Division of Wildlife personnel were concerned that the projects would do more to reduce riparian habitat than improve it because of the planned riprap bank stabilization designs. Division of Wildlife personnel suggested alternative techniques that were then incorporated into the designs used for bank construction. Root wads were used in one location to redirect flow away from the bank. At another location, bendway weirs were used to stabilize the banks. These methods improved aquatic habitat and were less expensive to implement than the proposed riprap methods.

Finally, consistent with the NCP's nine criteria for evaluating alternatives, it might be appropriate to consider use of ecologically friendly remedial alternatives when determining the technology that will be used for remediation. Ecologically friendly remediation can often result in lower O&M costs. With careful thought and communication with specific WCT members and other scientific resources, including the NRCS and the BTAG, the RPM could coordinate the Superfund cleanup with other in-stream and riparian zone restoration activities while still meeting program requirements.

The selection of removal or remedial alternatives that result in a restored natural habitat can benefit both the remedial and restoration goals, protect the environment by cleaning up natural habitat and can also be consistent with restoration activities, especially for riparian zones. Remediation that leaves natural soil and vegetation habitat in riparian zones can mitigate flooding, be cost-effective, generate and preserve soils, create self-sustaining ecosystems, meet Executive Order 13112 to use native species and control invasive species and minimize management needs and costs. Soils at contaminated sites are often of poor quality. If remediation includes capping, the soil quality above the cap is a critical first step to establishing a natural habitat. Using composted biosolids can increase fertility and reduce metal toxicity. Recycled wastes such as municipal biosolids and wood ash are readily available at low or no cost and can provide a fertile barrier. The NRCS office of the USDA and the Cooperative Extension can provide information on soil profiles, native plants, and the like, to help achieve ecological restoration. Remediation that protects or enhances in-stream habitat can also benefit both remediation and restoration processes. Bank stabilization or in-stream structures required for other remedy components can be designed to enhance fisheries or reduce pollutants downstream. An example of this approach is shown in the Upper Arkansas River case study. The possibilities of conducting remedial actions in ways that enhance or facilitate restoration are numerous and should be considered when selecting remedial actions within a watershed.

TMDL Restoration Integration—Water Quality Trading

Water quality trading may be used to integrate TMDL requirements for NPDES facilities and nonpoint sources and assist in watershed restoration. EPA's current trading policy is focused on nutrients and sediments and allows cross-pollutant trading between these and other oxygen demanding pollutants. Other pollutants may be considered on a case-by-case basis, in accordance with a permit and watershed restoration plans. Trading programs for bioaccumulative and other toxics, however, are not supported under the current policy because of their potential to create exceedances in water quality standards. Limited pilots of persistent, bioaccumulative, and toxic (PBT) chemical trading may be considered where trading achieves a substantial reduction of the PBT and where trading does not cause an exceedance of an aquatic life or human health criterion.



TMDL development or the establishment of a pollutant cap often serves as the driver for point sources to get involved in trading. Therefore, water quality trading provisions included in NPDES permits often will address impaired waters where a TMDL or similar pollutant loading cap has been established. In these cases, the water quality requirement for a particular point source is specified by a wasteload allocation (WLA) in the TMDL and expressed in the point source's NPDES permit as a water quality-based effluent limit (WQBEL) that is consistent with the WLA. A point source's required pollutant reduction is the difference between the discharger's current pollutant load and the load generated when the WQBEL is met.

CASE STUDY

Water Quality Trading Permits Exceed Expectations

Southern Minnesota Beet Sugar Cooperative

Background

Minnesota has established a formal policy for trading in watersheds. Trading is allowed through issuance of permits to companies/facilities; however, this wasn't always the case. The Southern Minnesota Beet Sugar Cooperative (SMBSC) is a farmer-owned cooperative with a beet-processing facility located in southern Minnesota. The processing facility treated process wastewater, storing it in lagoons during the processing season and spray-irrigating over 500 acres of alfalfa and grassland during the growing season. The SMBSC wanted to build a wastewater treatment plant to serve the facility. This would allow SMBSC to expand sugar production and resolve odor problems; however, regulations already in place created specific barriers to this resolution.

Southern Minnesota Beet Sugar Cooperative's Sugar Beet Processing Facility

A carbonaceous biochemical oxygen demand (CBOD5) WLA had been developed and approved on the lower Minnesota River in 1988. This WLA prohibited the additional loading that the Minnesota Pollution Control Agency (MPCA) wastewater treatment plant would produce. The MPCA allowed SMBSC to obtain a permit for the proposed wastewater treatment plant provided they offset all of the additional loading through NPS projects that reduced total phosphorus. The permit required SMBSC to establish a $300,000 trust fund to finance the projects, which was overseen by a trade board made up of a processing plant official, SMBSC's consultant, a Soil and Water Conservation District official, the Hawk Creek watershed coordinator, and an environmental advocacy representative. The permit addresses chronic rather than acute problems and promotes a nondegradation policy. In other words, there is no "backsliding" allowed.

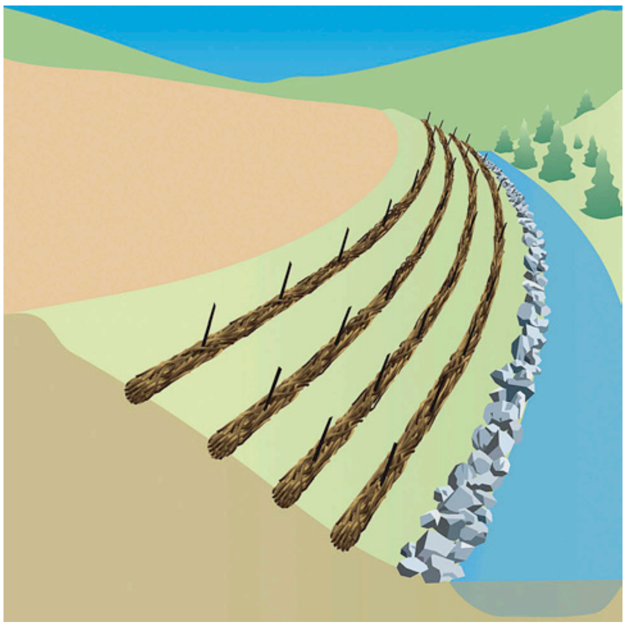
SMBSC's permit also requires that the needed NPS reduction be based on the actual discharge. To accomplish this, the actual discharge is grouped into categories, which create thresholds for the actual NPS reduction needed and these requirements reflect the 2.6 to 1 trade ratio. The largest category or tier of NPS trade offsets requires 13,000 lbs total phosphorus/yr. To date, the facility is achieving nearly 2.5 times the permit's required NPS reductions.

Number of Trades to Date

SMBSC contracts for sugar beet cover-cropping BMPs in the spring. In 2005, SMBSC had contracts on 579 sites totaling 58,832 acres yielding 14,292.5 lbs total phosphorus reduction/yr. One contract was established for cattle exclusion and bluff/channel stabilization BMPs yielding 1475 lbs total phosphorus reduction/yr. SMBSC's total approved credit count is 15,767.5 lbs total phosphorus/yr.

If a discharger installs a control technology that results in pollutant reductions greater than those required by the WQBEL, the discharger can generate credits. The number of credits generated is the difference between the wasteload allocated to that discharger (as expressed by the WQBEL in its permit) and the pollutant load actually discharged after installation of treatment processes or other pollutant reduction measures.

Point sources may find it more cost-effective to trade with nonpoint sources. Also, point-nonpoint source trading may have additional benefits to the environment other than specific pollutant reduction. The installation of nonpoint source best management practices could result in additional environmental benefits such as habitat restoration, flood control through wetlands creation, or control of additional pollutants. For more information on water quality trading please go to **www.epa.gov/owow/watershed/trading.htm**.



Supplemental Environmental Projects

A supplemental environmental project (SEP) is an environmentally beneficial project that a respondent in an enforcement action voluntarily agrees to perform as part of a settlement of the matter. In return, EPA or the state may agree to reduce the monetary penalty that it would otherwise seek as a result of the violation(s). Most enforcement actions against businesses or individuals for failure to comply with the environmental laws are resolved through settlement agreements. SEPs are designed to give companies charged with environmental violations an alternative to standard fines. These projects can provide a positive outcome for the company and the community. Acceptable SEP categories may include public health, pollution prevention, pollution reduction, environmental restoration and protection, emergency planning and preparedness, assessments and audits, environmental compliance promotion and other approved projects that might benefit human health or the environment. Restoration SEPs may involve restoring natural environments (ecosystems) or creating conservation land (e.g., transforming a former landfill into wilderness land). Within certain legal constraints, EPA has broad discretion to settle environmental enforcement cases including discretion as to the level of penalties the Agency will accept and whether to include SEPs as an appropriate part of a settlement. Under EPA policy and guidance, the amount of penalty mitigation EPA may consider is based on a number of factors. These include the cost of the SEP and whether or how effectively the SEP

- Benefited the public or the environment
- Was innovative
- Considered input from the affected community
- Factored in environmental justice issues
- Reduced emissions to more than one media (e.g., air, land, water)
- Implemented pollution prevention program techniques and practices

Generally, the value of the SEP should be greater than the amount of fine forgiven. The actual percentage of penalty mitigation granted is within EPA's discretion; however, EPA policy suggests that generally it should not exceed 80 percent of the cost of the SEP unless the violator is a small

A SEP Improves Health and Revitalizes Granite City, Illinois

For nearly 70 years, the NL/Taracorp facility in Granite City, Illinois, was a secondary lead smelter that exhausted lead, deposited crushed battery casings in the community and created a 250,000-ton slag/waste mountain on-site. This Superfund facility operated next to a residential community where, in 1991, the blood lead concentrations of one in four children exceeded the Centers for Disease Control's (CDC) health-based threshold.

The NL/Taracorp Team successfully negotiated three major consent decrees valued at more than $63,000,000 and assured the cleanup of 1,600 lead-contaminated residential yards. The decrees also called for the defendants to fund a $2 million lead-paint abatement program in homes near the site through an SEP. The defendants were not legally liable for lead paint or responsible for hiring of trained workers, but the NL/Taracorp team creatively addressed the overall problem of lead contamination in the area, including the need for street sweeping. The lead-paint abatement SEP program was established through outreach in the community. Early on, the Madison County Community Development Agency showed interest in managing the program and eventually received SEP funding to manage the lead paint program. Madison County was then able to leverage additional funding through grants and by using a revolving fund program to start a comprehensive lead abatement and education program in the various EJ communities that suffered from numerous environmental impacts, including the NL/Taracorp site and others. This collaboration was very successful.

The settlements achieved penalties amounting to approximately $3.5 million for failure to comply with a CERCLA Unilateral Administrative Order, including the $2 million SEP. The cleanup activities increased the value of area properties that will help the region redevelop, created job opportunities in an EJ community and required that the responsible parties fund a community lead-paint abatement program.

business, a government agency/entity or a nonprofit organization or the SEP implements pollution prevention. Furthermore, in all cases, the final settlement penalty should equal or exceed: (a) the economic benefit of noncompliance plus at least 10 percent of the gravity component; or (b) 25 percent of the gravity component only, whichever is greater, regardless of the cost or environmental value of the SEP. For more information about EPA's SEP policy, see **http://cfpub.epa.gov/compliance/resources/policies/civil/seps**. For examples of potential SEPs, see **www.epa.gov/compliance/resources/policies/civil/seps/potentialproject-seps0607.pdf**

Identification of Implementation Resources and Assignment to Programs/Stakeholders

Cross-Programmatic Cleanup Plan

The WCT should identify the existing and potential sources of funding available to perform each implementation task and assign responsibilities for the high priority tasks, including voluntary, mandatory and educational efforts that will help attain and maintain goals. This information should be documented in the **Cross-Programmatic Cleanup Plan**. This decision document should include a clearly laid out plan for action including a list of the tasks required to complete each project and the milestones that will be used to measure progress. During the implementation phase, communication between participants should remain high and include frequent status updates, sharing of work plans, remedial designs and recommended BMPs. The plan should include an annual schedule that will allow the team to revisit milestones and make any necessary revisions.

Preparing a worksheet similar to the Left Hand Watershed example in Table 5-1 and a Watershed Cleanup Fact Sheet (See Appendix C) that clearly states project background, cleanup goals and objectives, the plan for action, progress to date and a high level of interest in the project will allow cleanup partners to demonstrate to their agencies or grant sources the high level of support and priority being given to the project by others. This could increase the amount of funding that will be allocated to the project by government regulatory and support agencies, industry, communities and environmental action groups. A public outreach program is a critical component to the success of the project. Stakeholders should participate in the selection of cleanup alternatives and implementation of the NPS controls.

The results of this planning effort should be included in the TMDL Implementation Plan and in the larger 319 NPS Watershed Management Plan.

Table 5-1. Left Hand Watershed Implementation Draft Worksheet

Activity	Funding source	Estimated costs	Indicator
Evening Star Remediation	Brownfield cleanup grants	$200,000	Improved macroinvertebrate diversity
Argo Remediation	Brownfields cleanup grants	$200,000	Improved macroinvertebrate diversity
Streamside Tailings Cleanup	USFS and EPA removal	$200,000	Improved macroinvertebrate diversity
Bueno Tails Cleanup	USFS and EPA removal	$300,000	Turbidity less than 100 Nephelometric Turbidity Units (NTU)
Burlington Mine Cleanup	PRP—voluntary cleanup	$1,500,000	Reduced zinc and manganese load
JRT Tailings	CWA section 319 NPS funds	$100,000	Improved macroinvertebrate diversity

Integrated Watershed Monitoring

Under the CWA section 106(e), states, territories and authorized tribes implement monitoring programs that allow them to report on the attainment of WQS and to identify and prioritize waters not attaining standards. Monitoring can also be an element of NPDES permits, TMDL assessments and confirmation sampling. Cleanup programs such as RCRA and CERCLA typically require monitoring as an integral part of their implementation. State game and fish agencies perform stream monitoring and assessment as part of their programs. Local environmental groups also have an interest in tracking the health of their local ecosystems and often organize ongoing stream monitoring projects. Some watersheds will have other parties (e.g., owners of lakefront or streambank property, local schools and universities) interested in regular monitoring. The WCT should ensure that a comprehensive watershed monitoring plan is prepared and implemented to coordinate these efforts, where appropriate, and to ensure that interested parties have access to all the data that can affect their interests. Typically sampling undertaken for individual programs or facilities addresses specific sites rather than cumulative impacts across the watershed. By coordinating the sampling efforts across multiple programs, the data will provide a more complete picture of the significant sources of pollutants in the watershed and will streamline resources to allow for more extensive field work.

A comprehensive watershed monitoring plan and QAPP should be prepared as part of the Watershed Management Plan or other regulatory requirements. The watershed monitoring plan should identify the following:

- Monitoring locations
- Monitoring parameters
- Field and laboratory analyses/evaluation

- Benchmarks/detection limits
- Standard operating procedures for sample/data collection and evaluations
- Data quality requirements
- Monitoring frequency
- Monitoring responsibilities (who, where, for what period of time)
- Data management and distribution
- Funding for all aspects of monitoring

The WCT should go through the DQO procedure to ensure the requirements of all programs are met.

Developing a watershed monitoring plan can present challenges. Key questions include what data are essential and to what degree of precision, what are the indicators of success, who will do the work, and who will pay for it? Cleanup programs such as RCRA and CERCLA frequently require only limited water quality monitoring with respect to both location and time. NRDA restoration efforts are monitored, but the timespan and scope of monitoring will depend on the type and scope of restoration efforts and Trustee priorities. State water quality assessments are ongoing but often have limited funding. TMDLs that include a monitoring plan are generally carried out by the state monitoring program. Even if more samples are collected or more analyses performed than an individual program requires, overall cost savings are realized by reducing the field effort required.

Program Cleanup Processes

TMDL

TMDL components related to implementation and monitoring are described here.

Allocating Pollutant Loads: TMDL allocations should account for point sources, NPSs and background sources of pollution. The allocation should demonstrate that WQS will be met and maintained and that the load reductions are technically achievable. Factors such as technical and programmatic feasibility, cost-effectiveness, relative source contributions, equity and the likelihood of implementation can be considered. Allowable loads may be expressed in many ways and may divide up the allowable total load by percent removal, concentrations at points of compliance, total mass per time, reduction of load or percent removal proportional to raw load. The process quantifies the necessary reductions in pollutant loads to meet the in-stream water quality target. The technical analysis should demonstrate a reasonable assurance that the WLA and LA in the TMDL will achieve WQS when implemented. When determining TMDL allocations the following factors should be considered:

- ***Wasteload Allocation:*** Allocations assigned to point sources are frequently expressed as numeric effluent load or concentration. These allocations are generally implemented by using the NPDES Program with numeric standards that are incorporated into individual NPDES permits. States developing WLAs should look at the cumulative affects of multiple dischargers.
- ***Load Allocation:*** LAs include NPSs, stormwater sources for which NPDES permits are not required, atmospheric deposition, ground water and background sources of pollution. NPS LAs are implemented through a combination of federal, state,

Opportunity for Integration

- Studies and assessments performed by all cleanup programs can help determine reasonable load allocations for TMDLs. CERCLA RI/FS and EE/CA documents often provide the information required to make reasonable estimates of load reduction expected from planned cleanup efforts.
- The evaluation of cleanup technologies identified for a site could be applicable to similar sites in the watershed.

and local programs that include regulatory, nonregulatory, and voluntary efforts. The TMDL should include a description of the pollution control BMPs that must be implemented to achieve the specified load reductions. They may be expressed as numeric maximum allowable load, numeric reductions in pollutant load, or narrative statements of desired conditions regarding habitat or biology.

- ***Margin of Safety:*** The MOS is assigned and depends on the uncertainty in load, waterbody response and reduction feasibility.
- ***Seasonality:*** Seasonality is considered in the TMDL to ensure that WQS will be met and maintained throughout the year. Variations occur due to variations in the waterbody (assimilative capacity caused by seasonal changes in temperature and flow or sensitive periods for aquatic biota) and variations in loading (seasonal industries, snowmelt, precipitation events).
- ***Future Growth:*** Future growth or changes in land use can impact threatened or impaired waters. A reasonably foreseeable allocation may be allotted to future growth. If so, the TMDL should explain how evaluation of future growth was made and the implications for local planning processes and landowners.
- ***Implementation Plan:*** The Implementation Plan may be developed for one or multiple TMDLs in the watershed. The plan should include a description of the implementation actions or management measures required to meet the allocations and a description of the effectiveness of the actions; a timeline of when activities will occur including interim milestones; reasonable assurance that the activities will occur; legal or regulatory controls; the time required to attain WQS (by source or source category); a monitoring plan (including interim milestones); a description of milestones for attaining WQS; and TMDL revision procedures and triggers for revisions.
- ***Monitoring Plan:*** A Monitoring Plan is prepared to determine the effectiveness of control measures, whether the TMDL is working and a procedure for TMDL revision if standards are not being met. The plan should be based on DQOs and should include sampling parameters, locations, frequency, methods, schedule and who is responsible for implementing it. Watershed stakeholders can participate in developing and carrying out the Monitoring Plan.

Opportunity for Integration

- The TMDL Implementation Plan may adopt documentation from other programs to provide reasonable assurance that the designated load reductions will occur.

Opportunity for Integration

- For Watershed-based cleanup, the Monitoring Plan should describe a comprehensive monitoring effort that meets the needs of all stakeholders. The plan should describe what will be performed to ensure WQS are being met and that specific cleanup actions (Superfund cleanups, RCRA Cleanup Actions) are performing to the standards set in decision documents.

RCRA

EPA's goal is to facilitate timely, efficient and effective cleanups focused on results. Recent guidance encourages RCRA project managers to use a flexible approach that allows innovative technical approaches and focused data collection to speed the RCRA process while still ensuring that a remedy that will protect human health and the environment, prevent future releases and properly manage waste. The flexible approach can allow the following steps to be conducted in a less formal atmosphere. Public participation in decision making is still required, so it is recommended that public opinion be sought early and often when using the results-based approach.

RCRA Corrective Measures Study (CMS)

A CMS is performed when the potential need for corrective measures is verified by an RFI. EPA sets action levels that may be based on existing standards such as those found in the SCDM, Region 3 Risk Based Concentrations or Region 9 PRGs, state Water Quality Criteria or other appropriate levels. The facility may request that no further action be required on the basis of a determination that no release poses a threat to human health and the environment. If EPA requires further action, the CMS is prepared to analyze potential remedies. The number of remedies evaluated can vary from site to site. Potential remedies are evaluated for performance, reliability, ease of implementation and potential adverse impacts. The effectiveness, time required for implementation, estimated costs, and administrative or institutional requirements are also considered. EPA sets target cleanup levels against which the alternatives are measured. The final *media cleanup standards* may be more stringent than the target cleanup levels.

EPA has determined *presumptive* remedies applicable to specific categories of sites. EPA has already compared these alternatives against other alternative remedies generally applicable to that type of site, reducing the number of alternatives that must be considered in the CMS.

RCRA Corrective Action

Site-specific media cleanup standards are set that depend on reducing risk to an acceptable level for the current and anticipated future land use. Points of compliance are set that determine at what location the cleanup standards must be met. For example, for ground water, the point of compliance might be where the release enters surface water or the nearest well used for drinking water. Using the CMS, the remedy is selected that is protective of human health and the environment, achieves media cleanup standards set by EPA, controls the source of the release and prevents further releases to the extent practicable and properly manages wastes generated by the remediation. EPA also considers the long-term reliability and effectiveness of the remedy, the effectiveness of the remedy in reducing the toxicity, mobility or volume of contaminants; the short-term effectiveness of the remedy; ease of implementation; and cost. A compliance schedule is set, and the facility proceeds to implement the remedy. Corrective action may be conducted as a result of permit requirements, a corrective action order or voluntary corrective action. Long-term monitoring may or may not be required.

Interim measures may be required to address immediate threats to human health and the environment.

For more information, see *Results-Based Approaches and Tailored Oversight Guidance for Facilities Subject to Corrective Action Under Subtitle C of the Resource Conservation and Recovery Act.* EPA 530-R-03-012. September 2003.
www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/gen_ca/reslt-bse.pdf

CERCLA Removal Actions

EPA conducts or supervises Removal actions at sites where there are releases or threatened releases to the environment of *hazardous substances* or any pollutant or contaminant that could present an imminent or substantial danger to the public health or welfare or to the environment. Removals are classified as emergency, time-critical, or non-time-critical, depending on the time in which a response can be taken. Generally, the more time available, the more detailed the analysis of alternatives can be.

CERCLA Remedial Alternatives

The processes related to selection and implementation of remedial alternatives are described generally below.

Feasibility Study

The FS generally is conducted to develop and evaluate remedial alternatives. FS activities typically are fully integrated with the RI. FSs can include an alternatives screening step to select a reasonable number of alternatives for detailed analysis. To develop and screen alternatives, RPMs normally identify remedial action objectives that specify contaminants of concern, potential exposure pathways and remediation goals. Remediation goals generally establish the extent to which the site should be cleaned up to protect human health and the environment. The NCP and Superfund guidance documents for remedial actions address several factors that are considered in developing remedial action objectives, including the following:

- For known or suspected carcinogens, the remedial action normally achieves an upper-bound lifetime cancer risk level of between 10^{-4} and 10^{-6} for high-end receptors.
- For noncarcinogenic hazardous substances, a safe exposure level generally is established. This level normally represents a dose below which no adverse health effects are expected.
- For ground water, MCLs and nonzero MCLGs established under the SDWA (applicable to certain public water supplies) are potential ARARs.
- Ecological risks should be reduced to levels that are acceptable, with special attention paid to sensitive habitats and critical habitats of species protected under the ESA.
- Other ARARs must be met or waived.

As addressed in the NCP, remedial alternatives are developed and screened. EPA considers alternatives that reduce toxicity, mobility or volume of contaminated material through treatment; generally, alternatives that call for off-site transport and disposal or containment without treatment are the least-favored. EPA also considers a *no-action* (or *no further action*) alternative to provide a baseline for comparison. For categories of treatment options, a representative process option often is chosen for detailed analysis.

Remedial alternatives generally are screened to reduce the number of alternatives that will undergo detailed analysis and ensure that the most promising alternatives are considered. In general, the NCP's screening criteria include the following:

- ***Effectiveness.*** Generally, this includes the degree to which an alternative reduces toxicity, mobility, or volume through treatment; minimizes risks and provides long-term protection; complies with ARARs; minimizes short-term impacts; and achieves protection quickly.
- ***Implementability.*** Generally, this includes the technical feasibility and availability of the technologies each alternative would employ.
- ***Cost.*** Generally, alternatives providing effectiveness and implementability similar to that of another alternative, but at a greater cost, may be eliminated.

Under the NCP, the alternatives retained after the screening process are subjected to detailed analysis and comparison to nine criteria:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility or volume
5. Short-term effectiveness

6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

Generally, the purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to the others. These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria and modifying criteria.

Threshold criteria (which are the first two and based on statutory requirements) must be satisfied for a remedial alternative to be eligible for selection. Primary balancing criteria generally are used to weigh trade-offs between alternatives. State acceptance and community acceptance are modifying criteria that are taken into account after public comments are received on the proposed plan.

CERCLA Criteria for Selecting Remedial Action

Threshold Criteria

Overall Protection of Human Health and the Environment generally addresses whether a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

Compliance with ARARs generally addresses whether or not a remedy will meet all federal and state environmental requirements, standards, criteria and limitations that are applicable or relevant and appropriate.

Primary Balancing Criteria

Long-term Effectiveness and Permanence generally refers to expected residual risk and the ability of the remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion often includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of the management controls (e.g., institutional controls).

Reduction of Toxicity, Mobility, or Volume through Treatment generally addresses the degree to which treatment will be used to reduce the mobility, toxicity or volume of contaminants causing site risks.

Short-Term Effectiveness generally addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and operation of the remedy until cleanup goals are achieved.

Implementability generally addresses the technical and administrative feasibility of the remedy, including the availability of materials and services needed for a particular option.

Cost generally includes estimated capital (construction), O&M and net present worth costs. (The present worth analysis normally is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year—usually the current year. This analysis allows the cost of the remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the basis year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life.)

Modifying Criteria

State Acceptance generally indicates whether the state/Commonwealth concurs with, opposes, or has no comment on the selected remedy.

Community Acceptance considers whether the state/community agrees with the proposed remedy. This often is assessed in detail in the ROD responsiveness summary, which addresses public comments received on the Administrative Record and the PP.

A variety of alternatives may be considered for a site. For example, remedial alternatives for a site containing soil contaminated with solvents might include excavation and on-site or off-site treatment, capping combined with ground water pumping and treatment and in-situ treatment. Special rules can apply to sites where off-site transport and disposal are the selected alternative, to ensure hat the ultimate waste repository is in compliance with applicable laws. Generally, an alternative that does not allow unlimited use of a site after the remedial action is implemented, includes institutional controls to restrict land usage.

CERCLA Removal Engineering Evaluation/Cost Analysis (EE/CA)

For NTCRAs, the lead agency normally conducts an EE/CA, which is an analysis of removal alternatives for a site. The EE/CA should present definitive information on the source, nature and extent of contamination and risks presented by the site. The EE/CA also presents an analysis of removal alternatives. If an RI has been completed (because the removal is related to an NPL site), risk assessment data from the RI may be used to support the removal action objectives and only limited data collection will be required. The goal of the EE/CA is to identify the objectives of the removal action and to analyze the effectiveness, ability to implement and cost of various alternatives that may satisfy the objectives. For TCRAs, a similar but less formal process is conducted.

The EE/CA contains the following:

- ***Site characterization*** includes the site description and background (location, type of facility and operational status, structures/topography, geology/soil/aquifer information, surrounding land use and populations, sensitive ecosystems and meteorology); previous removal actions; source, nature and extent of contamination (locations of contaminants, magnitude of contamination, physical and chemical properties of the contaminant and targets potentially affected by the site); analytical data (existing data and data collected during the EE/CA); and streamlined risk evaluation (focused on the source of contamination the removal action will address).
- ***Identification of Removal Action Objectives*** requires a review of statutory limits on removal actions, determination of removal scope, determination of removal schedule and planned remedial activities.
- ***Identification and Analysis of Removal Action Alternatives*** involves the determination of the effectiveness (protection of human health and the environment; compliance with ARARs and other criteria; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness), implementability (technical feasibility, administrative feasibility, availability, state acceptance, and community acceptance); and cost (direct capital costs, indirect capital costs and post-removal site control costs) of an alternative. Presumptive remedies may be used to speed selection of an alternative.
- ***Comparative Analysis of Removal Action Alternatives*** is a comparison of the alternatives.
- ***Recommended Removal Action Alternative*** is the treatment that is preferred over containment or land disposal, and permanent solutions are preferred over temporary.

CASE STUDY

Cooperatively Working in the Left Hand Watershed

An MOU between EPA Region 8 and USFS Region 2 (see Appendix D) was developed for the Left Hand Watershed project in Colorado to describe the roles each program will play in assessment and cleanup of mixed ownership sites. The MOU will apply to other mixed-ownership sites within the Regions. One lead agency will be designated for each site, but work will be cooperative unless the agencies prepare an IAG to transfer funding for a single agency to perform the cleanup. (For more information about the Lefthand Watershed, see the case study in Chapter 2.

The state and the public are given the opportunity to comment on the EE/CA and recommended removal action. An action memo is prepared that documents the need for a removal response, the proposed action, the rationale for the proposed action and how state and public comments were considered. The action memo must be approved before work begins.

Proposed Plan, Public Comment, and Record of Decision

The selection of the remedial action generally is a two-step process; first the Region develops a PP that is put out for public comment, and second, the Region issues a ROD. The state, community and other stakeholders are given several opportunities to participate in the remedy selection activities. The remedy selection process may be initiated at one OU at a site while other OUs are still undergoing investigation or are in other stages of the cleanup process.

The lead agency (typically EPA at private sites; the owning federal agency at federal facilities) often works closely with the support agency to prepare a PP that summarizes the remedial alternatives that were analyzed, proposes a preferred remedial alternative and summarizes the information used to determine the preferred alternative. The PP is presented to the public and may be revised in response to state and public comments as appropriate.

After evaluating all comments received on the PP, the lead agency makes the final remedy selection decision. This decision is documented in the ROD, which may be signed by the Regional Administrator for sites where EPA is the lead agency. The ROD typically contains significant facts, analysis of facts and site-specific policy determinations considered in the remedy selection process and explains how the nine evaluation criteria were used to select the remedy. Generally, the ROD is based on an administrative record and is made available for public inspection. RODs for Superfund-financed actions normally include a formal written concurrence from the state.

Opportunity for Integration

- When appropriate, the ROD should address the watershed cleanup goals and objectives to the extent possible. For example, when determining ground water cleanup levels for the ROD, it may be appropriate to pay special attention to assessing the site's impact on surface water quality and drinking water sources in the entire watershed. Extra efforts also may be appropriate to ensure that the proposed remedy is congruent with restoration and redevelopment actions that will be conducted by other WCT partners.

Remedial Design/Remedial Action

The RD generally is the engineering plan used to guide implementation of the selected remedy. Remedial action (RA) generally is the physical implementation of the ROD and RD. RD/RA activities generally conform to the remedy set forth in the ROD and other decision documents. The NCP addresses mechanisms through which changes can be made to remedies specified in ROD. If the lead agency determines that some changes should be made to the selected remedy, but the changes do not fundamentally alter the remedial selection analysis set forth in the ROD, it may be appropriate to publish an explanation of significant differences (ESD). Fundamental changes to a ROD normally are documented in an amended ROD.

Operation and Maintenance

Many RAs will require O&M measures to continue at the site to ensure effective remedy implementation. O&M measures generally are initiated after the remedy is constructed and is determined to be operational and functional. At Fund-lead sites, in general EPA pays 90 percent of CERCLA remedial activities, and the state pays a 10 percent cost share. Typically one year after the commencement of O&M measures, the state assumes 100 percent of O&M. Federal funding (90 percent) of certain actions involving measures to restore ground water to beneficial use may continue for up to 10 years after the remedy becomes operational and functional.

Five-year reviews are performed at many CERCLA sites to ensure the remedy continues to be protective of human health and the environment.

NRDA

The NRDA process is described earlier in Chapters 2 and 4. The goal of the NRDA process is to restore resources—those actions undertaken to return an injured resource to its prerelease condition as measured in terms of the injured resource's physical, chemical or biological properties or the services it would have provided.

During settlement negotiations or after a settlement is reached, a Restoration and Compensation Determination Plan (restoration plan) is developed. The restoration plan specifies the necessary actions to restore the injured resources. The restoration plan documents the process to select restoration/replacement actions and assign costs. It lists a reasonable number of possible alternatives for restoration, rehabilitation, replacement or acquisition of equivalent resources and the related services lost to the public associated with each; selects one of the alternatives and the actions required to implement that alternative; gives the rationale for selecting that alternative; and identifies the methodologies that will be used to determine the costs of the selected alternative and the compensable value of the services lost to the public associated with the selected alternative. Possible alternatives are limited to those actions that restore, rehabilitate, replace or acquire the equivalent of the injured resources and services to no more than their baseline. The restoration plan may be expanded to incorporate requirements from procedures required under other portions of CERCLA or the CWA or from other federal, state or tribal laws applicable to restoration, rehabilitation, replacement or acquisition of the equivalent of the injured resources or may be combined with other plans for related purposes as long as the requirements of this section are fulfilled. The actions can be carried out on the lands where the contamination occurred or, if appropriate, at an alternate site that, when restored, provides a suitable replacement for the injured or lost resources.

When selecting the alternative to pursue, the Trustee considers the following factors:

- Technical feasibility
- The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, or acquisition of equivalent resources
- Cost-effectiveness
- The results of any actual or planned response actions
- Potential for additional injury to the injured resources or other resources resulting from the proposed actions, including long-term and indirect impacts
- The natural recovery period
- Ability of the resources to recover with or without alternative actions
- Potential effects of the action on human health and safety
- Consistency with relevant federal, state and tribal policies
- Compliance with applicable federal, state and tribal laws

The public is provided the opportunity to comment on the restoration plan during a public comment period. Once a settlement is reached with the responsible party, the restoration plan is implemented by the Trustees or the responsible party under the supervision of the Trustees. The Trustees monitor restoration projects to assure that they continue to be properly operated and to determine whether the efforts are successful over the long run in restoring the injured resources.

Opportunity for Integration

- Coordination among Trustees and between Trustees and other agencies participating in the NRDA process is designed to help all agencies present reasonable, consistent, cleanup alternatives to the community. Consistent with CERCLA, Regions also should coordinate with other agencies, including trustee agencies, throughout the cleanup process. This approach should improve community participation and support and reduce the potential for confusion that can occur when several agencies present conflicting solutions to the contamination problems in their community.
- Monitoring may also be integrated between TMDL, CERCLA Remedial, CERCLA Removal and NRDA programs.

Brownfields

Brownfields cleanups must protect human health and the environment and be conducted in accordance with federal and state laws. Cleanup levels that protect human health and the environment are determined by EPA and state agencies and may be based on existing standards such as those found in the SCDM, Region 3 Risk Based Concentrations or Region 9 PRGs, state Water Quality Criteria or other appropriate levels. Cleanup levels depend on the intended use of the property. The approach to selecting a cleanup alternative that will meet the cleanup levels is flexible. Innovative cleanup technologies are encouraged but must meet the site-specific cleanup standards. Public participation is required beofre implementing the remedy.

Additional Topics Related to Watershed Cleanup and Monitoring

Applicable or Relevant and Appropriate Requirements (ARARS)

In general, CERCLA requires that on-site remedial actions attain or waive federal and more stringent state ARARs upon completion of a remedial action. The NCP addresses compliance with ARARs during removal actions to the extent practicable. ARARs normally are identified during the EE/CA and RI/FS studies and are considered in the selection of alternatives. ARARs may be chemical-specific (such as WQS), action-specific (such as subtitle C landfill requirements) or location-specific (such as wetlands regulations). In general, the six circumstances provided in CERCLA section 121(d) under which ARARs may be waived are as follows: the action is an interim measure, the action would cause greater risk to human health and environment, technical impracticability, equivalent standard of performance, inconsistent application of state requirements and fund-balancing. As part of the ARARs analysis, project managers, in consultation with the site attorney, should consider appropriate requirements promulgated under the CWA. Federal water quality criteria as well as state-promulgated regulations including state WQS may be potential ARARs for surface water when water is discharged from dewatering or treatment areas or as effluent from confined disposal facilities (CDFs). Furthermore, some states may have their own promulgated sediment quality standards that may be potential ARARs for sediment.

TMDLs established or approved by the EPA under the CWA are planning tools designed to reduce contributing point and NPS of pollutants in water quality limited segments (WQLS). TMDLs calculate the greatest amount of loading of a pollutant that a waterbody can receive without exceeding CWA WQS. TMDLs are usually established by the states, territories or authorized tribes and

Opportunity for Integration

- In an effective watershed cleanup effort, non-CERCLA programs should clearly identify their requirements to CERCLA participants; this approach should help programs work together to ensure that effective, economical remedies are implemented to meet the goals of all participating programs in a manner that is consistent with CERCLA and the NCP. Early and frequent communication between programs is key to identifying and addressing ARARs.
- When a waiver from ARARs is necessary for on-site remedial action, the WQS program and the Trustees can help the RPM develop targets that may still protect the existing use.
- The target for the TMDL represents the existing numeric standard or a translation of the narrative criteria/use classification into a quantifiable criterion that is relevant to the specific sites and applies to a specific point of compliance on a stream/segment/reach. These standards or translation of standards may be ARARs in appropriate circumstances.
- Collaboration between CERCLA and TMDL programs should help to quantify the needed load reductions on a source-by-source basis within the watershed to achieve the desired TMDL targets. This should include an analysis linking the controls to the environmental indicators (e.g., WQS).

approved by the EPA. Effluent limits for point sources in NPDES permits should be consistent with the assumptions and requirements in a WLA in an approved TMDL.

TMDLs established by states, territories or authorized Indian tribes, may or may not be promulgated as rules. EPA-established TMDLs are not promulgated as rules, are not enforceable and, therefore, are not ARARs. TMDLs established by states, territories or authorized tribes should be evaluated on a regulation-specific and site-specific basis. Even if a TMDL is not an ARAR, it may aid in setting protective cleanup levels and may be appropriately a to-be-considered (TBC) guidance. Project managers should work closely with regional EPA Water Program and state personnel to coordinate matters relating to TMDLs. The project manager should remember that even when a TMDL or WLA is not enforceable, the WQS on which they are based may be ARARs. TMDLs can also be useful in helping project managers evaluate the impacts of continuing sources, contaminant transport and fate and effects. Similarly, Superfund's RI/FS may provide useful information and analysis to the federal and state water programs charged with developing TMDLs. For more information, see EPA *Contaminated Sediment Remediation Guidance for Hazardous Waste*, OSER 9355.0-85, December 2005, page 3-8, **www.epa.gov/superfund/health/conmedia/sediment/guidance.htm**.

CASE STUDY

Setting Site-Specific Water Quality Standards

Eagle River and French Gulch

Eagle River

At the Eagle Mine Superfund Site in Colorado, it was technically impracticable to achieve the existing state WQS, so the RPM worked with EPA and state WQS programs and the community to determine appropriate biological metrics to support a brown trout fishery. The biological criteria were used to define a *healthy biological community*. When compliance with the biological criteria is achieved, the water quality will be measured and used to define new WQS for the Eagle River.

French Gulch

At the Wellington Oro Superfund site, metal-laden water from abandoned mine workings was discharged both at a discrete seep and through dispersed subsurface flow into ground water. Most of the water was discharged at the on-site seep so it could be treated and released to the Blue River; however, it was suspected that additional mine pool water was being discharged at unknown locations within the alluvial aquifer. Despite several hydrogeological studies, the underground discharge locations were difficult to identify because of the complexity of the mine workings and the dredge mining-disturbed streambed. UAA was conducted for the Blue River to determine (1) appropriate water quality criteria downstream of the mine and (2) if additional costly investigations that might allow for capture and treatment of this water were necessary. The UAA provided documentation for site-specific WQS in the Blue River and concluded that the aquatic habitat in the Blue River was severely impacted by historic dredge mining and, despite restoration of portions of the river, habitat is limited to supporting adult brown trout. The WQS for the Blue River 2 miles downstream of the French Gulch inflow were adjusted to reflect the adult brown trout criteria. The revisions to the WQS were approved by the Colorado Water Quality Control Commission and used in the final determination of the final remediation alternative. Working together, both Water and Superfund Program goals were met, plus the property was available for reuse. A subsequent consent decree, agreed to by the DOJ, DOI, EPA, state of Colorado and B&B Mines, provided the level of comfort needed to allow the sale of the property to Summit County and the Town of Breckenridge for use as open space.

Wetlands Protection

At CERCLA sites containing wetlands, wetlands protection and restoration issues should be considered during the PA/SI, EE/CA, RI/FS studies and during RD/RA. Wetlands typically are considered in the ecological risk assessment and the FS where the response action may impact the wetlands. Where possible, impacts to wetlands from remedial actions should be avoided or minimized. Even though actual CWA section 404 permits are not required for on-site Superfund actions in wetlands, the substantive requirements of the section 404 regulations are met and unavoidable impacts to wetlands are mitigated. Before initiating any action that might impact wetlands, regional wetlands staff and the BTAG should be contacted for advice on CWA section 404 compliance and watershed protection priorities.

CASE STUDY

Working Together for Remediation, Habitat Restoration, and Reuse

Jordan River, Salt Lake County, Utah

Map of South Jordan City Wildlife Enhancement Project, USFWS

The Jordan River, in Salt Lake County, Utah, is a highly urbanized and degraded river that has been dewatered, channelized and polluted. Five Superfund sites on the Jordan River have been or are in the process of being remediated. In 1991 the USFWS received a $2.3 million settlement from the responsible parties of one of the Superfund sites known as the Sharon Steel Superfund site. The funds were for restoring threatened and endangered species, migratory birds and wetlands affected by the release of heavy metals from the site. In 1997 the USFWS embarked on three long-term projects to restore damaged natural resources and restore 274 acres of habitat on the Jordan River. Other federal, state, municipal and nonprofit organizations including Utah Reclamation Mitigation and Conservation Commission, EPA, USACE, Utah Division of Wildlife Resources, West Jordan City, the city of South Jordan, National Audubon Society, Great Salt Lake Audubon Society, Tree Utah and Trust for Public Lands have contributed both funds and in-kind services to match the $2.3 million with $7.4 million for a total of $9.7 million. This partnership of state and federal agencies and local organizations has begun work on properties that have been acquired for the restoration project. Efforts are underway to contour highly erodible banks, remove nonnative invasive vegetation and to plant trees and shrubs that are native and provide quality habitats for migratory birds. As property values continue to rise, it becomes a race to acquire the remaining acreage with the secured funds, and the USFWS is now looking for new partners to join the effort to preserve and protect a riparian corridor on the Jordan River. These projects represent immense planning, negotiating and vision from many agencies of various jurisdictions as well as nonprofit organizations, municipalities and private citizens that have come together to make these projects a reality.

The Jordan River is listed as impaired on the Utah 303(d) list for dissolved oxygen and TDS. In early 2005, work began on a TMDL for the Jordan River from Utah Lake to Great Salt Lake. Utah DEQ, Salt Lake County, and the towns along the Jordan River are working together to coordinate the TMDL development, CERCLA remediation and revitalization activities along the river. At the request of the Utah DEQ, EPA and other agencies are consolidating efforts to develop the Jordan River TMDL, identify opportunities for cross-program collaboration and coordinate the various implementation projects. The EPA TMDL coordinator will work with the group by examining ecological issues in a broader scale and reestablishing communication with the primary stakeholders

CASE STUDY

(continued)

Jordan River, Salt Lake County, Utah

regarding riparian restoration. This project is expected to be one of the most complex TMDLs that Utah will develop with a significant component for permitting, stormwater and wetlands, which will provide opportunities for instream mitigation.

An initial scoping meeting was held with USFWS, Salt Lake County, Utah DEQ, Utah Division of Water Quality and EPA about compiling existing data, current and upcoming activities, TMDL assessment and the benefits of coordination. The parties agreed to expand the TMDL assessment from the lower segment of the Jordan River to the entire reach. Additionally, work at the Midvale Slag NPL site where a consent decree has recently been signed and cleanup work initiated, will be modified to ensure that it fits with multiagency and community objectives. EPA Superfund contractors will provide modifications of stream restoration renditions to include hydraulic and hydrologic modeling. On-site contractors will delay the bank stabilization project until after high flow, which will allow for potentially more significant restoration. Midvale has agreed to review the renditions and consider more extensive in-stream restoration that may extend beyond the existing 50-foot open space.

The following projects are ongoing along the Jordan River:

- USFWS—Natural Resource Damage Award from Sharon Steele—three projects are on hold (Audubon Society, Tree Utah, USACE Water Resources Redevelopment)
- USACE—2004 Water Resources Redevelopment Project for the Jordan River $7,000,000 redirected to Iraq, so activities are on hold; lobbying through legislature for restoration of funds
- TMDL development is now extended to the entire Jordan River:
    - Dissolved oxygen, phosphorus
    - TDS
    - Fecal coliform
- Current TMDL development for Utah Lake, which contributes significant TDS loading to the Jordan River
- CERCLA—Midvale Slag NPL Site activities continue
    - Erosion control, April–June
    - Additional remediation/restoration requires more funding. Any Superfund dollars require 10 percent match from state
    - Removal of sheet pile
- 50 feet along stream bank have been donated by the owner to cities for open space

The following items are considered the next steps to collaborative cleanup:

- Collection of all existing data to be shared by contractors:
    - Historical data—two long-term monitoring sites (Narrows, Lower End)
    - USGS NAWQA data, 2000–2005 (Kid Wadell)
    - EMAP/REMAP data
- Superfund remediation plans will include the following:
    - Geomorphic analysis
    - Data acquisition

Jordan River, Salt Lake County, Utah

- Site reconnaissance
- Hydraulic/hydrologic analysis—model high and low flows
- Geomorphic analysis—channel stability, sediment transport
- Habitat analysis—structural enhancement, riparian corridor enhancement
- Implementation plan (phasing plan/schedule)
- Passive re-aeration, wetlands, and such
- Water quality modeling—metals, sediment, perchloroethylene

- Jurisdictional Wetlands on OU-1 between slag piles are not on redevelopment plans; potential restoration proposed by Salt Lake County for Midvale (significant financial benefits)
  - NRCS—wetland habitat improvement project funding
  - Engage Midvale and Salt Lake in discussion
- Salt Lake County is providing engineering support for removal of sheet pile and potential installation of cascading dissolved oxygen structure to be funded by Superfund
- Investigate Brownfields funding opportunities (restoration/revitalization in Midvale and West Jordan)
- Investigate EJ funding opportunities
- Light Rail Crossing draft Environmental Impact Statement (EIS), possible mitigation funds
- Stormwater Part II permit Sandy City
- Midvale and West Jordan redevelopment plans are in development

Jordan River

CASE STUDY

Milltown Reservoir Sediments Operable Unit

Milltown Reservoir/Clark Fork River Superfund Site, Western Montana

Artist's rendition of the future restored Blackfoot and Clark River confluence

The Milltown Reservoir Sediments Site (Milltown Site) is an OU within the larger Milltown Reservoir Sediments/Clark Fork River Superfund site. There are Superfund cleanup activities ongoing throughout the Clark Fork Basin. The Milltown Dam and Reservoir are at the confluence of the Clark Fork and Blackfoot Rivers, a few miles upstream of Missoula, in western Montana. Behind the dam are approximately 6.6 million cubic yards of contaminated sediments, the result of historical mining operations upstream in Butte. Arsenic in the sediments has polluted the local drinking water aquifer and release of copper in the sediments threatens downstream fish and other aquatic life. EPA issued a ROD calling for removal of the Milltown Dam and the most highly contaminated sediments. There is broad public support for this cleanup plan—98 percent of the nearly 5,000 comments received during the public comment periods supported EPA's proposed plans.

The Milltown Site is adjacent to the unincorporated communities of Milltown and Bonner. Missoula, 6 miles west of the site, is home to the University of Montana and is one of the fastest-growing areas of Montana, boasting world-class whitewater, fly-fishing and other recreational opportunities. People in the Milltown area are proud of their community, school and families and want to maintain their quality of life. A couple dozen community members are participating in a Redevelopment Community Action Group (funded by a Superfund Redevelopment Initiative award) and their aim is to provide EPA with a vision of what the community would like to see in terms of future site development. EPA and the natural resource Trustees are working to integrate remediation and restoration so they are compatible with desired local future land use.

Remediation and Restoration Goals

Remediation goals (Remedial Action Objectives) are

- Restore the ground water to its beneficial use within a reasonable time period using monitored natural recovery
- Protect downstream fish and macroinvertebrate populations from releases of contaminated reservoir sediments, which occur with ice scour and high-low events
- Provide permanent protection against dam failure and the subsequent catastrophic release of contaminated sediments
- Provide compliance with the ESA (bull trout fish passage) and wetland protection through consultation with USFWS, the Confederated Salish and Kootenai Tribes and state agencies

Milltown Reservoir/Clark Fork River Superfund Site, Western Montana

Restoration goals are

- Restore the confluence area of the Blackfoot and Clark Fork Rivers to be naturally functioning and self-maintaining
- Use natural, native materials, to the extent practicable, for stabilizing channels, banks and floodplain
- Improve water quality by reducing the rate of release of contaminated sediments through bank erosion outside the area covered by the remediation plan
- Provide high-quality fish and wildlife habitat
- Improve aesthetic values in the area by creating a diverse, natural setting

Milltown Dam and Reservoir

- Provide recreational opportunities such as river boating, fishing and trail access for hiking and biking in addition to the remedial and restoration goals set as part of the Superfund process. The community-based redevelopment group has the following goals, believing the cleanup efforts should
  - Contribute to redevelopment of a desirable community where people of all ages and income levels can and want to live
  - Build on current community character and strengthen the roots and sense of community pride
  - Protect a riparian buffer area and community open spaces that enhance community appeal
  - Be compatible with and promote a stable, mixed economy with opportunities for commercial, industrial, retail and service interests
  - Foster diverse, free, public river access and recreational opportunities compatible with the natural environment of the area
  - Promote infrastructure necessary for community development, maintenance and growth
  - Maintain and enhance the quality of the existing school district
  - Provide educational opportunities and facilities that allow people of all ages to learn about the history of the area and redevelopment efforts

Streamlined Remediation and Restoration

EPA, the state of Montana, the Trustees and the responsible parties (Atlantic Richfield Company/BP and NorthWestern Energy) have worked together, negotiating how the remediation and restoration would be integrated. The idea is that if the remedial program is going to move dirt, it should be put back in a way that literally lays the groundwork for planned restoration activities. Restoration and remediation have been streamlined in many ways, including

- Modifying the remedial design process to accommodate restoration elements (e.g., wetlands, natural channel, floodplain and vegetation designs)
- Integrating restoration construction activities into the remedial process (e.g., removing the powerhouse, radial gate and right abutment associated with the Milltown Dam; channel, floodplain and wetland construction)

(continued)

Milltown Reservoir/Clark Fork River Superfund Site, Western Montana

Remedial and Restoration Funding

The Superfund remediation costs, estimated by EPA to be approximately $106 million, are being borne by the responsible parties. The details of the cleanup costs and activities will be finalized in the Consent Decree among the various parties (DOJ, EPA, the State of Montana, Confederated Salish and Kootenai Tribes and USFWS).

Restoration funds are being provided by NorthWestern Energy ($23.9 million in cash and land donations) and Montana's Natural Resource Damages program. The courts approved Montana's Natural Resource Damages claim against Atlantic Richfield Company in 1999 for $135 million. The settlement provides funds to be used for restoration of natural resources in the Clark Fork River Basin (not only for the Milltown Reservoir area). Accordingly, the state will spend about $5 million from this fund.

Montana and the other Trustees will collectively contribute approximately $8 million for restoration of the Milltown Reservoir area. There has been substantial cost-savings by integrating remediation and restoration. Through close coordination and careful planning, around $2.5 million in remediation costs will have been saved. The responsible parties have agreed to perform about this same amount for restoration activities. In addition, by keeping in mind the community's vision for the area, remediation and restoration activities were coordinated to allow for planned community uses such as wildlife observation points, additional fishing and boating access points, a swimming beach, skating pond and interpretive center.

Milltown Reservoir, looking up towards the Blackfoot River

Milltown Reservoir after drawdown

Appendices

There are four appendices in this document:

Appendix A: **Left Hand Watershed Collaborative Sampling Documents**

Appendix B: **Standard Guidance to Format Sample Results, Field Measurements, and Associated Metadata**

Appendix C: **Left Hand Watershed Fact Sheet**

Appendix D: **USFS/EPA Memorandum of Understanding used in the Left Hand Watershed**

Because of their size, they are available only online at
www.epa.gov/superfund/health/conmedia/sediment/documents.htm

APPENDIX A

Lefthand Watershed
Collaborative Sampling Documents

APPENDIX A-1
Sampling and Analysis Plan

LEFTHAND WATERSHED

Sampling and Analysis Plan

March 23, 2004

Primary Contributors:

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CONTENT

TABLES

1.0 INTRODUCTION

This Sampling and Analysis Plan SAP describes the sampling, analysis and assessment methods that will be used for the following listed segments:

- Little James Creek
- James Creek and tributaries
- Lefthand Creek and tributaries

The Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) will coordinate environmental and water quality assessments and funding efforts within the Lefthand Watershed. This effort will promote a holistic approach to assure coordination in establishing and achieving environmental cleanup and water quality goals. A key component of this effort will be assuring participation between local, state and federal stakeholders.

There were synoptic surface water quality studies and data collection efforts focused on metals in the Lefthand Watershed by University of Colorado in 2002 and 2003. Under a current 319 EPA grant, a water quality assessment report of the Lefthand Watershed is being written by the Lefthand Watershed Oversight Group (LWOG). The focus will be to summarize the most relevant current and historic water quality work on-going in the Lefthand watershed. Sampling and analysis activities in 2004 will be conducted by the USFS, USGS, CDPHE and EPA with assistance from University of Colorado.

2.0 PROBLEM DEFINITION

2.1 Lefthand Watershed

The Left Hand Creek watershed lies in north central Colorado on the east slope of the Front Range of the Rocky Mountains north west of the city of Boulder. It drains about 85 square miles of an area ranging in elevation from nearly 14,000 feet at the Continental Divide east to about 4800 feet on the Plains where it discharges to St. Vrain Creek in Longmont, Colorado. Left Hand Creek, James Creek and Little James Creek are the only perennial streams in the watershed, however, there are numerous intermittent stream channels. The basin discharges an average of about 28,840 acre feet annually. Left Hand Creek and James and Little James Creeks are part of the Colorado Headwaters Hydrologic Unit Code 10190005. Left Hand Creek and James Creek are located in Boulder County just north of Boulder, Colorado. Little James Creek flows into James Creek, which flows into Left Hand Creek.

Left Hand Creek and Little James Creek are listed on the State of Colorado's 1998 303(d) list as impaired for not supporting the aquatic life use classification. Both waters are listed with a high priority for Total Maximum Daily Load (TMDL) development. The listing specified that the numeric standards for cadmium, iron, manganese, zinc and pH, were not being attained. Additional dissolved metals data have shown that standards for copper and lead are also exceeded. The water quality in Left Hand Creek, James Creek and Little James Creek is affected by discharges from various mines and waste rock and mine tailings in the area. The drainage area encompasses the historical Captain Jack and Golden Age mining districts and receives runoff from a number of rock dumps, mill tailings and abandoned mining sites. These areas were mined for gold, lead, silver, fluorspar (calcium fluoride) and uranium.

Although there are numerous mines throughout the watershed, only one mine is currently on the National Priorities List. This is the Captain Jack Mine and Mill, located in the upper portion Left Hand Creek. A remedial investigation is planned to begin at the Captain Jack Mine in FY 2004. The EPA and CDPHE under CERCLA have investigated two others. They are the Golden Age Mine located in Little James and James Creek, and the Slide Mine/Corning Tunnel, located in the middle portion of Left Hand Creek The site investigation for the Slide Mine/Corning Tunnel was conducted during FY 2003 EPA, State, and local partners are currently developing a strategy to address the Slide Mine/Corning Tunnel site.

The James Creek watershed covers approximately 36 square miles from its source near Ward to its confluence with Left Hand Creek. The Little James Creek watershed area only encompasses about three square miles.

The Jamestown's water supply intake is located in James Creek upstream of the inflow from Little James Creek. The Left Hand Water District serves drinking water to between 11,000 to 16,000 people in rural Boulder and Weld Counties. Left Hand Creek supplies water to Boulder Reservoir via Left Hand Reservoir. Twenty to sixty percent of the water in Boulder Reservoir, a water supply for the City of Boulder, can come from this source. The City of Boulder system supplies drinking water to 105,000 people.

3.0 Project Objectives

The primary goals of this investigation are to:

- Evaluate water quality in the various drainages within the Land Hand Creek Watershed;
- Conduct habitat studies to determine how well the waterbodies are functioning as habitat for fish, and other aquatic organisms;
- Conduct flow measurements to aid in evaluating existing metals loads to the watershed and potential sources of metals loading to the watershed;
- Use the data to assist in making feasibility and remedial cleanup decisions for the watershed in an effort to meet existing water quality standards that adequately protect human health and the environment in the watershed.

4.0 Lefthand Creek

4.1 Summary of Available Data

UOS (URS Operating Services) conducted field work at the Captain Jack Mill (CJM) site on June 25 and 26th, 1997. The CJM site is located about 1.5 miles south of Ward. The investigation involved the collection of 26 samples for laboratory analysis and the collection of non-site specific information. Surface water and sediment samples collected along Left Hand Creek and its tributaries on June 25 and 26, 1997, indicated elevated concentrations of aluminum, calcium, copper, iron, lead, magnesium, manganese and zinc. Furthermore, calculations indicated a sizable amount of metals loading to Left Hand Creek that is attributed to the Big Five Mine adit discharge. Left Hand Creek exhibited evidence of contamination from both the CJM site and the Big Five Mine adit. Evidence of contaminant migration from the CJM site was exhibited by fine grained materials (possibly tailings) present along the stream bank immediately adjacent to the mill site. Additional evidence of contamination took the form of an orange precipitate lining the bottom of portions of Left Hand Creek and the channel of the Big Five Mine adit drainage.

The Hazardous Materials and Waste Management Division (HMWMD) of the Colorado Department of Public Health and Environment (CDPHE), under a cooperative agreement with the U.S. Environmental Protection Agency (EPA), conducted a Combined Assessment if the Slide Mine/Corning Tunnel area in Fall 2002 and Spring 2003. The CA called for the collection of 24 field samples consisting of 4 solid source, 2 aqueous source/adit, 5 surface water. 5 sediment samples and 5 aqueous QA/QC samples. The Slide Mine site covers an area of approximately 12 acres near the town of Rowena. The mine is situated 0.65 miles west of Rowena along Lefthand Creek Road at an elevation of 8,200 feet. The Slide mine is located on the south side of Lefthand Creek on the hillslope overlooking the Left Hand Creek drainage. The mine is situated on the hill terrace approximately 1000 feet above Left Hand Creek. Analysis of surface water samples collected from Left Hand Creek did not indicate a release of contaminants to the stream from the mine adit and during periods when site conditions are steady. However, sediment samples collected from Left Hand Creek downstream of the probable point of entry for site contaminants indicate that pile materials are migrating from the site to the drainage and are present at elevated concentrations in sediments 0.3 miles downstream of the site. CDPHE also performed a high-flow sampling event on April 18, 2003. Field observations made on this sampling date indicated that the site was discharging to Left Hand Creek.

Surface water and sediment data was collected by University of Colorado in 2002 and 2003 and the results indicated exceedances of the State of Colorado acute and chronic criteria for dissolved metals for copper and zinc.

Sediment
The Left Hand Water District experiences ongoing problems with sediment deposition at their intake on Lefthand Creek. This District has spent hundreds of thousands of dollars recently in efforts to mitigate the impact of these sediments. The District spends many man and equipment hours each year removing sediment from their intake structures.

Nutrients
There are potential nutrient loading concerns from the cumulative impact of Individual Sewage Disposal Systems (ISDS). The nutrient of concern for this effort is Total Phosphorus.

4.2 Proposed Monitoring Strategy for the Left Hand Creek

Tracer studies will be conducted by University of Colorado in March 2004 to determine metal loading throughout the basin. A synoptic study will be conducted in May and November, 2004 to characterize nutrient, sediment, metals and flow conditions on James Creek. Biological samples will be collected following protocols recommended by Will Clemens at CSU and described in section 6.0. The following parameters will be collected at various sites:

- *Field Parameters* – Temperature, flow, dissolved oxygen, pH, conductivity
- *Laboratory Parameters* – total phosphorus (TP), total suspended solids (TSS), total and dissolved metals, dissolved organic carbon (DOC), turbidity and hardness
- *Physical Habitat Parameters* – Particle size analysis, Rapid Bioassessment Protocols (Barbour, et al. 1999), pebble counts
- *Biological Parameters* – Macroinvertebrates (species composition and tissue analysis for metals)

5.0 James Creek

5.1 Summary of Available Data

The Golden Age Mining district contributes runoff to James Creek. Jenks Gulch, Castle Gulch, Hill Gulch and other drainages may be contributing additional metals to James Creek. Indications are that metals are not impacting James Creek upstream of Little James Creek. Metals concentrations at these sites were often below detection. An ecological investigation of the water quality of the upper James Creek (Duren, 2001) found that roads and off road vehicle activity may have had a negative affect on the ecosystem health of James Creek.

Data collected by the University of Colorado in July of 2002 indicated exceedances of the acute criteria for zinc in upper James Creek and exceedances of the acute criteria for copper and zinc at the point of confluence with Little James Creek. Data collected by RiverWatch indicate exceedance of acute criteria for copper in Upper James near Chipmunk Gulch and below Overland Mountain.

5.2 Proposed Monitoring Strategy for James Creek

A tracer study will be conducted in March 2004 by the University of Colorado to assess metal loading in the watershed. A synoptic study will be conducted in May and October, 2004 to characterize nutrient, sediment, and flow conditions on James Creek. Biological samples will be collected following Rapid Bioassessment Protocols. The following parameters will be collected at each site:

- *Field Parameters* – Temperature, flow, dissolved oxygen, pH, conductivity

- *Laboratory Parameters* – total phosphorus (TP), total suspended solids (TSS), total and dissolved metals, dissolved organic carbon (DOC), turbidity and hardness
- *Physical Habitat Parameters* – Particle size analysis, Rapid Bioassessment Protocols (Barbour, et al. 1999), pebble counts
- *Biological Parameters* – Macroinvertebrates (species composition and tissue analysis for metals)

5.3 Summary of Available Data for Little James Creek

The Little James Creek/ James Creek watershed drains numerous adits, shafts, and tailings piles within a part of the Jamestown Mining District, including the Burlington, Emmit, and Golden Age Mines. The area was primarily developed for its lead-silver, fluorspar, and uranium deposits. URS Operating Services, Inc. was tasked by the USEPA Region VIII, to conduct an Expanded Site Inspection under the Superfund program at the Golden Age Mine site in Jamestown, Boulder County, Colorado. The second field sampling event was conducted June 1 through 3, 1998. Aqueous samples collected that were collected from Little James Creek show elevated concentrations of the following total and dissolved metals; beryllium, lead, manganese, sodium, thallium, and zinc.

5.4 Proposed Monitoring Strategy for Little James Creek

A tracer study will be conducted in March 2004 by the University of Colorado to assess metal loading in the watershed. A synoptic study will be conducted in May and November, 2004 to characterize nutrient, sediment, and flow conditions on Little James Creek. Biological samples will be collected following RB Protocols. The following parameters will be collected at each site:

- *Field Parameters* – Temperature, flow, dissolved oxygen, pH, conductivity, turbidity
- *Laboratory Parameters* – total phosphorus (TP), total suspended solids (TSS), total and dissolved metals, dissolved organic carbon (DOC), turbidity and hardness
- *Physical Habitat Parameters* – Particle size analysis, Rapid Bioassessment Protocols (Barbour, et al. 1999), pebble counts
- *Biological Parameters* – Macroinvertebrates (species composition and tissue analysis for metals)

6.0 Summary of Monitoring Activities and Sampling Frequencies

6.0 Sampling Procedures

A listing of all of the proposed monitoring sites is presented in Table 6-1. An overall summary of the proposed sampling activities is presented in Table 6-2. The laboratory will provide training to any volunteers that may assist with this sampling project. Field measurements including pH, conductivity, dissolved oxygen, and temperature will be taken at each sampling location listed in Table 1 All meters will be calibrated before use in the field. All field measurements and notations will be recorded in the field notebook.

A team led by Dr. Joe Ryan, Department of Civil, Architectural, and Environmental Engineering, and Alice Wood, a Master's student in the Department of Environmental Studies, will conduct metal loading tracer tests to locate the major sources of metals and acidity in the James Creek watershed. The metal loading tracer tests will be conducted during high- and low-flow stream conditions from April 2003 to August 2004 to investigate the effects of abandoned mines and mill sites on the water quality James Creek Additionally, a mass-balance approach will be used to assess the fate of metals entering the creeks as dissolved and colloidal fractions by measuring the metal content of the stream bed sediments. The results of the metal loading tracer tests will be disseminated to the various stakeholders concerned about water quality in the James Creek watershed to aid in decisions related to abandoned mine and mill site remediation.

Church et al. (1997) and Kimball et al. (2001) demonstrated the utility of tracer injections and synoptic sampling for the determination of metal loadings in stream systems. This study will incorporate tracer tests (the injection of a salt tracer to a stream and subsequent measurement of tracer dilution as it flows downstream), to precisely gauge stream discharge. Synoptic sampling involves collection of stream water samples at regular downstream intervals during the tracer test. Tracer experiment discharge data paired with laboratory analysis (ICP-AES and ICP-MS) of the stream water samples will allow the development of a stream profile of total and dissolved metal loadings.

Personnel from the U.S. EPA Region VIII Office of Technical and Management Services-Laboratory will conduct field measurements, habitat analysis and collect water and macroinvertebrate samples for laboratory analyses of those parameters identified in Tables 6-1 of this sampling plan. All parties involved in this sampling effort will be responsible for the collection and preservation of all samples and their appropriate chain-of-custody requirements. Surface water flow measurements and field parameters will be taken at the same approximate time that water samples are collected following procedures outlined in "Minimum Requirements for Field Sampling Activities" (EPA 1996). The laboratory will provide training to any volunteers that may assist with this sampling project.

Personnel from the CLP laboratory and ESAT team will analyze the sediment, groundwater and surface water samples for metals. The Region 8 EPA lab will analyze select samples for TDS, turbidity, DOC and total phosphorus. Samples will be collected into separate polypropylene containers and chilled for transport to the laboratories. Personnel from the EPA Region 8 lab will supervise the collection, preservation, labeling and shipment, including the appropriate chain-of-custody requirements for all samples they collect for chemical analysis. Sampling station locations for field parameters, habitat analysis, chemical analyses, and macroinvertebrates are presented in Table 6-1. Samples will be collected from the furthest downstream location to the upstream locations in order to minimize cross-contamination.

6.1 Flow Measurements and Field Parameters

Surface water flow measurements and field parameters, including temperature, flow, dissolved oxygen, pH, conductivity will be taken at the same approximate time that water samples are collected following procedures outlined in "Minimum Requirements for Field Sampling Activities" (EPA 1996). Flow measurements will be taken at the same approximate time that the water column and sediment samples are collected. Flow measurements will be made with a Marsh McBirney flow meter and a top-setting wading rod.

6.2 Biological Parameters – Macroinvertebrates (species composition and tissue analysis for metals)

Personnel from the EPA Region VIII lab will collect qualitative and quantitative aquatic macroinvertebrate samples. Replicate benthic macroinvertebrate samples (n=3) will be collected using a 0.1-m^2 Surber sampler (500-µm mesh net) from shallow riffle areas (<0.5 m) at selected sites. Substrate will be disturbed to a depth of approximately 10 cm and materials will be sieved using a 500-µm mesh sieve. All organisms retained will be preserved in 70% ethanol in the field. In the laboratory, samples will be sorted and organisms will be identified to the lowest practical taxonomic level (genus or species for most taxa; subfamily for chironomids).

We will measure bioavailability of heavy metals in the field using the filter-feeding caddisfly *Arctopsyche grandis* (Trichoptera: Hydropsychidae). *Arctopsyche* is a relatively large, widely-distributed caddisfly found in many Rocky Mountain streams. Because *Arctopsyche* is highly tolerant of heavy metals, this species can be collected from both reference and metal-contaminated sites. Caddisflies will be collected from field sites, placed in 20 mL acid-rinsed vials and immediately placed on ice. Where possible, replicate samples (n=3) will be collected from field sites. Where available, heptageniid mayflies, a grazer, will also be collected. Metals analysis will be done by the CLP lab using ICP-MS.

Metal bioavailability to aquatic organisms is greatly influenced by levels of dissolved organic carbon (DOC) in water. DOC will be measured at all field sites where macroinvertebrates and periphyton are collected. Water samples will be collected using a 60 mL syringe fitted with a collection tube and glass filter (0.7 mm pore size). Samples will be were preserved with hydrochloric acid (pH = 2.0) and stored at 4^oC. DOC will be analyzed at the EPA Region VIII laboratory.

Personnel from the EPA Region 8 Lab will be responsible for picking, sorting and identifying the macroinvetebrate to species level at selected sites. All macroinvertebrates will be identified to the lowest taxonomic level possible. All specimens and debris will be returned to the EPA Region VIII for final disposition. EPA Region VII lab will also be tasked to produce a final report on results from the macroinvertebrate sampling.

6.3 Macroinvertebrate Sorting and Analysis and DOC

In the laboratory, samples will be sorted and organisms will be identified to the lowest practical taxonomic level (genus or species for most taxa; subfamily for chironimids).

Bioavailibility of heavy metals in the field will be measured using the fiter-feeding caddisfly *Arctopsyche Grandis* (Trichoptera: Hydropsychidae). *Arctopsyche* is a relatively large, widely-distributed caddisfly found in many Rocky Mountain streams. Because *Arctopsyche* is highly tolerant of heavy metals, this species can be collected from both reference and metal-contaminated sites. Caddisflies will be collected from field sites, placed in 20 mL acid-rinced vials and immediately placed on ice. Where possible, replicate samples (n=3) will be collected from field sites. Where available, heptageniid mayflies, a grazer, will also be collected. Metal analysis will done using ICP-MS.

Metal bioavailability to aquatic organisms is greatly influenced by levels of dissolved organic carbon (DOC) is water. DOC will be measured at all field sites where macroinvertebrates are collected. Samples will be preserved with hydrochloric acid (pH = 2.0) and stored at 4^o C.

6.4 Pebble Counts

The Zig-Zag Pebble Count Analyzer was developed by Greg Bevenger, Forest Hydrologist, Shoshone National Forest, and Rudy King, Station Statistician, Rocky Mountain Research Station, to help users properly implement the zig-zag pebble count procedure (Bevenger and King, 1995, A pebble count procedure for assessing cumulative watershed effects. Rocky Mountain Forest and Range Experiment Station Research Paper RM-RP-319, 17 pages). The zig-zag method is a pebble count procedure using a zig-zag sampling pattern along a longitudinal stream reach such that a stream is sampled along a continuum instead of an individual site, reach, or cross-section. By doing this, numerous meander bends and all associated habitat features are sampled as an integrated unit rather than as individual cross-sections.

Macro enabled worksheets are provided to help users: (1) estimate sample size, (2) enter field data, (3) produce tables and graphs, (4) perform statistical analysis using contingency tables and the Pearson chi-squared statistic, and (5) make notes. The spreadsheet-workbooks also contain case studies to illustrate typical application of the procedure and provides examples of typical analysis scenarios. The intent is to assist users with the development of study plans and to help them interpret results. The thrust of each analysis is to identify shifts in the fine gravel and smaller portions of the distribution, rather than the median.

6.5 Simple Field Leach Test for Rapid Screening

A field leach test will be used to assess the abandoned mine waste piles. The protocol is based on the paper published by U.S. Geological Survey, 2000 "A Simple Field Leach Test for Rapid Screening and Qualitative Characterization of Mine Waste Dump Material on Abandoned Mine Lands", Hageman, Philip L., Briggs, Paul H.

6.6 Sample Handling and Custody

Bill Schroeder, of the T&MS Laboratory, will be the field sample custodian and will keep records of all samples delivered to the EPA Region VIII laboratory for analyses. Chain of custody procedures will follow those listed in Region VIII's Minimum Requirements for Field Sampling Activities (September 1996).

A chain of custody record will accompany all chemistry samples and will be checked by the appropriate sample custodian. All samples will be tagged with pre-numbered and recorded samples tags.

The tentative types and numbers of analytical samples to be collected (exclusive of QC samples) are listed in Table 6-1).

6.7 Calibration Procedures and Frequency

All meter and laboratory calibration procedures will be conducted according to USEPA requirements and follow the EPA Laboratory's standard operating procedures and the manufacturer's instruction manuals. Electrodes for pH and conductivity determinations will be calibrated with appropriate buffers each day before samples are collected. The dissolved oxygen probe will be calibrated to saturated air prior to use in the field. Thermometer calibration is factory set by the manufacturer and is not required prior to use in the field. In the event that problems are discovered with instruments in the field, maintenance procedures described in the Region VIII Laboratory's SOPs (found on 8-net Intranet) and the manufacturer's instruction manuals will be performed as needed to assure the integrity field measurements.

6.8 Analytical Procedures

All procedures for metals analyses will follow USEPA's "Methods for Chemical Analysis of Water and Waste," 1983. All procedures for macroinvertebrate collection and identification will follow "Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers", Second Edition, 1999. Methods for field measurements of pH, conductivity, temperature and dissolved oxygen will follow EPA's "Methods for Chemical Analysis of Water and Wastes," 1983, APHA Standard Methods 16th Edition, the Region VIII SOP for Field Samplers, and the manufacturer's instruction manuals.

Special Instructions:

"Total Recoverable Analyte" means the concentration of analyte determined to be in either a solid sample or an unfiltered aqueous sample following treatment by refluxing with hot dilute mineral acid as defined in Method 200.2 (Methods for the Determination of Metals in Environmental Samples, Supplement 1, EPA/600/R-94/111, May 1994.)

"Dissolved Analyte" means the concentration of analyte in an aqueous sample that will pass through a 0.45-micron membrane filter assembly prior to acidification as defined in Method 200.7 Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma - Atomic Emission Spectrometry, Methods for the Determination of Metals in Environmental Samples, Supplement 1, EPA/600/R-94/111, May 1994.

7.0 QUALITY CONTROL REQUIREMENTS

One quality control sample set for chemical analyses, including a container blank, filter blank and preservative blank, will be collected for every 10 locations sampled in the field. Samplers will also prepare VOC trip blanks in the EPA regional laboratory prior to the initiation of fieldwork. Quality control samples will be used to determine whether or not sampling procedures introduce contaminants in the field. Field duplicates for chemical analyses will also be collected to determine whether or not the data is reproducible.

If QC samples reveal a sampling or analytical problem, field and laboratory personnel will troubleshoot the problem and attempt to identify the source of contamination. Upon working out a plausible solution, personnel will take necessary steps to assure that similar problems will not arise during future sampling events. Data may need to be flagged and qualified depending upon the nature and extent of the contamination.

Quality control checks to be performed by the Region VIII Laboratory, CLP and ESAT are listed in Table 7.0. The precision and accuracy for each chemical parameter will be determined according to the laboratory's SOPs and the EPA methods for Chemical Analysis of Water and Wastes. Laboratory personnel will include a QA/QC report in their final data package to the project manager. Chemical analytical results outside the limits for acceptability prescribed by the T&MS-Laboratory will be reported to William Schroeder and EPA Region 8 RPM Stan Christensen. Corrective action, including instrument recalibration and reanalysis of the sample will be pursued.

7.1 Decontamination Procedures

All sampling equipment will be acid rinsed and rinsed with deionized water between sampling stations. Prior to collecting samples at each new station, the equipment is rinsed three times with native water to further ensure no contaminant carryover. Equipment blanks will also be taken to ensure that the equipment decontamination process is adequate.

7.2 Disposal of Investigation-Derived Wastes

This field effort will involved the collection of minimal Investigation-Derived Wastes (IDW). Equipment rinsate wastes, disposable sampling equipment and personal protective equipment will be collected, contained, or bagged, as appropriate by each field team for proper disposal at the EPA Region VIII Golden, Colorado laboratory.

8.0 Data Quality Objectives Process

The EPA Data Quality Objectives (DQO) Process is a seven step systematic planning approach to develop acceptance or performance criteria for EPA-funded projects. Data quality objectives define the level of scientific rigor required for sample collection, sample analysis and data analysis. The DQOs for the Left Hand Creek Watershed effort are presented in the QAPP, (or see the example Table format I added at the end of this SAP.) The Seven steps of the process are:

1. The Problem Statement
2. Identifying the Decisions
3. Identifying the Decision Inputs
4. Defining the Study Boundaries
5. Developing Decision Rules
6. Defining Tolerable Limits on Decision Errors
7. Optimizing the Sample Design – I don't think all these have been fully addressed in the QAPP yet.

8.1 Criteria for Measurement Data

(See pages 18-21 of the EPA QA/G-5, December 2002.). These measurement performance and acceptance criteria are often expressed in terms of data quality indicators. The seven principle indicators are:

1. Precision - the degree of agreement among repeated measurements of the same characteristic, or parameter, and gives information about the consistency (reproducibility) of the method.
2. Bias – the systematic or persistent distortion of a measurement process that causes errors in one direction.

3. Accuracy - a measure of confidence that describes how close a measurement is to its "true" value.

4. Representativeness -the extent to which measurements actually represent the "true" environmental conditions.

5. Comparability - the degree to which data can be compared directly to similar studies and that one data set can be compared to another and combined for the decision(s) to be made.

6.Completeness - the comparison between the amount of data you planned to collect and analyze versus how much usable data was collected and analyzed. Normally expressed as a percentage.

7. Sensitivity – The capability of a method or instrument to discriminate between measurement responses representing different levels of the variables of interest.

Precision and accuracy for chemical measurements such as pH, temperature, conductivity and dissolved oxygen will be determined according to the EPA Chemical Methods Manual, EPA Region VIII's Standard Operating Procedures (SOP) for Field Samplers, or the manufacturers specifications. Macroinvertebrate data will be analyzed according to the procedures outlined in the EPA RBP Methods Manual. Data acceptability for macroinvertebrate identification may be determined by an outside source such as Colorado State University, or USGS. For this set of samples, precision will be based on one or two stations with a field duplicate for chemical analyses.

8.2 Data Quality Assessment –

Data Quality Assessments (DQA) are prepared to document the overall quality of data collected in terms of the established DQOs. The data assessment parameters calculated from the results of the field measurements and laboratory analyses are reviewed to ensure that all data used in subsequent evaluations are scientifically valid, or known and documented quality, and where appropriate, legally defensible. The goal of the DQA is to present the findings in terms of data usability.

The major components of a DQA are presented below and show the progression of the assessment leading to determination of data usability.

- A QA/QC review of field generated data and observations;
- Individual data validation reports for all sample delivery groups;
- Description of the procedures used to further quality data generated from samples run via dilution, reanalysis, and duplicate analysis;
- Evaluation of QC samples such as, field blanks, trip blanks(N/A), equipment rinsates, field replicates, and laboratory control samples to assess the quality of the field activities and laboratory procedures;
- Assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness throughout the examination of laboratory and field control samples in relation to established objectives and correct application of statistical methods(if applicable); and
- Summary of the usability of the data, any qualifiers and any biases, based on the assessment of data conducted during the previous steps. Sample results for each analytical method will be qualified as acceptable, rejected, or estimated.

9.0 Data Validation and Usability

9.1 Data Reduction, Validation and Reporting

Upon completion of chemical analysis, the laboratory will use the peer review process to detect errors in the analytical data package. All Lefthand field and analytical data will then be reviewed by the field team leader, the QA officer, and the laboratory senior chemist before it is presented to the EPA project manager. Decisions to reject or qualify data will be made by the senior chemist or QA officer.

Region VIII standard report forms will be used for all analyses. All data and significant observations during analyses will be noted in the final data package and will be kept on file at the EPA Region 8 Laboratory. Any deviations from the required analytical procedures will also be documented. Stream flow measurements will occur during the same general time period that the surface water samples are collected only if conditions allow safe access.

9.2 Validation and Verification Methods

Procedures to be used for validating and verifying data are as follows: comparing computer entries to field data log sheets, looking for data gaps, analyzing quality control data such as chain of custody information, spikes, equipment calibration, checking calculations, examining raw data for outliers, reviewing graphs and tables. If any of the data are found outside the QC limits identified in Table 7.0, re-analysis of the samples may be requested. Laboratory QC data will be reviewed to ensure that all data are useable.

Errors in data entry will be corrected. Outliers and inconsistencies will be flagged for further review, or discarded. Problems with data quality will be discussed in the draft and final reports.

9.3 Reconciliation with Data Quality Objectives

As soon as possible after this sampling event, calculation and determinations for precision, completeness, and accuracy will be made and corrective action implemented if needed. If data quality indicators do not meet this project's specifications, data may be discarded and resampling may occur. The cause of failure will be evaluated. If the cause is found to be equipment failure, calibration/maintenance techniques will be reassessed and improved. If the problem is found to be sampling team error, team members will be retrained. Any limitation on data use will be detailed in both draft and final reports.

If failure to meet project specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for future sampling events.

10.0 Documentation and Reporting

Field Notes
Field notes will include a chronological record of daily sampling events and sampling information to document the critical project information. This may include:

- Project Team Members and responsibilities
- Arrival time to location(s)
- Weather conditions
- Sample identification, location, and description;
- Sampler's name;
- Date and time of collection;
- Field instrument readings;
- Physical characteristics of the samples or the area from which collected;
- Field observations and details related to integrity of samples or laboratory analysis
- Deviations from sampling plan and why;
- Applicable health and safety information or issues

10.1 Sample Location Documentation

Records of actual sampling locations and procedures will be documented through keeping a field logbook, photographs, and use of a Global Positioning System (GPS) instrument. Locations will also be mapped. Due to unanticipated conditions, site locations or procedures may change. Any deviations in locations or procedures will be documented in the field logbook and discussed with the team members at the conclusion of each day's activities.

10.2 Data Reduction, Validation and Reporting

The results of the analyses conducted by Region VIII's laboratory, including raw data sheets, QA/QC report, and a summary of the data, will be forwarded to Kathryn Hernandez, Project Manager, Region 8 EPA. The laboratory will also provide the data in electronic format to Kathryn Hernandez in the form of a Excel spreadsheet. If any laboratory QA/QC does not meet the EPA Region VIII Laboratory acceptance criteria, Bill Schroeder will be immediately notified for further instructions. The results of the water chemistry and flow data will be evaluated and summarized by TMS personnel. Data validation for chemical analyses conducted by Region VIII will follow standard operating procedures

10.3 Internal QC Checks and Frequency

Duplicate sample(s) will be collected from surface water and sent to the laboratory for metals and anion analyses. Set(s) of field blanks (container, preservation and filter) from a surface water sampling location will also be collected to check on the sample container, filtration apparatus and acids used in preservation. Blanks will be prepared from ultra-pure deionized water that has been brought into the field from the laboratory. Blanks will be prepared in the same manner as typical samples under the same environmental conditions

10.4 Preventative Maintenance

Field meter supplies including filling and buffer solutions will be changed prior to the sampling event. All field meters will be checked in the laboratory prior to the sampling event and maintenance procedures will be followed when problems are noted. In the event that maintenance procedures are unable to fix the problem, probes or parts will be replaced as needed

10.5 Schedule

The following is a preliminary schedule for this field event. The schedule will be flexible and may change by events that occur in the field.

May 17 1) Travel from the EPA Golden Laboratory to the Boulder, Colorado. EPA Laboratory personnel will provide two pickup trucks that can seat the 2 laboratory personnel plus 3 volunteers. If you desire to ride in either of the two vehicles, please contact Bill Schroeder at 303-312-7755. Each vehicle will be gassed and equipped with maps and walkie talkies. Planned departure from the EPA Lab will be 8:00 AM.
2) Unload personal gear, prepare personal field gear, brief the field team, ready trucks for field sampling, calibrate meters.

May 18 1) Calibrate field meters, load personal field gear, meet USFS parking lot at 28th and Yarmouth. Divide into teams. Team leaders will be as follows:

TEAM 1: TBD
TEAM 2: Bill Schroeder (team lead)
TEAM 3: TBD

2) Sample sites. The sites each team is responsible for sampling are listed in Table 1 of this sampling plan.
3) Debrief the field team at the end of the day. Discuss problems encountered, sites not sampled, etc.

May 19 1) Same tasks as April 18. Sample remaining sites.

10.6 Health and Safety Plan

All personnel involved in this study have current health and safety training certifications and are participating in the EPA medical monitoring program. All personnel have been trained in field safety, first aid, CPR, and laboratory safety. It is anticipated that all fieldwork can be conducted in Level D personal protective equipment (PPE). A project-specific Health and Safety Plan will be developed and reviewed by all team members prior to mobilization. Each field team will carry a copy of the project-specific Health and Safety Plan throughout the duration of the project.

Table 6-1. Proposed Lefthand Watershed Monitoring Sites

Site ID#	Description	Latitude/Longitude	Rationale	Notes
Lefthand Creek and tributaries				
5560*	Nugget Hill Mine		Drainage from mine	Gully west of Nugget Gulch
5560*	Shneider Propery – mine opening into garage		Water drainage	Near Glendale Gulch
5560*	Gale Mine and Up Gulch		Mine drainage	Only flows before July
5560A1	Lefthand Creek at Peak-to-Peak Hwy	40 04 09.27 105 31 00.66	Background reference	ACU sample site 1. Benthic/sediment sample site, also.
5560A6	Upstream of unnamed trib that drains mine across P-to-P Hwy	40.06527 N 105.51326 W	Metals from mine site (unknown name)	At CU sample site 6
5560A-TC	Tributary C below Dew Drop tails	40 03 52.77 105 30 55.95		
5560A8	Downstream of unnamed trib that drains mine across P-to-P Hwy	40.06476 N 105.51185 W	Metals from mine site (unknown name)	At CU sample site 8
5560A12	Upstream of Big Five Tunnel site	40.06288 N 105.51053 W	Metals from Big Five Tunnel site	At CU sample site 12
5560A13	Upstream of Big Five Tunnel drainage confluence	40.06228 N 105.50967 W	Metals from Big Five Tunnel site	At CU sample site 13
5560ABF1	Big Five Tunnel drainage	40.06185 N 105.50899 W	Metals from Big Five Tunnel Site	At Big Five Tunnel discharge confluence with Lefthand Creek
5560A14	Downstream of Big Five Tunnel drainage confluence	40.06192 N 105.50876 W	Metals from Big Five Tunnel site	At CU sample site 14
5560A17	Upstream of White Raven site	40.06068 N 105.50694 W	Metals from White Raven site	At CU sample site 17
5560A21	Downstream of White Raven site	40.05885 N 105.50609 W	Metals from White Raven site	At CU sample site 21
5560A-PU	Puzzler Gulch	40.05562 N 105.50183 W	Major tributary to Lefthand	CU sampling showed this trib to be clean
5560A54	Downstream of Puzzler Gulch confluence	40.05551 N 105.50160 W	Potential for dilution from Puzzler	At CU sample site 29
5560A-IN	Indiana Gulch	40 03 21.74 105 30 04.37	Major tributary to Lefthand, drains Ward mine workings	CU sampling showed some elevated metals in this trib
5560A56	Downstream of Indiana Gulch confluence at Sawmill Road.	40 03 20.81 105 30 02.47	Metals from Indiana Gulch	At CU sample site 30. Benthic/sediment sample site, also.

5560ASPRI	Spring Gulch	40 04 29.32 105 25 10.52	Tributary to Lefthand	
5560A92	Downstream of Spring Gulch	40 04 28.54 105 25 07.80	Effects of Spring Gulch	CU sample site LH2 C
5560ALI	Lick Skillet Gulch	40 04 27.27 105 24 46.66	Effects of Lick Skillet Gulch	
5560A-95-1	Above Lick Skillet and below tailings	40 04 27.77 105 24 47.33		
5560A96	Below Lick Skillet	40 04 27.69 105 24 43.82	Metals from Lick Skillet Gulch	CU sample site 15. Also a benthic/sediment sample site.
5560A101	Above Slide Mine	40 04 28.60 105 24 02.98	Metals from Slide Mine	CU sample site LH2 21 Also a benthic/sediment sample site.
5560A-SL-1	Upstream Slide Mine discharge	40 04 28.17 105 23 59.39		
5560A-SL-2	Downstream Slide Mine discharge	40 04 28.02 105 23 59.39		
5560A103	Below Slide Mine	40 04 29.70 105 23 53.08	Metals from Slide Mine	CU sample site LH2 22. Also a benthic/sediment sample site.
5560A113	Below Rowena	40 04 43.50 105 23 01.54	Metals from old workings near Rowena	CU sample site LH3 4
5560A???	Above Glendale Gulch	40.08124 N 105.36906 W	Metals from workings along Glendale Gulch	CU sample site LH3 8
5560AGG	Glendale Gulch	40.0806288 N* 105.3660441 W*	Tributary to Lefthand	*approximate coordinates. Not previously sampled by CU (dry in 2003)
5560A???	Below Glendale Gulch	40.08263 N 105.36595 W	Metals from workings along Glendale Gulch	CU sample site LH3 10
5560A???	Above Nugget Gulch	40.08816 N 105.36378 W	Metals from workings along Nugget Gulch	CU sample site LH3 13
5560ANG	Nugget Gulch	40 05 19.73 105 21 48.84	Tributary to Lefthand	*approximate coordinates. Not previously sampled by CU (dry in 2003)
5560A123	Below Nugget Gulch	40 05 20.04 105 21 46.95	Metals from workings along Nugget Gulch	CU sample site LH3 14
5560A???	Above “Lee Hill Gulch”	40.09233 N 105.35279 W	Metals from Lee Hill Gulch	CU sample site LH3 19. Also a benthic/sediment sample site.
5560ALE	“Lee Hill Gulch”	40 05 36.13 105 21 03.94	Tributary to Lefthand	

5560A129	Below "Lee Hill Gulch"	40 05 35.69 105 21 02.18	Metals from Lee Hill Gulch	CU sample site LH3 20. Also a benthic/sediment sample site
5560A???	Above James Creek confluence	40.10053 105.34277	Metals from James Creek	CU sample site LH3 27. Also a benthic/sediment sample site
5560A???	Below James Creek confluence	40.10282 N 105.34033 W	Metals from James Creek	CU sample site LH3 32. Also a benthic/sediment sample site.
5560ATI	Tributary between LH4 10 and LH4 11 sample sites. "Unnamed Trib I"	40.1087646 N* 105.3354900 W*	Ephemeral tributary to Lefthand	*approximate coordinates. Not previously sampled by CU (dry in 2003)
5560A???	Downstream of 10/11 tributary	40.10883 N 105.33517 W	Effects of 10/11 trib	CU sample site LH4 11
5560AJE	"Jeep trail" tributary	40.10656 N 105.32175 W	Effects of "Jeep trail" tributary	
5560A127	Downstream of "Jeep trail" tributary	40 06 31.77 105 19 05.67	Effects of "Jeep trail" tributary	CU sample site LH4 22
5560A136-2	½ upstream of Carnage Canyon	40 06 15.61 105 20 16.19		
5560ASI	Sixmile Creek	40.11087 N 105.30696 W	Effects of Sixmile Creek	
5560A???	Downstream of Sixmile Creek	40.11014 N 105.30635 W	Effects of Sixmile Creek	CU sample site LH4 32
5560A???	At Buckingham Park	40.11113 N 105.30704 W	Downstream of major known metal and sediment inputs	CU sample site LH4 33. Also a benthic/sediment sample site.
5560ASPRU	Spruce Gulch	40.12448 N 105.30508 W	tributary to Lefthand	
5560A???	Downstream of Spruce Gulch	40.12491 N 105.30467 W	Effects of Spruce Gulch	CU sample site LH5 11
5560A184	At Haldi Headgate	40 07 53.07 105 17 33.11	Downstream of major known metal and sediment inputs	CU sample site LH5 18. Also a benthic/sediment sample site.

Site Id	James Creek Site	Latitude/Longitude	Rationale	Notes
James Creek				
5561A62	James Creek upstream of Lefthand	40 06 07.94 105 20 33.31	Major tributary to Lefthand	
5561AT1	James Creek at Peak-to-Peak Hwy	40 05 21.33 105 29 46.75	Background reference	Colleen has done pebble counts here* CU has not sampled here.
5561AT2	Below Co. Rd. 100 crossing over James Creek	40 05 31.25 105 29 09.56	Sedimentation from vehicle travel	Colleen has done pebble counts here. CU has not sampled

				here.
5561AT3	Above Forget-Me-Not meadow	105 25 59.3 40 05 57.57	Background reference site # 2	Colleen has done pebble counts and benthic studies here. CU has not sampled here.
5561AT4	Above the Creek Crossing	40 06 04.78 105 25 47.83	Sedimentation from vehicle travel (reference)	Colleen has done pebble counts here. CU has not sampled here.
5561A-1	Below the Creek Crossing	40 0607.77 105 2546.42	Sedimentation from vehicle travel	Colleen has done pebble counts and benthic studies here. This is also upstream of the Fairday.
5561A10	Below the Fairday Mine Site	40 0638.40 105 2514.35	Metals, sedimentation from Fairday mine workings	Colleen has done pebble counts and benthic studies here. USFS has also done pebble counts here.
5561AT5	Above Gary's campsite	40 06.704 N 105 24.802 W		Colleen has done pebble counts here*.
5561A16	Above Treatment Plant where gullies from Bueno Mt. enter stream	105 24 03.13 40 06 50.24	Metals, sedimentation from Bueno Mt. mine workings	
5561A28	Jamestown Water Treatment Plant	40 06 54.86 105 23 31.55		Colleen has done pebble counts here*
5561A29	Immediately upstream of Little James confluence	40 06.981 105 23.461	Metals, sedimentation from Little James	
5561A30-582	Immediately downstream of Little James confluence	40 06 55.75 105 23 18.86	Metals, sedimentation from Little James	
5561A37	At Town Park	40 06.799 105 22.840	Metals (particularly Pb)	
5561A52	Upstream of Curie Springs	40 06.590 105 21.529	Metals	
5561A53	Just downstream of Curie Springs	40 06 34.34 105 21 29.95	Metals	
5561A-CU	Curry Springs	40 06 34.53 105 21 33.40		
5561A55a	Upstream of Castle Gulch	40 0628.45 105 22 22.16	Metals, sedimentation from Castle Gulch	
5561AHI	Hill Gulch	40 06 46.76 105 22 46.47		
5561ACG	Castle Gulch	40 06 26.36 105 21 11.79	Metals, sedimentation from Castle Gulch	*approximate coordinates
5561A56	downstream of Castle Gulch	40 06.435 105 21.119	Metals, sedimentation from Castle Gulch	

5561A62	James Creek@ Buckingham Park	40 06 07.94 105 20 33.31	Major tributary to Lefthand	
	Little James Creek Site	**Rationale**	**Notes**	
Little James Creek				
5562A-0	Little James Creek background	40 08 12.19 105 24 41.57	Background reference	
5562A-6	Upstream of Argo and small tailings			
5562A-8	Upstream of Argo below small tailings	40 07 44.75 105 24 06.99		
5562A10	Downstream of Argo discharge, upstream of Emmit	40 07 42.02 105 24 01.91		
5562A15	Upstream of Burlington Mine, downstream of Emmit	40 07 34.91 105 23 55.13	Metals, sedimentation from Emmit Adit and Balarat Creek (reference)	
5562A14	Just upstream of Emmit Adit	40.12665 105.39925	Metals, sedimentation from Emmit Adit and Balarat Creek	
5562AEM	Emmit Adit	40 07 35.30 105 23 56.97		
5562A15	Just upstream of Balarat Creek confluence	40 07 34.91 105 23 55.13	Metals, sedimentation from Emmit Adit and Balarat Creek	
5562ABA	Balarat Creek	40 07 35.32 105 23 54.41		
5562A16	Just downstream of Balarat Creek confluence	40 07 33.74 105 23 54.61	Metals, sedimentation from Emmit Adit and Balarat Creek	
5562A18-1	upstream of JRT TAILINGS	40 07 27.03 105 23 52.35	Metals from undetermined source (tailings, also ephemeral trib)	
5562A-21	Downstream of JRT tailings	40 07 24.99 105 23 50.84		
5562A28	Upstream of Streamside Tailings	40 07 11.52 105 23 39.14	Metals, sedimentation from Streamside Tailings, Bueno Mt.	
5562A29	Along Streamside Tailings	40.11941 105.39414	Metals, sedimentation from Streamside Tailings, Bueno Mt.	
5562A32	Downstream of Streamside Tailings	40 07 04.02 105 23 38.08	Metals, sedimentation from Streamside Tailings, Bueno Mt.	
5562A35	Bottom of Waterfall	40.11674 105.39215		
5562A38	Just above confluence with Little James	40 06 58.41 105 23 28.35		

Table 6-2a: General description of analytical services requested for May 2004 sampling

MATRIX	ANALYSIS (method)	NO. OF SAMPLES (without QC)	QC SAMPLES
Water	Field Parameters: pH, DO, conductivity, temperature, flow, and GPS, turbidity	78	
Water	Total Recoverable Metals (EPA 200.7)	78	4
Water	Dissolved Metals (EPA 200.7)	78	4
Water	Lithium (EPA 200.8)	150	6
Water	Anions: TP, SO_4 (EPA 300)	39	2
Water	TSS, DOC, TUR	39	2
Sediment	Total Recoverable Metals	78	4
Water	Macroinvertebrates (Rapid Bioassessment Protocols)	10	
Sediment	Habitat Assessment (Rapid Bioassessment Protocol) and particle distribution	10	

Table 6-2b: General description of analytical services requested for November 2004 sampling

MATRIX	ANALYSIS (method)	NO. OF SAMPLES (without QC)	QC SAMPLES
Water	Field Parameters: pH, DO, conductivity, temperature, flow, and GPS, turbidity	78	
Water	Total Recoverable Metals (EPA 200.7)	78	4
Water	Dissolved Metals (EPA 200.7)	78	4
Sediment	Total Recoverable Metals	78	4
Macroinv.	Tissue Analysis – TR Metals	50	
Fish Tissue	Tissue Analysis – TR Metals	25	

Site ID#	Description	Field Measurement	Chemical Samples						Biological sampling		Habitat analysis
			Water					Sediment			
		Flow, pH, DO, temp	DOC	Tur, TSS, SO4	Total Metals	Diss. Metals	TP,	Total Metals (#)	Tissue Analysis	Species Comp.	RBA protocols + Beringer / King, Particle size distr
5560A-1	Lefthand Creek at Peak-to-Peak Hwy	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5** (ref)
5560A-TC	Trib C off the peak to peak turn off right before	5, 11			5, 11	5, 11		5, 11			
5560A-PU	Puzzler Gulch	5, 11			5, 11	5, 11		5, 11			
5560A-51	Lefthand above Puzzler confl	5, 11			5, 11	5, 11		5, 11			
5560A-54	Lefthand below Puzzler above Ind	5, 11			5, 11	5, 11		5, 11			
5560AIN	Indiana Gulch	5, 11			5, 11	5, 11		5, 11	11		
5560A-56 ~~(A29)~~	Downstream of Indiana Gulch confluence at Sawmill Road.	5, 11	5	5	5, 11	5, 11	5	5, 11	11		USFS bugs site above Indiana. Almost sterile. (particle size distribution only)
5560A-69-1	Directly below Loader Smelter in LH	5, 11			5,11	5, 11		5, 11			
5560A-63a ~~(A41*)~~	Downstream of Tuscarora Gulch Below Loader Smelter	5, 11	5	5	5, 11	5, 11	5	5, 11	11		USFS bugs site – by picnic site (near 69)
5560A-SPRI	Spring Gulch	5, 11			5, 11	5, 11		5, 11	11		Good population – diversity ?
5560A-92 ~~(A64)~~	Downstream of Spring Gulch	5, 11			5, 11	5, 11	5	5, 11	11		
5560A-95-1	Above Lickskillet below tailings	5, 11	5	5	5, 11	5, 11	5	5, 11		5	**5**
5560ALI	Lick Skillet Gulch	5, 11		5	5, 11	5, 11		5, 11	11		

Site ID#	Description	Field Measurement	Chemical Samples						Biological sampling		Habitat analysis
			Water					Sediment			
		Flow, pH, DO, temp	DOC	Tur, TSS, SO4	Total Metals	Diss. Metals	TP,	Total Metals (#)	Tissue Analysis	Species Comp.	RBA protocols + Beringer / King, Particle size distr
5560A-96 ~~(A67*)~~	Below Lick Skillet Rd.	5, 11		5	5, 11	5, 11	5	5, 11			
5560A-101 ~~(A73)~~	Above Slide Mine	5, 11		5	5, 11	5, 11	5	5, 11			
5560ASL1	At Slide Mine downstream discharge	5, 11			5, 11	5, 11		5, 11			
5560ASL2	At slide Mine upper discharge	5, 11			5, 11	5, 11		5, 11			
5560A-103 ~~(A74)~~	Below Slide Mine	5, 11		5	5, 11	5, 11	5	5, 11			
5560A-113 ~~(A84)~~	Below Rowena	5, 11		5	5, 11	5, 11	5	5, 11			
5560ANG	Nugget Gulch	5, 11			5, 11	5, 11		5, 11			
5560A123 ~~(A94)~~	Below Nugget Gulch	5, 11		5	5, 11	5, 11	5	5, 11			
5560ALE	“Lee Hill Gulch”	5, 11			5, 11	5, 11		5, 11			
5560A-129 ~~(A100)~~	Below “Lee Hill Gulch”	5, 11		5	5, 11	5, 11	5	5, 11	11		
5560A-127 ~~(A127*)~~	Below 4WD at Carnage Canyon	5, 11	5	5	5,11	5,11		5,11		no	Particle size distribution only USFS site (Uof C #156)
5560A-136-2 ~~(A108*)~~	Below James Creek confluence	5, 11		5	5, 11	5, 11	5	5, 11	11		
5560A-184 ~~(A154)~~	At Haldi Headgate	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5**
5561A-T1	James Creek at Peak-to-Peak Hwy	5, 11	5		5, 11	5, 11	5	5, 11	11	5	**5 (ref)**

Site ID#	Description	Field Measurement	Chemical Samples						Biological sampling		Habitat analysis
			Water					Sediment			
		Flow, pH, DO, temp	DOC	Tur, TSS, SO4	Total Metals	Diss. Metals	TP,	Total Metals (#)	Tissue Analysis	Species Comp.	RBA protocols + Beringer / King, Particle size distr
5561A-T2	Below Co. Rd. 100 crossing over James Creek	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5**
5561A-T3	Above Forget-Me-Not meadow	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5(ref)**
5561A-T4	Above the Creek Crossing	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5**
5561A-1	Below the Creek Crossing	5, 11	5	5	5, 11	5, 11	5	5, 11	11		Above John Jay
5561A-10	Below the Fairday Mine Site	5, 11	5	5	5, 11	5, 11	5	5, 11	11		
5561A-FD	Trib from Fairday	5, 11	5	5	5, 11	5, 11	5	5, 11			
5561A-16	Above Treatment Plant where gullies from Bueno Mt. enter stream	5, 11	5	5	5, 11	5, 11	5	5, 11	11		
5561A-28	Jamestown Water Treatment Plant	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5**
5561A-30-582	downstream of Little James confluence	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5 – Riverwatch site**
5561A-HI	Hill Gulch above Elsian Park	5, 11			5, 11	5, 11		5, 11			
5561A-55A	James Creek below Jenks Gulch	5, 11	5	5	5, 11	5, 11	5	5, 11	11		USFS site
5561A-53	Just downstream of Curie Springs	5, 11			5, 11	5, 11	5	5, 11	11		
5561A-CU	Curie Gulch Adit (small bldg)	PH only			5, 11			5, 11	11		
5561ACG	Castle Gulch	5, 11		5	5, 11	5, 11		5, 11	11		

Site ID#	Description	Field Measurement	Chemical Samples						Biological sampling		Habitat analysis
			Water					Sediment			
		Flow, pH, DO, temp	DOC	Tur, TSS, SO4	Total Metals	Diss. Metals	TP,	Total Metals (#)	Tissue Analysis	Species Comp.	RBA protocols + Beringer / King, Particle size distr
5561A-62	downstream of Castle Gulch	5, 11		5	5, 11	5, 11	5	5, 11	11		
5562A-0	Little James Creek above the Argo Mine	5, 11	5	5	5, 11	5, 11	5	5, 11	11	5	**5 ref**
5562A-6	Little James above small tailings & Argo (green gate) at road				5, 11	5, 11		5, 11			**NOT GPSd**
5562A-8	Above Argo Mine below tailings	5, 11		5	5, 11	5, 11		5, 11	11		Source sedm samples
5562A-10	Upstream of Burlington Mine below Argo	5, 11		5	5, 11	5, 11		5, 11	11		
5562A-EM	Emmit Adit	5, 11			5, 11	5, 11		5, 11	11		Source and sediment samples @ adit
5562A-15	upstream of Balarat Creek below Emmit	5, 11		5	5, 11	5, 11		5, 11	11		
5562ABA	Balarat Creek	5, 11			5, 11	5, 11		5, 11	11		
5562A-16	downstream of Balarat Creek confluence	5, 11		5	5, 11	5, 11		5, 11	11		
5562A18-1	Above JRT tailings after Fork	5, 11		5	5,11	5, 11		5, 11	11		
5562A-21 ~~(A22)~~	Below JRT tailings in Little James	5, 11		5	5, 11	5, 11		5, 11	11		Source and sediment samples
5562A-28 ~~(A25)~~	Upstream of Streamside Tailings	5, 11		5	5, 11	5, 11	5	5, 11	11		
5562A-32 ~~(A31)~~	Downstream of Streamside Tailings	5, 11		5	5, 11	5, 11		5, 11	11		

Site ID#	Description	Field Measurement	Chemical Samples						Biological sampling		Habitat analysis
			Water					Sediment			
		Flow, pH, DO, temp	DOC	Tur, TSS, SO4	Total Metals	Diss. Metals	TP,	Total Metals (#)	Tissue Analysis	Species Comp.	RBA protocols + Beringer / King, Particle size distr
5562A-38	Just above confluence with James	5, 11	5	5	5, 11	5, 11	5	5, 11	11	**5**	**5** (sterile)
Totals	55 sites		20 sampl es	37 samples	85 (incl source samples	85 (incl source samples	30 sampl es	85 sedm samples (incl source)		Species compositi on - 10	Habitat ass = 10 Particle size = 11

Source Analysis Site Name	**Background Soils**	**Source Tails**	**Elutriation**
Argo	5	5	5
Bueno	5	5	5
Emmit	5	5	5
Fairday	5	5	5
Golden Age Mine	5	5	5
Grand Central	5	5	5
JRT	5	5	5
Loader	5	5	5
Burlington Tails	11	11	11
Lick Skillet	11	11	11
Dew Drop	11	11	11
Totals	**5 – 8 sites**		

TABLE 6-4 ESAT MDL – ICP MS

2004	MDL	CCV	ICV	ICSA	ICSAB	CRA	Spike	LCS	Units
Be 9	1	50	50	0.0	0.0	2	50	1000	ug/L
Al 27	10	50	50	10000	10000	20	2000	1000	ug/L
V 51	3	50	50	0	0	12	200	1000	ug/L
Cr 52	2	50	50	0.0	20.0	10	200	1000	ug/L
Mn 55	2	50	50	0.0	20.0	2	200	1000	ug/L
Co 59	0.2	50	50	0.0	20.0	1	200	1000	ug/L
Ni 60	0.4	50	50	0.0	20.0	1.5	200	1000	ug/L
Cu 65	5	50	50	0.0	20.0	10	200	1000	ug/L
Zn 66	3	50	50	0.0	20.0	10	500	1000	ug/L
As 75	1	50	50	0.0	20.0	5	100	2000	ug/L
Se 82	1	50	250	0.0	0.0	5	50	1000	ug/L
Mo 98	0.2	50	50	0.0	0.0	1	0	1000	ug/L
Ag 107	0.2	50	50	0.0	20.0	1	50	250	ug/L
Cd 114	0.2	50	50	0.0	20.0	1	50	1000	ug/L
Sb 121	0.5	50	50	0.0	0.0	10	200	2000	ug/L
Ba 135	0.3	50	50	0.0	0.0	2	500	1000	ug/L
Hg 202	0.5	2.5	0	0.0	0.0	2	0	0	ug/L
Tl 205	0.1	50	50	0.0	0.0	1	50	5000	ug/L
Pb 208	0.3	50	50	0.0	0.0	1	100	2000	ug/L
Th 232	0.1	50	50	0.0	0.0	0.5	0	0	ug/L
U 238	0.1	50	50	0.0	0.0	0.5	0	0	ug/L

MDL Determined: 1/13/2004

Table 6 – 5 ESAT MDL _ ICP-OE

2004	MDL	ICV	CCV	Spike	ICSA	ICSAB	CRA	LCS	Cal Std	Range
Al3961	0.02	0.500	5.00	2.0	60.0	60.0	0.050	1.0	10.0	250
As1890	0.005	1.000	2.50	0.80	0	1.0	0.025	2.0	5.0	10
As1937	0.005	1.000	2.50	0.80	0	1.0	0.025	2.0	5.0	10
Ba4554	0.002	0.500	0.50	0.20	0	0.30	0.010	1.0	1.0	10
Ba4934	0.002	0.500	0.50	0.20	0	0.30	0.010	1.0	1.0	10
Be3130	0.001	0.500	0.50	0.20	0	0.10	0.005	1.0	1.0	10
Ca3158	0.05	0.500	0.50	0.20	0	0.10	0.250	1.0	1.0	1000
Ca3179	0.05	2.500	10.00	1.0	300	300	0.250	1.0	20.0	1000
Co2286	0.001	0.500	0.50	0.20	0	0.30	0.005	1.0	1.0	10
Cr2677	0.001	0.500	2.50	0.40	0	0.30	0.005	1.0	5.0	10
Fe2382	0.05	2.500	5.00	3.0	250	250	0.150	1.0	10.0	600
Fe2599	0.05	2.500	5.00	3.0	250	250	0.150	1.0	10.0	600
K_7664	0.2	5.000	10.00	10	0	20.0	1.000	5.0	20.0	330
Mg2790	0.2	2.500	10.00	2.0	150	150	0.500	1.0	20.0	1000
Mn2605	0.005	0.500	1.00	0.20	0	0.20	0.025	1.0	2.0	400
Mo2020	0.002	0.500	0.50	0.4	0	0.3	0.010	1.0	1.0	50
Na5889	0.1	2.500	10.00	3.0	50.0	50.0	0.500	1.0	20.0	1000
Ni2216	0.002	0.500	2.50	0.50	0	0.30	0.010	1.0	5.0	50
Sb2068	0.005	1.000	1.00	0.80	0	1.0	0.025	2.0	2.0	5
Se1960	0.01	0.500	2.50	2	0	0.5	0.040	1.0	5.0	10
SiO2-2516	0.05	2.500	5.00	2	0	0.5	0.250	5.0	10.0	50
Tl1908	0.01	2.500	2.50	2	0	1.0	0.050	5.0	5.0	10
V_2924	0.005	0.500	1.00	0.3	0	0.3	0.015	1.0	2.0	10

all units = mg/L Method = IntStd3 MDL determined 1-12-04

Table 6-6. EPA Region 8 Laboratory Analyses:

Analyte (Specific)	Prep/ Analytical Methods	Reporting Limits (RL)	Container	Preservative	Hold Time
Anions					
Sulfate (SO4)	EPA 300.0 SOP 310	1.0 mg/L	1 L HDPE cubitainers	Chill < 4 °C	28 days
Wet Chemistry Inorganics					
Turbidity (Tur)	EPA 180.1 SOP 307	N/A	1 L HDPE cubitainers	Chill < 4 °C	48 hours
Solids					
Total dissolved solids (TDS)	EPA 160.1 SOP 304	4 mg/L	1 L HDPE cubitainers	Chill < 4 °C	7 days
Total suspended solids (TSS)	EPA 160.2 SOP 303	4 mg/L	1 L HDPE cubitainers	Chill < 4 °C	7 days
Nutrients					
Total phosphorous (TP)	I-4600-85 SOP 320	0.02 mg/L	1 L HDPE cubitainers	Chill < 4 °C, H_2SO_4, pH < 2	28 days

Table 7: Metals QC Check Protocol for ICP, ICP-MS, and GFAA (Each Run)

QC Check (Symbol)	Explanation	Run Frequency	Acceptance Criteria	Corrective Action
Quality Control Sample (ICV)	Preferably out-of-house, critiqued standard or else standard from different lot than calibration standards	Beginning of run to verify calibration; it may also take place of last CCV	Published limits or 90-110% of "true" (ICP & DW AA); 85-115% (AA) otherwise	Restandardize & rerun ICV
Continuing Calibration Verification (CCV)	Approximate mid-range std made from working stds stock	Every 10 samples and at end	90-110% expected	Restandardize & rerun all samples from last “acceptable” QC or check sample
Spectral/Mass Interference Check for ICP/ICP-MS (SIC/ICS)	Challenge each channel or line with a potential spectral or mass interferent	Once/run beginning or end	For SIC's with analytes (100 ±20% expected); otherwise ≤± PQL for SIC & ICS	Recalculate IEC’s & rerun SIC or use an alternate wave-length Recalc mass eqns for ICS & rerun
Calibration Blank (CB)	Blank with same acid content as working stds; i.e. zero point on curve	Beginning, end and after each CCV	≤± PQL	Restandardize on So
Preparation Blank (PB)	Digested or extracted blank with same reagents as prepared unknowns	Once/run or 5% - whichever greatest	≤ PQL	Redigest all samples <10 times PQL value
Matrix Spike (SPK)	Unknown sample fortified at 10-100 X MDL for each analyte; for high conc. samples (spike <20% analyte conc.), no calc. required	Every 10th sample for drinking waters (DW), otherwise 1 per 20 unknown	Spike recovered at: 75-125% (AA) 80-120% (ICP & ICP-MS) waters, 65-135% (both) solids	Check for instrument drift. Compose 1 post-digest spike & retest. If still not acceptable, see corrective action for L.
Lab Fortified Blank (LFB)	Spike of CB at same level as SPK	Once/run for DW samples	85-115% expected	Same as for Matrix Spike
Duplicate Sample (DUP)	Either a field split or lab aliquot of previous sample	1 per 20 unknown	≤20% RSD for conc, ≥PQL except for solid matrices (≤35%)	Check for instrument drift, noise, sample in homogenity or contamination prior to re-preparation
Lab Control Sample (LCS)	For solid & liquid digested matrices, a well-characterized known prepared same as unknowns and of similar matrix	1 per batch	80-120% of "true" value or published limits, waters 70-130% of “true” value, solids	Check for corresponding high or low results in pre-digest spikes, if similar, redigest all samples
Serial Dilution (L) for ICP & ICP-MS	Unknown whose conc. ≥50 MDL diluted 5 X	1 per batch	Dilution value 90-110% of original for waters, 80-120% solids	Dilute all samples not near RL or run by std. additions
Detection Limit Standard (DET)	Low level standard ≈ 2-5 MDL conc.	Once/batch prior to unknowns; run only when sens criteria failed during standardization e.g. Mo or IR’s	50-150% of expected	Correct instrument's sens. problem or else need to redetermine & raise reporting limits

NOTE: Calibration is to be performed daily; corr. coeff. must be ≥ 0.995. When sample values >PQL, replicate RSD must be ≤ 20%. MDLs and linear ranges are to be redetermined annually. A PE sample must be passed yearly. (1) Additional acceptance requirements for tuning soln. and I.S. drift

APPENDIX A2
Lefthand Watershed Collaborative Sampling Quality Assurance Project Plan

Quality Assurance Project Plan
for the
Chemical and Biological Assessment of the Left Hand Watershed
Spring high flow and Fall low flow 2004-2005

Prepared By:

Kathryn Hernandez
EPA Region VII
999 18th Street
Denver, CO 80202

March 5, 2004

APPROVALS:

______________________________________ ____________

Angus Campbell, Project Manager Date
Remedial Programs
Hazardous Materials and Waste
Management Division
Colorado Department of Public Health and Environment

______________________________________ ____________

Kathryn Hernandez, Project Manager Date
Environmental Scientist
Ecosystems Protection and Remediation
EP Office

______________________________________ ____________

Stan Christensen, RPM Date
Ecosystems Protections and Remediation
Superfund Remedial Office

TABLE OF CONTENTS

DISTRIBUTION LIST

This Sampling and Analysis Plan (SAP) and Quality Assurance Project PLan(QAPP) and any subsequent revision will be distributed to the following individuals and organizations listed below as well as anyone upon request of this document.

- Stan Christensen – Region 8 EPA – RPM
- Sabrina Forrest – Region 8 EPA – Site Assessment
- University of Colorado – Professor Joseph Ryan
- Lefthand Watershed Oversight Group (LWOG)
- Bill Schroeder – Region 8 EPA Laboratory

Section 1
Project Management and Objectives

This quality assurance project plan (QAPP) supports the surface water, groundwater, biological and sediment sampling programs for Left Hand Watershed in Boulder, Colorado. This QAPP was prepared in accordance with EPA QA/R-5 EPA Requirements for QAPPs, Final (EPA 2001) and EPA's QA/G-5 guidance for QAPPs (EPA 1998). Section 1.0 presents project management and introductory information. Section 2.0 provides guidance for measurement and data acquisition. Section 3.0 describes assessment and oversight aspects of the project, and Section 4.0 describes data validation and usability issues. References are provided in Section 5.0.

1.1 Project/Task Organization

This section covers the basic area of project management, including project organization, background and purpose, project description, quality objectives and criteria, roles and responsibilities of participants, special training, documentation and records. . The surface water, groundwater and sediment sampling program will be implemented by, Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (CDPHE) and their consultant Walsh Environmental Scientists and Engineers (Walsh) and EPA Region VIII. University of Colorado will provide assistance collecting samples. Specific QA and sampling plans are in place for the surface water, groundwater and sediment sampling for these programs. Analytical services for the Captain Jack Superfund site will be provided by the Environmental Services Assistance Team (ESAT) contract at the EPA Region VIII laboratory, and the EPA Region VIII laboratory located at 16194 W. 45th Drive, Golden, Colorado 80403. Dr. John Gillis is the contract manager and can be reached at (303) 312-7824 or 303-312-7708. The laboratory's main number is 303-312-7700. Analytical services for the watershed wide samples will be provided Contract Laboratory Program (CLP) contract. Carol Beard is the Technical Project Officer (TPO) and can be reached at 303-312-6687. Additional analytical services to anions, TSS and turbidity will be provided by the EPA Region VIII laboratory.

1.1.1 EPA Project Managers

The EPA Remedial Project Manager (RPM) for the Captain Jack Superfund site is Mr. Stan Christensen (303) 312-6694. The EPA Project Manager for the Left Hand Watershed is Kathryn Hernandez (303) 312-6101). They have overall responsibility for the surface water and sediment sampling investigation. Mr. Christensen and Ms. Hernandez are responsible for:

- Defining project objectives
- Establishing project policy and procedures to address the specific needs of the overall project and of each task
- Granting final approval of project plans and reports generated by contractors
- Assuring that plans are implemented according to schedule
- Committing the resources necessary to meet project objectives and requirements
- Evaluating project staffing requirements and acquiring EPA or contractor resources as needed to ensure performance within budget and schedule constraints
- Informing contractor personnel concerning special considerations associated with the project
- Providing site access (if necessary)
- Reviewing work progress for each task to ensure that budgets and schedules are met
- Reviewing and analyzing overall performance with respect to goals and objectives
- Ensuring that EPA field sampling teams have the supplies and equipment needed
- Maintaining communication with the EPA Region VIII laboratory with regards to the sampling schedule, delivery orders, and sample analysis
- Maintaining communication with the EPA Region VIII laboratory about receipt of analytical results.

1.1.2 EPA Region VIII Laboratory

Dr. John Gillis is responsible for the ESAT contract and related QA/QC issues and keeping the analytical service uninterrupted. Dave Ostrander of the EPA Region VIII laboratory is responsible for the laboratory and related QA/QC issues and keeping the analytical service uninterrupted. Additional responsibilities include:

- Scheduling laboratory personnel and material resources
- Maintaining proper chain-of-custody and performing all designed analytical services
- Preparing and delivering analytical reports to the EPA RPM
- Identifying problems, resolving difficulties in consultation with QA staff, implementing and documenting corrective action procedures
- Maintaining QA/QC for the laboratory.

1.1.2.1 CLP Laboratory

- Scheduling laboratory personnel and material resources
- Maintaining proper chain-of-custody and performing all designed analytical services
- Preparing and delivering analytical reports to the EPA RPM

- Identifying problems, resolving difficulties in consultation with QA staff, implementing and documenting corrective action procedures
- Maintaining QA/QC for the laboratory.

1.1.3 University of Colorado

The U of C field team leader for activities to be performed in March, 2004 at the Left Hand Watershed Site is Dr. Joseph Ryan (303-492-0772). Alice Wood is the overall manager for the field sample collection effort and is responsible for coordination of the following activities:

- Maintaining communications with EPA regarding University of Colorado work
- Assembling and supervising University of Colorado field sampling teams
- Supervising production and review of deliverables
- Tracking work progress against planned budgets and schedules
- Scheduling personnel and material resources
- Implementing field aspects of the investigation, including this QAPP, the monitoring plan, and other project documents.

The University of Colorado field sampling team is responsible for the following:

- Notifying the EPA RPM of the delivery of samples
- Gathering sampling equipment and field logbook(s)
- Obtaining sample containers, preservatives, and forms
- Ensuring that the quantity and location of all samples meet the requirements of appropriate work plans.
- Identifying problems, resolving difficulties in consultation with QA staff, implementing and documenting corrective action procedures.
- Maintaining proper chain-of-custody forms during sampling events.

1.1.4 EPA Region VIII Field Group

EPA Region VIII Laboratory field group is responsible for:

- Organizing surface water, biological and sediment sample collection
- Working with University of Colorado and EPA staff field teams to make sure samples are collected properly and that field and chain of custody documentation is correctly performed
- Validation of project data
- Communicating with EPA RPM, CDPHE regarding project status.
- Notifying the EPA RPM of the delivery of samples
- Gathering sampling equipment and field logbook(s)
- Obtaining sample containers, preservatives, and forms
- Ensuring that the quantity and location of all samples meet the requirements of

appropriate work plans.
- Identifying problems, resolving difficulties in consultation with QA staff, implementing and documenting corrective action procedures.
- Maintaining proper chain-of-custody forms during sampling events

1.1.5 CDPHE Project Manager

The CDPHE Remedial Project Manager (RPM) for the Captain Jack Superfund site is Mr. Angus Campbell (303) 692-3385. He has overall responsibility for the surface water, groundwater and sediment sampling investigation at the Captain Jack site. Mr. Campbell is responsible for:

- Defining project objectives
- Establishing project policy and procedures to address the specific needs of the overall project and of each task
- Granting final approval of project plans and reports generated by consultants
- Assuring that plans are implemented according to schedule
- Committing the available resources that are necessary to meet project objectives and requirements
- Evaluating project staffing requirements and consultants resources as needed to ensure performance within budget and schedule constraints
- Informing consultants personnel concerning special considerations associated with the project
- Providing site access (if necessary)
- Reviewing work progress for each task to ensure that budgets and schedules are met
- Reviewing and analyzing overall performance with respect to goals and objectives
- Maintaining communication with the ESAT laboratory with regards to the sampling schedule, delivery orders, and sample analysis
- Maintaining communication with the ESAT laboratory about receipt of analytical results.

1.1.5.1 CDPHE Contractor

Walsh has been selected as the CDPHE contractor. Walsh's project manager will be determined prior to mobilization into the field. This person is responsible for the overall management and coordination of collecting surface water, sediment and biological samples from the Captain Jack area and performing all appropriate procedures for sample collection. The Walsh project manager will be responsible for:

- Maintaining communications with CDPHE regarding the site work
- Assembling and supervising project team
- Production and review of deliverables
- Tracking work progress against planned budgets and schedules
- Scheduling personnel and material resources

- Implementing all aspects of the RI/FS work plans and applicable guidance documents, including this QAPP, the monitoring plan, and other project documents.
- Notifying the CDPHE of the field work activities
- Gathering sampling equipment and field logbook(s)
- Ensuring that the quantity and location of all samples meet the requirements of appropriate work plans.
- Identifying problems, resolving difficulties in consultation with QA staff, implementing and documenting corrective action procedures.
- Maintaining proper chain-of-custody forms during sampling events.

1.1.6 Quality Assurance Organization

Responsibility for Quality Assurance for the project lies with each member of the team. However, EPA Project Coordinator, Kathryn Hernandez and RPM's Stan Christensen and Angus Campbell remains responsible for these overall project quality objectives:

- Implementing corrective actions resulting from staff observations, QA/QC surveillance, and/or QA audits
- Reviewing and approving project-specific plans
- Directing the overall project QA program
- Maintaining QA oversight of the project
- Reviewing QA sections in project reports as applicable
- Reviewing QA/QC procedures applicable to this project
- Initiating, reviewing, and following up on response actions, as necessary
- Arranging performance audits of measurement activities, as necessary.

1.1.7 Report Organization

This QAPP is organized in accordance with EPA's QA/R-5 guidance for preparing QAPPs. This section (Section 1.0) presents project management and introductory information. Section 2.0 provides guidance for measurement and data acquisition. Section 3.0 describes assessment and oversight aspects of the project, and Section 4.0 describes data validation and usability issues.

Appendix I, describes the site specific details for the Captain Jack superfund site RI/FS as they differ from this QAPP.

1.2 Background and Purpose

The Left Hand Creek Watershed covers about 85 square miles and lies in north central Colorado on the eastern slope of the front range of the Rocky Mountains, northwest of Boulder, Colorado. Many intermittent streams exist throughout the watershed; however, Left Hand, James, and Little James are the only perennial streams. The James Creek watershed covers approximately 36 square miles from its source near Ward to its confluence with Left Hand Creek. The Little James Creek watershed area only encompasses about three square miles. Little James Creek flows into James Creek, which flows drains into Left Hand Creek. Combined, the basin discharges about 28,840 acre-feet annually (EPA 2003) Over 100 years of mining in this region have resulted in heavy metal and other mining-related contamination throughout the Left Hand Creek Watershed

The Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE will coordinate environmental and water quality assessments and funding efforts within the Left Hand Watershed. This effort will promote a holistic approach to assure stakeholder coordination in establishing and achieving environmental cleanup and water quality goals. A key component of this effort will be assuring participation between local, state and federal stakeholders. Several stakeholders have collected mine waste, surface water/sediment, and ground water samples.

There were synoptic surface water quality studies and data collection efforts focused on metals in the Left Hand Watershed by University of Colorado in 2002 and 2003. The surface water quality indicated exceedances of the acute standard for zinc and copper in section of Left Hand Creek, James Creek and Little James Creek. Data collected in Little James Creek indicated exceedances of aluminum, copper, lead and zinc. Under a current 319 EPA grant, a water quality assessment report of the Left Hand Watershed is being written by the Left Hand Watershed Oversight Group (LWOG). The focus will be to summarize the most relevant current and historic water quality work in the Left Hand watershed in order to determine data needs and future sampling strategies. Sampling and analysis activities in 2004 will be conducted by the USFS, USGS, CDPHE and EPA with assistance from University of Colorado.

Left Hand Creek and Little James Creek are listed on the State of Colorado's 1998 303(d) list as impaired for not supporting the aquatic life use classification. Both waters are listed and have a high priority for Total Maximum Daily Load (TMDL) development. The listing specified that the numeric standards for cadmium, iron, manganese, zinc and pH, were not being attained. Additional dissolved metals data have shown that collected by the Division of Water Quality at CDPHE indicated that the Colorado Acute standards for copper and lead are also exceeded. The water quality in Left Hand Creek, James Creek and Little James Creek is affected by discharges from various mines and waste rock and mine tailings in the area. The drainage area encompasses the historical Captain Jack and Golden Age mining districts and receives runoff from a number of rock dumps, mill tailings and abandoned mining sites. These areas were mined for gold, lead, silver, fluorspar (calcium fluoride) and uranium.

The EPA has conducted several Superfund Pre-remedial investigations in the Left Hand Watershed. Although there are numerous mines throughout the watershed, only one mine is presently on the National Priorities List. This is the Captain Jack Mill site (CERCLIS ID COD981551427) located in the upper portion Left Hand Creek. Other mines that have been investigated through the EPA PA/SI program are the Golden Age Mine (CERCLIS ID CO0000023077), located in Little James and James Creek, the , and the Slide Mine/Corning Tunnel (CERCLIS ID CON000801995), located in the middle portion of Left Hand Creek. Site investigations have been completed at the Captain Jack, Golden Age, and the Slide Mines within the district. A remedial investigation is planned to begin at the Captain Jack Mine in FY 2004.

The purpose of the watershed sampling and analysis program is to quantify the existing load of dissolved metals, total metals in the surface water and metals concentration in sediments to assist in determining the potential sources and their contributions to the watershed.

The purpose of this QAPP is to provide guidance to ensure that all environmentally-related data collection procedures and measurements are scientifically sound and of known, acceptable, and documented quality and the sampling activities are conducted in accordance with the requirements of this project.

1.3 Project Goal

Receptors in the watershed include fisheries, wetlands, and the Left Hand Water District drinking water intake located near the mouth of Left Hand Canyon and residents that live near mine waste rock and tailings piles. The overall purpose of this sampling plan is to collect additional surface water and sediment samples at high and low flows throughout the basin in order to identify the significant loading sources of metals and to allow the stakeholders to evaluate water quality in the various drainages of the Left Hand Canyon Watershed which includes Left Hand Creek, Little James Creek and James Creek and their tributaries. This data will assist in making feasibility and remedial cleanup decisions for the watershed in an effort to meet existing water quality standards that adequately protect human health and the environment in the Left Hand Watershed

1.4 Quality Objectives and Criteria for Measurement

This section provides a means for control and review of the project so that environmentally-related measurements and data collected by the field sampling teams are of known and acceptable quality. The subsections below describe the data quality objectives (DQOs) (Section 1.4.1) and data measurement objectives (Section 1.4.2) for the project.

1.4.1 Data Quality Objectives

The DQO process is a series of planning steps based on the scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The EPA has issued guidelines to help data users develop Left Hand Watershed Site-specific DQOs (QA/G-4; August 2000). The DQO process is intended to:

- Clarify the study objective
- Define the most appropriate type of data to collect

- Determine the most appropriate conditions from which to collect the data
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design.

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and ensures that analytical techniques are used that will generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps of which the output from each step influences the choices that will be made later in the process. These steps are as follows:

Step 1: State the problem.
Step 2: Identify the decision.
Step 3: Identify the inputs to the decision.
Step 4: Define the study boundaries.
Step 5: Develop a decision rule.
Step 6: Specify tolerable limits on decision errors.
Step 7: Optimize the design.

During the first six steps of the process, the planning team develops decision performance criteria (i.e., DQOs) that will be used to develop the data collection design. The final step of the process involves refining the data collection design based on the DQOs. A brief discussion of these steps and their application to this QAPP is provided below.

1.4.1.1 Step 1: State the Problem

Sampling by the University of Colorado and RiverWatch in 2002 and 2003 found concentration of copper and zinc in Left Hand Creek, James Creek and Little James Creek that exceed State water quality standards for dissolved metals.

Left Hand Creek
UOS (URS Operating Services) conducted field work at the Captain Jack Mill (CJM) site on June 25 and 26th, 1997. Surface water and sediment samples collected along Left Hand Creek and its tributaries on June 25 and 26, 1997, indicated elevated concentrations of aluminum, calcium, copper, iron, lead, magnesium, manganese and zinc. The Hazardous Materials and Waste Management Division (HMWMD) of the Colorado Department of Public Health and Environment (CDPHE), under a cooperative agreement with the U.S. Environmental Protection Agency (EPA), conducted a Combined Assessment if the Slide Mine/Corning Tunnel area in Fall 2003. Sediment sampled collected from Left Hand Creek downstream of the PPE for site contaminants indicate that pile materials are migrating from the site to the drainage and are present at elevated concentrations in sediments 0.3 miles downstream of the site. CDPHE also performed a high-flow sampling event on April 18, 2003. Field observations made on this sampling date indicated that the site was discharging to Left Hand Creek.

The Left Hand Water District experiences ongoing problems with sediment deposition related to several off road vehicle areas, at their intake on Left Hand Creek. This District has spent hundreds of thousands of dollars recently in efforts to mitigate the impact of these sediments. The District spends many man and equipment hours each year removing sediment from their intake structures.

There are potential nutrient loading concerns from the cumulative impact of Individual Sewage Disposal Systems (ISDS).

James Creek
The Golden Age Mining district contributes runoff to James Creek. Jenks Gulch, Castle Gulch, Hill Gulch and other drainages may be contributing additional metals to James Creek. Flat Creek may be impaired due to excessive nutrient and sediment levels. Additional data are needed to further diagnose these potential impairments. Indications are that metals are not impacting James Creek upstream of Little James Creek. Metals concentrations at these sites were often below detection. An ecological investigation of the water quality of the upper James Creek (Duren, 2001) found that roads and off road vehicle activity may have had a negative affect on the ecosystem health of James Creek.

Little James Creek
The Little James Creek/ James Creek watershed drains numerous adits, shafts, and tailings piles within a part of the Jamestown Mining District, including the Burlington, Emmit, and Golden Age Mines. The area was primarily developed for its lead-silver, fluorspar, and uranium deposits. Aqueous samples collected 6/98 from Little James Creek show elevated concentrations of the following total and dissolved metals; beryllium, lead, manganese, sodium, thallium, and zinc.

1.4.1.2 Step 2: Identify the Decision

This step identifies the principal study question, defines alternative actions, and develops a decision statement. To accomplish the objective of the investigation (i.e., whether or not water quality meets established standards and to quantify the existing load), study questions must be developed. For this investigation, the study questions are as follows:

> What are the load contributions of the various sources in the watershed for the metals of concern? What reductions are needed to meet water quality standards?
>
> Are concentrations of metals of concern in waters of the Left Hand Watershed meeting established water quality standards?
>
> Are concentrations of site-related contaminants in sediments of the Left Hand Watershed acceptable for maintaining a healthy benthic macroinvertebrate community and cold water fishery?
>
> Are concentrations of site-related contaminants in aquatic prey species safe for predatory

species?

Are physical habitat alterations contributing to reduced aquatic life in the Left Hand Watershed?

Are the sediment loads from Off Road Vehicle affecting the biological community in the watershed?

Are nutrient concentrations in the watershed elevated indicating potential leakage of individual septic systems?

If the answer is yes, the following actions may be taken:

- Complete additional investigations to determine what areas within the watershed require and the feasibility of identified remedial actions.

1.4.1.3 Step 3: Identify the Inputs to the Decision

The purpose of this step is to identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statements discussed in Step 2. Since the objective of this investigation is to determine a the current water quality, quantify the load and assess the population of aquatic organisms both the species composition and tissue concentration, the following data are needed and will be collected through field study and sampling.:

- Current site-related chemical concentrations in surface water, groundwater, and sediment with paired flow measurements in the watershed.
- Current population demographics and tissue concentrations of representative aquatic organisms in the Left Hand Watershed.
- Current nutrient concentrations of surface water.
- Current riparian and in-stream habitat condition and physical sediment composition.

Historic data will drive decisions too – should add as applicable

- Historical surface water and sediment data in the watershed.
- Historical and new data for other parameters
- Cleanup levels or other benchmarks and standards used for comparison

The information collected during this investigation will enable the stakeholder group to make informed choices regarding additional study needs and remedial actions.

1.4.1.4 Step 4: Define the Study Boundaries

The spatial and temporal boundaries of the proposed investigation are described in Step 4 of the DQO process. Step 4 defines when and where data are to be collected. Section 4.0 of the project-specific Field Sampling Plan describes the proposed sampling design for this investigation. In general terms, the geographic limits of the study area include:

- The Little James Creek, James Creek and tributaries, and Left Hand Creek and tributaries

The temporal boundary for the water quality investigation is controlled by the most appropriate times of the year to collect surface water/sediment, macroinvertebrate, source/soil data. The schedule for the sampling events will be decided based on review of existing monitoring data collected by other stakeholders and from local observations regarding stream flow in the watershed.

1.4.1.5 Step 5: Develop a Decision Rule

The decision rule for this project depends on whether the water quality in the Left Hand Watershed has met identified water quality standards for what analytes at what standards. Could add a table to show the benchmarks/stds we're using. If those standards are not met, the decision will be either to determine what sources contribute the greatest load and prioritize those sites for clean up actions.

If water quality standards are met, then no further action will be needed. If not, then the frequency and duration of standards exceedence and the effects to aquatic life will be evaluated to determine what if any actions are needed. Additional investigations may be undertaken to determine the nature and practicality of possible source removal/remedial alternatives.

1.4.1.6 Step 6: Specify Tolerable Limits on Decision Errors

Decision maker's tolerable limits on decision errors, which are established performance goals for the data collection design, are specified in this step. Decision makers are interested in knowing the true value of the constituent concentrations. Since analytical data can only estimate these values, decisions that are based on measurement data could be in error. These errors are:

(1) Concentrations may vary over time and space. Limited sampling may miss some features of this natural variation because it is usually impossible or impractical to measure every point of a population. Sampling design errors occur when the sampling design is unable to capture the complete extent of natural variability that exists in the true state of the environment.
(2) Analytical methods and instruments are never absolutely perfect, hence a measurement

can only estimate the true value of an environmental sample. Measurement error refers to a combination of random and systematic errors that inevitably arise during the various steps to the measurement process.

The combination of sampling design and measurement error is the total study error. Since it is impossible to completely eliminate total study error, basing decisions on sample concentrations may lead to a decision error. The probability of decision error is controlled by adopting a scientific approach in which the data are used to select between one condition (the null hypothesis) and another (the alternative hypothesis). The null hypothesis is presumed to be true in the absence of evidence to the contrary. For this project the null hypothesis is that the true value of the constituents are above the water quality standards. The alternative hypothesis is that the true values of the constituents are below the water quality standards.

A false positive or "Type I" decision error refers to the type of error made when the null hypothesis is rejected when it is true and a false negative or "Type II" decision error refers to the type of error made when the null hypothesis is accepted when it is false. For this project, a Type I decision error would result in deciding that the inorganic constituent concentrations are below the action levels when they are not. A Type II decision error would result in deciding that the inorganic constituent concentrations are not below the standards action levels when they are.

For this project, a Type I error is less acceptable (worse case) than a Type II error because a Type I error could result in ecological and/or human harm whereas, a Type II error could result in remediation and further improvement in water quality.

Due to the complexity of the site and seasonal variations of contaminant levels in various sources throughout the site, several years of sampling effort, measured at critical time periods should decrease the amount of error involved in this project. By taking many measurements over a long period of time, overall improvements in water quality and trends aquatic life should be accurately measured and the impact of errors from a single sample or sampling event should be minimized. It is anticipated that the overall trend of water quality and biological life will be of critical importance in the final decision on water quality and the need for any further remedial action.

1.4.1.7 Step 7: Optimize the Design for Obtaining Data

EPA with the approval of CDPHE designed the surface water, sediment, and biological sampling program and habitat assessment. If additional sampling locations need to be dropped, added, changed or the schedule of sampling needs to be altered to improve sampling design, they will be. Evaluation of the effectiveness of the sampling program will be performed on a continuous basis.

1.4.2 Data Measurement Objectives

Every reasonable attempt will be made to obtain a quality and acceptable set of usable field measurements and analytical data. If a measurement cannot be obtained or is unusable for any reason, the effect of the missing or invalid data will be evaluated. In order to determine data usability, data quality indicators consisting of precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) will be evaluated, as described in Section 1.4.2.2

1.4.2.1 Quality Assurance Guidance

The field QA program has been designed in accordance with EPA's guidance for the Data Quality Objectives Process, EPA QA/G4 (August 2000), and EPA Requirements for Quality Assurance Project Plans, QA/R-5 (EPA 2001).

1.4.2.2 Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity Parameters

PARCCS are indicators of data quality, PARCCS goals are established to aid in assessing data quality. The following paragraphs define PARCCS parameters associated with this project.

Precision. The precision of a measurement is an expression of mutual agreement among individual measurements of the same property taken under prescribed similar conditions. Precision is quantitative and most often expressed in terms of relative percent difference (RPD). Precision of the laboratory analysis will be assessed by comparing original and duplicate results. The RPD will be calculated for each pair of duplicate analyses using the following equation:

$$RPD= |S - D| \times 100/((S+D) /2)$$

Where:

S = First sample value (original Value)
D = Second sample value (duplicate value)

Precision of reported results is a function of inherent field-related variability plus laboratory analytical variability, depending on the type of QC sample. Various measures of precision exist depending upon "prescribed similar condition." Field duplicate samples will be collected to provide a measure of the contribution to overall variability of field-related sources. Acceptable RPD limits for field duplicate measurements will be less than or equal to $\leq$ 20% for aqueous matrices. Contribution of laboratory-related sources to overall variability is measured through various laboratory QC samples. Acceptable RPD limits for laboratory measurements are provided in Table 1-1.

Accuracy. Accuracy is the degree of agreement of a measurement with an accepted reference or true value and is a measure of the bias in a system. Accuracy is quantitative and usually expressed as the percent recovery (%R) of a sample result. The %R is calculated as follows:

$$\% \text{ Recovery} = (SSR - SR / DA) \times 100$$

Where:

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

Ideally, it is desirable for the reported concentration to equal the actual concentration present in the sample. Analytical data will be evaluated for accuracy. Matrix spikes (MS) and / or laboratory control samples/laboratory control sample duplicates (LCS/LCSDs) will be used, whichever is applicable. Acceptable % R for analytical data associated with this investigation are provided in Table 1-1.

Representativeness. Representativeness expresses the degree to which sample data accurately and precisely represent the following:

- The characteristic being measured
- Parameter variations at a sampling point
- An environmental condition.

Representativeness is a qualitative and quantitative parameter that is most concerned with the proper design of the sample plan and the absence of cross-contamination of samples. Acceptable representativeness will be achieved through (1) careful, informed selection of sampling locations, (2) selection of testing parameters and methods that adequately define and characterize the extent of possible contamination and meeting the required parameter reporting limits, (3) proper gathering and handling of samples to avoid interferences and prevent contamination and loss, and (4) use of uncontaminated sample containers as the sample collection tool, eliminating

the need for decontamination of sampling equipment and possible cross contamination of samples.

Representativeness is a consideration that will be employed during all sample location and collection efforts. The representativeness will be assessed qualitatively by reviewing the procedures and design of the sampling event and quantitatively by reviewing the laboratory blank samples. If an analyte is detected in a laboratory blank, any associated positive result less than five times the detected concentration of the blank may be considered undetected. Field blanks will not be collected during this investigation.

Completeness. Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Usability will be determined by evaluation of the PARCCs parameters excluding completeness. Those data that are reviewed and need no qualification or are qualified as estimate or undetected are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. A completeness goal of 90% is projected for the data set collected for this investigation. If the completeness goal of 90% is not met, additional sampling may be necessary to adequately achieve project objectives.

Completeness is calculated using the following equation:

$$\% \text{ Completeness} = (DO/DP) \times 100$$

Where:
DO = Data Obtained and usable
DP = Data Planned to be obtained

Comparability. Comparability is a qualitative parameter. Consistency in the acquisition, handling, and analysis of samples is necessary for comparison of results. Data developed under this investigation will be collected and analyzed using standard EPA analytical methods and QC procedures to ensure comparability of results with other analyses performed in a similar manner. Data resulting from this field investigation may subsequently be compared to other data sets.

Sensitivity. Sensitivity is the achievement of method detection limits and depends on instrument sensitivity and sample matrix effects. Therefore, it is important to monitor the sensitivity of data-gathering instruments to ensure that data quality is met through constant instrument performance. Instrument sensitivity will be monitored through the analysis of blanks. Reporting limits are presented in Table1-1.

1.4.2.3. Field Measurements

Field data will be collected as outlined in the surface water, biological, sediment monitoring and habitat assessment sampling plan.

1.4.2.4 Laboratory Analysis

Guidelines for analytical methods, reporting limits, holding times, and QC analyses are discussed below. The sampling and analysis plan provides laboratory analytical methods and reporting limits applicable to that study.

Analytical Methods

Laboratory analysis will be conducted at the EPA Region VIII Laboratory by the Region Lab and ESAT contract and at CLP. Surface water, sediment and biological samples collected under this QAPP will be analyzed for the following parameters using analytical methods identified below:

EPA Region 8 Lab Analytical Methods:
Dissolved Organic Carbon (EPA Method 415.1)
Sulfate (EPA Method 375.1-4)
Total phophorus (I-4600-85)
Total suspended solids (EPA Method 160.2)
Turbidity (EPA Method 180.1)

ESAT Analytical Methods:
For metals 200.7 and 200.8.
Anions 300.0
TDS 160.1
TSS 160.2
Hardness 2340B
Alkalinity 310.1 or 310.2

ESAT are on the prep for total versus total recoverable metals. ESAT will follow SW846 method 3015 for total metals. The SOP is in progress now.

CLP Analytical Methods:
Soils/water ILM O 5.2 AEF
For dissolved/total metals ILM O 5.3 MS

ESAT Target Analyte List – ICP/MS

2004	MDL	CCV	ICV	ICSA	ICSAB	CRA	Spike	LCS	Units
Be 9	1	50	50	0.0	0.0	2	50	1000	ug/L
Al 27	10	50	50	10000	10000	20	2000	1000	ug/L
V 51	3	50	50	0	0	12	200	1000	ug/L
Cr 52	2	50	50	0.0	20.0	10	200	1000	ug/L
Mn 55	2	50	50	0.0	20.0	2	200	1000	ug/L
Co 59	0.2	50	50	0.0	20.0	1	200	1000	ug/L
Ni 60	0.4	50	50	0.0	20.0	1.5	200	1000	ug/L
Cu 65	5	50	50	0.0	20.0	10	200	1000	ug/L
Zn 66	3	50	50	0.0	20.0	10	500	1000	ug/L
As 75	1	50	50	0.0	20.0	5	100	2000	ug/L
Se 82	1	50	250	0.0	0.0	5	50	1000	ug/L
Mo 98	0.2	50	50	0.0	0.0	1	0	1000	ug/L
Ag 107	0.2	50	50	0.0	20.0	1	50	250	ug/L
Cd 114	0.2	50	50	0.0	20.0	1	50	1000	ug/L
Sb 121	0.5	50	50	0.0	0.0	10	200	2000	ug/L
Ba 135	0.3	50	50	0.0	0.0	2	500	1000	ug/L
Hg 202	0.5	2.5	0	0.0	0.0	2	0	0	ug/L
Tl 205	0.1	50	50	0.0	0.0	1	50	5000	ug/L
Pb 208	0.3	50	50	0.0	0.0	1	100	2000	ug/L
Th 232	0.1	50	50	0.0	0.0	0.5	0	0	ug/L
U 238	0.1	50	50	0.0	0.0	0.5	0	0	ug/L

MDL Determined: 1/13/2004

Reporting Limits

The reporting limits are presented in the sampling plan. If the result is between the instrument detection limit (IDL) and the reporting limit, the value will be reported as an estimated concentration and qualified by the laboratory. The achievement of the IDL depends on instrument sensitivity. It is therefore important for the laboratory to monitor the sensitivity of data-gathering instruments to ensure data quality through constant instrument performance checks.

Holding Times

Holding times are storage times allowed between sample collection and sample analysis when the designated preservation and storage techniques are employed. Required holding times must be considered when determining the method of shipment. Holding times and preservation for each analytical method used in specific investigations are provided in the surface water and sediment sampling plans.

Quality Control Analyses

To provide an external check of the quality of the field procedures and laboratory analytical data, field duplicate samples will be collected at a rate of 5% per media/event and submitted to the each laboratory, in accordance with standard QA protocol. Duplicate samples provide a check for sampling and analytical error. The frequency of duplicate sample collection that will be analyzed for the surface water investigation are discussed in Section 5.0 of the FSP of the surface water work plan. If disposable equipment is used to collect samples (eliminating the need for decontamination), equipment rinsate blanks may be omitted.

In addition to the external QA/QC controls, internal QA procedures are maintained by the laboratory. Internal QC samples may include laboratory blanks (i.e., method blanks, preparation blanks), laboratory duplications, matrix spikes, and laboratory control samples (known standards). Double volume samples will be collected for water samples at a rate of 5% and submitted for MS analysis. To ensure the laboratory analyzes MS's, designated samples will be labeled and noted on the chain-of-custody forms as extra volume sample for MS analyses.

1.5 Special Training Requirements

EPA and CDPHE, will ensure that qualified, experienced, and trained staff perform or oversee all data collection and sampling tasks. Each entity involved in this project is responsible for the safety of its employees.

1.6 Documentation and Records

Each laboratory will submit their standard analytical data reports to the either the EPA RPM or state project officer. Each data report will contain a case narrative that briefly describes the number of samples, the analyses, and any noteworthy analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed chain-of-custody forms, cooler receipt forms, analytical data, and a QC package. The CLP will provide both hard copy of the raw analytical data and a validated electronic spreadsheet of the final individual sample results. ESAT and the EPA laboratory will provide a paper hard copy and an electronic data deliverable with samples and quality assurance results. A PDF file of all data will be provided. The analytical data will be formatted to be compatible with CDPHE's EQUIS database and EPA's STORET database. The state project officer will be responsible for entering all data provided by the laboratories into their EQUIS database system, which will then be transferred into EPA STORET.

A record of samples, analyses, and field events will be kept in a field logbook.

Section 2
Measurement and Data Acquisition

This section covers sample process design and implementation, sampling methods requirements, handing and custody, analytical methods, QC, equipment maintenance, instrument calibration, supply acceptance, non-direct measurements, and data management. The field procedures are designed so that the following occurs:

- Sample collection is consistent with project objectives
- Samples are collected in a manner so that data represent actual Left Hand Watershed site conditions.

2.1 Sample Process Design

The general goal of the field investigation is to obtain surface water quality and sediment and biological data.. The number, types, and locations of samples are outlined in the surface water, sediment, biological and habitat sampling plan.

2.2 Sampling Methods Requirements

Sampling equipment, containers, and overall field management for the sampling and assessment is described below.

2.2.1 Sampling Equipment and Preparation

Equipment required for sampling, health and safety, documentation, and field parameter monitoring is presented in the sample plan.
Field preparatory activities include, procurement of field equipment, laboratory coordination, confirmation of site access (if necessary), as well as a field planning meeting that includes field personnel and QA staff.

2.2.2 Sample Containers

Clean polyethylene sample containers (or cubitainers) will be pre-rinsed with an aliquot of the water to be sampled, and then emptied before collecting and preserving (as required) samples in the field. The containers will be provided by the Region VIII Laboratory.

2.2.3 Sample Collection, Handling, and Shipment

Samples collected during this investigation consist of surface water, sediment, biological, and duplicate samples. Surface water sample collection procedures are outlined in the sampling and analysis plan and the *Compendium of Standard Operating Procedures* (EPA, 1996).

2.3 Sample Handling and Custody Requirements

Custody and documentation for field and laboratory work are described below, followed by a discussion of corrections to documentation.

2.3.1 Field Sample Custody and Documentation

The information contained on the sample label and the chain-of-custody record will match. The purpose and description of the sample label and the chain-of-custody record is discussed in the following sections.

2.3.1.1 Sample Labeling and Identification

An numeric coding system will identify each sample collected during sampling events. The coding system will provide a tracking record to allow retrieval of information about a particular sample and to ensure that each sample is uniquely identified. Sample numbers will correlate with locations to be sampled. The nomenclature that has been decided on was based on existing naming conventions established for this watershed in STORET.

Sample labels or tags will be completed and affixed to the appropriate sample containers. Preprinted labels may be used. These labels will be secured with waterproof tape and will include the sample identification number, the parameter (s) to be analyzed, the sampler's initials, and the preservative used. At the time of sample collection, a member of the field team will add the date and time of sample collection.

2.3.1.2 Chain-of-Custody Requirements

Chain-of-custody procedures and sample shipment will follow the requirements stated of the individual laboratories. CLP requires Forms II Lite. . The chain-of-custody record is employed as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A complete chain-of-custody record is required to accompany each shipment of samples.

2.3.1.3 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with SOP No. 10 Sampling Handling, Documentation and Analysis. Samples will be placed in a cooler with ice. Custody seals will be placed over the cooler, then secured by tape. Samples collected by CDPHE, and ½ of the biological samples collected for species diversity will be shipped or delivered to:

John Gillis
EPA Region VIII laboratory
16194 W. 45th Drive
Golden, CO 80403
(303) 312-7700 (main lab)
(303) 312-7824 John's Downtown Denver Office
(303) 312-7708 John's Lab Office

Sediment, surface water and biological samples collected for total and dissolved metals analysis and will be shipped or delivered to:

Contract Laboratory Services
Xxxx
Xxxx
Xxxx

Surface water samples collected for TSS, turbidity, total phosphorus and dissolved organic carbon; sediment samples for particle size analysis and the biological samples collected for species diversity analysis will be shipped or delivered to:

EPA Region VIII laboratory
16194 W. 45th Drive
Golden, CO 80403
(303) 312-7700 (main lab)

2.3.1.4 Field Logbooks and Records

Field logbooks will be maintained by each field team. The log is an accounting of the accomplishment of scheduled activities, and will duly note problems or deviations from the governing plan and observations relating to the field program. The EPA RPM will be provided copies of the logbooks to include in the official project files.

2.3.2 Laboratory Custody Procedures and Documentation

EPA and ESAT Laboratory custody procedures are provided in the laboratory's QA management plan. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping cooler and the individual samples. This inspection will include measuring the temperature of the temperature blank within the cooler to document that the temperature of the samples is within the acceptable criteria (4±2 degrees Celsius), if samples are cooled, and verifying sample integrity. The pH of the samples will also be measured, if preserved with an acid or base. The enclosed chain-of-custody records will be cross-referenced with all of the samples in the shipment. These records will then be signed by the laboratory sample custodian and copies provided to the EPA. The sample custodian will continue the chain-of-custody record process by assigning a unique laboratory number to each sample on receipt. This number will identify the sample through all further handling. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, data reporting, and disposal. CLP uses its own SOPs.

2.3.3 Corrections to and Deviations from Documentation

For the logbooks, a single strikeout initialed and dated is required for documentation charges. The correct information should be entered in close proximity to the erroneous entry. All deviations from the guiding documents will be recorded in the field logbook (s). Any modifications to chain-of-custody forms will be made on all copies, The EPA RPM will be notified of any major changes or deviations.

2.4 Analytical Methods Requirements

The laboratory QA program and analytical methods are addressed below.

2.4.1 Laboratory Quality Assurance Program

EPA Region VIII laboratory, ESAT and CLP will be used as the laboratory for this investigation. Samples collected during this project for the EPA Lab and ESAT will be analyzed in accordance with methods determined by the EPA (see laboratory Quality Management Plan). CLP uses its own methods.

2.4.2 Methods

The methods to be used for chemical analysis will be determined by the EPA. The holding time requirements for each analytical method are determined by the analytical methods.

<u>Macroinvertebrate Sorting and Analysis and DOC</u>

In the laboratory, samples will be sorted and organisms will be identified to the lowest practical taxonomic level (genus or species for most taxa; subfamily for chironimids).

Bioavailibility of heavy metals in the field will be measured using the fiter-feeding caddisfly *Arctopsyche Grandis* (Trichoptera: Hydropsychidae). *Arctopsyche* is a relatively large, widely-distributed caddisfly found in many Rocky Mountain streams. Because *Arctopsyche* is highly tolerant of heavy metals, this species can be collected from both reference and metal-contaminated sites. Caddisflies will be collected from field sites, placed in 20 mL acid-rinced vials and immediately placed on ice. Where possible, replicate samples (n=3) will be collected from field sites. Where available, heptageniid mayflies, a grazer, will also be collected. Metal analysis will done using ICP-MS.

2.5 Quality Control Requirements

Field, laboratory, and internal office QC are discussed below.

2.5.1 Field Quality Control Samples

Each field duplicate will be collected at a single sampling location and collected identically and consecutively over a minimum period of time. This type of field duplicate measures the total system variability (field and laboratory variance), including the variability component resulting from the inherent heterogeneity of the medium. Field duplicates will be collected at a minimum frequency of one per 20 samples per media/event.

2.5.2 Laboratory Quality Control Samples

EPA Region VIII, ESAT and CLP laboratories will follow all laboratory QC checks, which may include matrix spikes, laboratory control samples, laboratory duplicates and laboratory blanks (i.e., method blanks, preparation blanks).

2.5.2.1 Internal Quality Control Samples

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of glassware and reagents. Each type of laboratory-based QC sample will be analyzed at a rate of 5% or one per batch (batch is a group of up to 20 samples analyzed together), whichever is more frequent. Results of the QC will be included in the data package and QC samples will consist of laboratory duplicates, laboratory blanks, MSs, and LCS/LCSDs, whichever is applicable, and any other method-required QC samples.

Laboratory blank samples will be analyzed to assess possible contamination so that corrective measures may be taken, if necessary. Laboratory duplicate samples are aliquots of a single sample that are split on arrival at the laboratory or upon analysis. Results obtained for two replicates that are split in a controlled laboratory environment will be used to assess laboratory precision of the analysis. MS and LCS analyses may be used to determine both precision and accuracy.

2.5.2.2 Laboratory Quality Control Checks

A calibration standard is prepared in the laboratory by dissolving a known amount of a standardized compound in an appropriate matrix or dilution. The final concentration calculated from the known quantities is the true value of the standard. Where applicable, reference standard solutions will be traceable to the National Institute of Standards and Technology or other nationally recognized source. The analysis results obtained from these standards are used to prepare a standard curve and, thereby, quantify the compounds found in the environment samples.

The number of calibration standards is prescribed by each individual analytical method procedure.

2.5.3 Internal Quality Control Checks

Internal QC checks will be conducted throughout the project to evaluate the performance of the project team during data generation. All internal QC will be conducted in accordance with the applicable procedures listed below:

- All project deliverables will receive technical and QA reviews prior to being issued. Completed review forms will be maintained in the project files
- Corrective action of any deficiencies is the responsibility of the ESAT/EPA/CLP manager.

2.6 Equipment Maintenance Procedures

All laboratory equipment will be maintained in accordance with the laboratory's SOPs.

2.7 Instrument Calibration Procedures and Frequency

Calibration of field and laboratory instruments is addressed in the following subsections.

2.7.1 Field Instruments

Field instruments used to measure data will be used during this investigation. Field measurements will include flow measurements and surface water pH, temperature, and specific conductance. Portable meters will be used to obtain field measurements. The instrument will be calibrated prior to use each day and as often as needed to maintain calibration in accordance with the manufacturer's instruction.

2.7.2 Laboratory Equipment

Calibration of laboratory equipment will be based on written procedures approved by laboratory management. Instruments and equipment will be initially calibrated and continuously calibrated at required intervals as specified by either the manufacturer or more updated requirements (e.g., methodology requirements).

Records of initial calibration, continuing calibration and verification, repair and replacement will be filed and maintained by the laboratory. Calibration records will be filed and maintained at the laboratory location where the work is performed and may be required to be included in evaluation data reporting packages.

2.8 Acceptance Requirements for Supplies

Prior to acceptance, all supplies and consumables will be inspected by the EPA, CDPHE contractor or University of Colorado student field sampling team or other contractors to ensure that they are in satisfactory condition and free of defects.

2.9 Non-direct Measurement Data Acquisition Requirements

Sampling locations within the site have been established prior to this investigation. No non-direct measurement data acquisition requirements exist at this time.

2.10 Data Management

Each laboratory will submit their standard analytical data reports to the either the EPA RPM or state project officer. Each data report will contain a case narrative that briefly describes the number of samples, the analyses, and any noteworthy analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed chain-of-custody forms, cooler receipt forms, analytical data, and a QC package. The CLP will provide both hard copy of the raw analytical data and a validated electronic spreadsheet of the final individual sample results. ESAT and the EPA laboratory will provide a paper hard copy and an electronic data deliverable with samples and quality assurance results. A PDF file of all data will be provided. The analytical data will be formatted to be compatible with CDPHE's EQUIS database and EPA's STORET database. The state project officer will be responsible for entering all data provided by the laboratories into their EQUIS database system, which will then be transferred into EPA STORET.

After validation by CDPHE, data will be made available to EPA, University of Colorado on CD's updated quarterly and other parties through the STORET website. .

Section 3
Assessment and Oversight

Assessments and oversight reports are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also address activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities and serve to keep management current on field activities.

3.1 Assessments and Response Actions

3.1.1 Assessments

Performance assessments are quantitative checks on the quality of measurement systems. Performance assessments for the laboratory can include "blind" reference samples, samples of known concentration. The samples may be included in the sampling stream to evaluation laboratory performance.

System assessments are qualitative reviews of different aspects of project work to check on the use of appropriate QC measures and the functioning of the QA system. System assessments include field and office audits. EPA and CDPHE will each be responsible for overseeing the quality control aspects of each of their contractors. EPA is responsible for the overall Quality Control assessment of the project and may perform system audits at any time.

3.1.2 Response Actions

Response Actions will be implemented on a case-by-case basis to correct quality problems. Minor response actions taken in the field to immediately correct a quality problem will be documented in the applicable field logbook and verbally reported to the EPA RPM. Major response actions taken in the field will be approved by the EPA RPM prior to implementation of the change. Such actions may include revising field procedures, re-sampling and/or retesting, changing sampling frequency, etc. Quality control problems that cannot be corrected quickly through routine procedures require implementation of a corrective action request (see figure 3-1). This action can be initiated by the RPM or field personnel if the need arises.

3.2 Reports to Management

QA reports to the RPM will be provided whenever quality problems are encountered. Field teams will note any quality problems in the applicable logbook or other form of documentation.

Section 4 Data Validation and Usability

Laboratory results will be reviewed for compliance with project objectives. The EPA Laboratory and ESAT contractors will be responsible for validation of their surface water laboratory data

4.1 Validation and Verification Methods

Data validation consists of examining the data packages against pre-determined standardized requirements set forth in this QAPP and referenced methods. The validator examines the reported results, QC summaries, case narrative, instrument calibration runs, chain-of-custody information, raw data, QC samples, calibration, blank results, and other information as appropriate to the data package. The validator checks to determine if project quality objectives were met in the analysis of the data and qualifies data according the National Functional Guidelines for data review.

4.2 Reconciliation with Data Quality Objectives

The analytical data will be provided to all interested parties and decision makers. The data will be examined to determine compliance with water quality standards and quantification of potential sources. In addition, the data collected for this project will be used to help proritize cleanup sites.

Left Hand Watershed QA Corrective Action Request

Project:

Requested by:________________________________ Date:
Condition noted:

Is condition adverse to Quality of project? Yes ____ No_____
Person/organization responsible____

Requested Change:

Corrective Action(s) taken to correct problem (to be filled out by person responsible, use additional pages if needed).

Corrective Action Plan Accepted______________________ Date:_______________________

Verified by:____Date:_______________________

Corrective Action Accepted_______________________ Date:_______________________

APPENDIX A3

Agency Sampling Worksheet

LEFTHAND WATERSHED
Agency Sampling Worksheet

	Program/Stakeholder						
	LWOG/CU	**CDPHE**	**EPA**	**USFWS**	**USGS**	**USFS**	**JCWI**
Area/Segment	Little James (above Argo to James Cr)	Brownfields: Argo only / Superfund: Captain Jack	Watershed		Whole watershed	Loder Smelter Wano tailings – Jamestown Golden Age/ Castle Gulch Castle Gulch down to Lefthand water intake	James Creek -Peak to Peak to Jamestown Little James Creek at mouth
Media Sample#/ Locations	Water Tracer dilution/ metal loading test ~ 30 sample locations	Brownfields: SW = 2-3 locations Soils = 5-15 / SF: Soils, sedm, water-sw/gw, biota	As needed	Invertebrate Field sampling -possibly fish (will coordinate with USGS, USFS, EPA & CDOW for fish tissues	Streambed sediment, surface water – total/dissolved Up to 30 sites	Water – 3 locations Soil – 3 locations Invertebrates	Water quality, some turbidity Basic chemistry and metals (total and dissolved) 6 sites –capture impacts from John Jay Mine, Fairday Mine and Little James cumulative
Timing / Freq. Needed eg 1 yr, 2yr, 12yr	~end of "local" snowmelt ~Late March, April?	High / low flows / High/low Seasonal, two years	High/ low flows		One time	High/low flow 2 times/year	Monthly (currently)
When Sampling Planned/ Wanted	Late March, April	High – March Low – Aug/ September 2004	The sooner the better for the EPA lab.		Low flow	Spring Fall	Currently continuous -wish to expand area/ extent downstream
Analyses Needed	Metals, Cu, Zn, Pb, Fe, Mn, Al, Ca, Mg at a min.	Total/dissolved metals WQ for piper stifts diagrams / Total/dissolved metals, alkalinity, hardness	Total/ dissolved metals, hardness, macroinvertebrate	Community (ID species) Tissue concentrations (fish & invert)	Metals	Total/dissolved metals Inverts – community ID Tissue Analysis TDS/ turbidity/ TSS	TSS/ Macroinvertebrates,/pebble count – imbeddedness
Analyzed by Who	Need help ($ running out)	Analytica EPA	EPA Lab ESAT (Lab)	EPA, CSU (CDPHE)?	USGS - internal	Water samples to contract lab. Inverts?	Division of Wildlife (Riverwatch)
EPA Capacity Lead Time needed	Help with analysis						EPA QAPP

APPENDIX B

Standard Guidance to Format Sample Results, Field Measurements, and Associated Metadata

Standard Guidance to Format Sample Results, Field Measurements, and Associated Metadata

Environmental Protection Agency Region 8

Updated July 22, 2004

General Information

This document describes how environmental data must be formatted before it can be submitted to USEPA Region 8's data archive. Data providers are requested to create data tables and save them as ***tab-delimited text files***. Most commonly available software products such as Microsoft Access, Excel, and Lotus 1-2-3 can create tab-delimited files but remember:

I. To **not** to include text delimiters such as quotation marks
II. To **not** include a row of column headings at the beginning of your files
III. To delineate individual fields or columns using a tab
IV. To **not** include tabs anywhere in the actual data that you are formatting

There are two types of metadata tables that must be successfully submitted ***before*** you submit sampling data and field measurements:

1 PROJECTS	Documents the reasons why samples or field measurements were collected
2 LOCATIONS	Describes stations where samples are collected and/or field measurements are made

For ***non-biological*** results, there are two different types of tables that can be submitted:

3 FIELD MEASUREMENTS	Results of measurements or observations made in the field
4 CHEMISTRY	Results of ***non-biological*** samples analyzed in a laboratory

For ***biological*** results, there are three different types of tables that can be submitted:

5 INDIVIDUALS	Physical attributes associated with individual organisms
6 TAXON ABUNDANCE	Census results associated with populations of biological organisms
7 TISSUE	Results of tissue samples analyzed in a laboratory

The following sections list the data fields and format restrictions that are associated with each type of data table. **For more information or to request deviations from these data formats, contact Martin McComb at 303-312-6963 or mccomb.martin@epa.gov.**

1 PROJECTS

This type of table contains data documenting the reasons why samples or field measurements were collected. The columns, order, and specific requirements in this table type are: (required fields are flagged with "R")

	Column Order. Name	Column Definition	Specific Requirements
R	1. Project ID	User defined identifier for a specific data collection effort.	**Free Text:** 8 character limit
R	2. Project Name	A user defined name for a specific data collection effort.	**Free Text:** 60 character limit
R	3. Project Start Date	Date on which a specific data collection effort began.	**Acceptable Format:** MM/DD/YYYY
R	4. Project Duration	Planned duration of a specific data collection effort.	**Free Text:** 15 character limit
R	5. Project Purpose	Reasons why a specific data collection effort was initiated.	**Free Text:** 1999 character limit
	6. Project Contact	Contact information for party responsible for data collection effort.	**Free Text:** 1999 character limit

2 LOCATIONS

This type of table contains data describing stations (both surface points and wells) where samples are collected and/or field measurements are taken. The columns, order, and specific requirements in this table type are: (required fields are flagged with "R")

	Column Order. Name	Column Definition	Specific Requirements
R	1. Location ID	ID representing a station where a sample is collected or a field measurement is taken.	**Free Text:** 15 character limit
R	2. Location Name	Name representing the station identified by Location ID.	**Free Text:** 60 character limit
R	3. Location Primary Type	Primary type of location at which samples are collected and field measurements are made.	**Valid Values:** Canal Cave Channelized stream Combined sewer Constructed Wetland Estuary Facility Gallery Great Lake Lake Land Land runoff Landfill Mine/mine discharge Ocean Reservoir River/Stream Riverine impoundment Spring Storm sewer Waste pit Waste sewer Well Wetland
R	4. Location Secondary Type	Secondary type of location at which samples are collected and field measurements are made. Use "None" for all Primary Types except Canal, Facility, and Wetland.	**Valid Values:** Drainage — Canal Irrigation — Canal Transport — Canal Industrial — Facility Municipal Sewage (POTW) — Facility Municipal Water Supply (PWS) — Facility Other/combined — Facility Privately Owned non-Industrial — Facility Estuarine, emergent — Wetland Estuarine, forested — Wetland Estuarine, scrub-shrub — Wetland Lacustrine, emergent — Wetland Palustrine, emergent — Wetland Palustrine, forested — Wetland Palustrine, moss-lichen — Wetland Palustrine shrub-scrub — Wetland Riverine, emergent — Wetland
R	5. Latitude	Latitude, in decimal degrees, of a well or location where a sample is collected or field measurements are made.	**Format:** ##.#######
R	6. Longitude	Longitude, in decimal degrees, of a station where a sample is collected or field measurements are made.	**Format:** -###.#######
R	7. Lat/Long Method	Method used to determine the representative Latitude and Longitude coordinates.	**Valid Values:** 007 Address Matching - Other 011 Census – Other 012 GPS Carrier Phase Static Relative Position 013 GPS Carrier Phase Kinematic Relative Pos. 014 GPS Code Differential 015 GPS Code Precise Position

	Column Order. Name	Column Definition	Specific Requirements
			016 GPS Code Standard Position Off 017 GPS Code Standard Position On 028 GPS-Unspecified 018 Interpolation – Map 019 Interpolation – Photo 020 Interpolation – Satellite 021 Interpolation-Other 030 Interpolation-Digital Map Source 022 Loran C 027 Unknown
R	8. Lat/Long Datum	Datum used to determine the representative Latitude and Longitude coordinates.	**Valid Values:** NAD27 North American Datum of 1927 NAD83 North American Datum of 1983 OTHER Other UNKNOWN Unknown
	9. Lat/Long Scale	Scale of the format used to interpolate the representative Latitude and Longitude coordinates. Required if Lat/Long Method is an interpolation.	**Free Text:** 20 character limit
	10. Elevation	Ground elevation of a station where a sample is taken or field measurements are made.	**Format:** #####.####
	11. Elevation Units	Units of measure for the ground elevation measurement.	**Valid Values:** ft or m
	12. Elevation Method	Method used to determine the elevation of a station where a sample is taken or field measurements are made.	**Valid Values**: 001 GPS Carrier Phase Static Relative Position 002 GPS Carrier Phase Kinematic Relative Pos. 003 GPS Code Differential 004 GPS Code Precise Position 005 GPS Code Standard Position Off 006 GPS Code Standard Position On 007 Classical Surveying Techniques 008 Other 009 Altimetry 014 Topographic Map Interpolation
	13. Elevation Datum	Datum used to determine the elevation of a station where a sample is taken or field measurements are made.	**Valid Values:** NAVD88 North American Datum of 1988 NGVD29 National Geodetic Datum of 1929 WGS84 World Geodetic System of 1984 SEALV Elevation from Mean Sea Level OTHER Other UNKNOWN Unknown
R	14. State	Postal abbreviation of the state in which the station is located.	**Valid Values:** CO MT ND SD UT WY
R	15. County	Name of the county in which the station is located.	**Valid Values:** Refer to Appendix D

3 FIELD MEASUREMENTS

This type of table contains data describing the results of measurements or observations made in the field. The columns, order, and specific requirements in this table type are: (required fields are flagged with "R")

	Column Order. Name	Column Definition	Specific Requirements
R	1. Project ID	ID for a specific data collection effort.	**Free Text:** Must exist in STORET
R	2. Location ID	ID representing a station where a sample is collected or a field measurement is taken.	**Free Text:** Must exist in STORET
R	3. Activity ID	ID that groups together a suite of field measurements that were made at the same date, time, place, and in the same medium.	**Free Text:** 12 character limit
R	4. Medium	Medium in which the field measurements were made.	**Valid Values:** Air Sediment Soil Water
R	5. Date	Date that the field measurements were made.	**Acceptable Format:** MM/DD/YYYY
	6. Time	Time that the field measurements were made.	**Acceptable Format:** HH:MM
	7. Personnel	Name of the person who collected the field measurements.	**Acceptable Format:** LastName (space) FirstName
	8. Depth	Depth from surface to where the field measurements were taken.	**Acceptable Format:** #####.##
	9. Depth Units	Units associated with the depth where the field measurements were taken.	**Valid Values:** ft or m
	10. Activity Comments	Text comments to be associated with a group of field measurements.	**Free Text:** 256 character limit
R	11. Parameter	Name of the characteristic that was measured.	**Valid Values:** Refer to Appendix B
R	12. Result Value	Value that was measured.	**Acceptable Format:** #########.#####
R	13. Result Value Units	Units associated with the value measured.	**Valid Values:** Refer to Appendix C
	14. Result Type	Type of result that was measured.	**Valid Values:** Actual Calculated Estimated
	15. Result Comment	Comments associated with the measured value.	**Free Text:** 256 character limit

4 CHEMISTRY

This type of table contains data describing the results of results of *non-biological* samples analyzed in a laboratory. The columns, order, and specific requirements in this table type are: (required fields are flagged with "R")

	Column Order. Name	Column Definition	Specific Requirements
R	1. Project ID	ID for a specific data collection effort.	**Free Text:** Must exist in STORET
R	2. Location ID	ID representing a station where a sample is collected or a field measurement is taken.	**Free Text:** Must exist in STORET
R	3. Sample ID	ID that groups together the results of a sample analyzed in a lab.	**Free Text:** 12 character limit
R	4. Sample Category	Category that best describes the kind of sample that was collected and analyzed.	**Valid Values:** Composite w/o Parents Depletion Replicate Field Blank Field Calibration Check Field Equipment Rinsate Blank Field Replicate/Duplicate Field Spike Field Split Field Surrogate Spike Integrated Cross-Sectional Profile Integrated Time Series Integrated Flow Proportioned Integrated Horizontal Profile Integrated Vertical Profile Routine Sample
	5. Replicate Number	Number to distinguish a replicate sample analysis from a primary one. Only valid if Sample Category field is "Field Replicate/Duplicate" or "Depletion Replicate". All replicates should have the same Activity ID as the primary sample.	**Valid Values:** Integers between 01 and 99
R	6. Activity Medium	Medium in which the sample was collected.	**Valid Values:** Air Sediment Soil Water
	7. Sample Matrix	Specific matrix that was analyzed by the lab.	**Valid Values:** Refer to Appendix E
R	8. Activity Date	Date that the sample was collected.	**Acceptable Format:** MM/DD/YYYY
	9. Activity Time	Time that the sample was collected.	**Acceptable Format:** HH:MM
	10. Personnel	Name of the person who collected the sample in the acceptable format.	**Acceptable Format:** LastName FirstName
	11. Depth	Depth from surface to where the sample was collected.	**Acceptable Format:** #####.##
	12. Depth Units	Units associated with the depth from surface to where the sample was collected.	**Valid Values:** ft or m
	13. Upper Depth	Depth from surface to the top of the place where the sample was collected if the sample was collected over a range of depths.	**Acceptable Format:** #####.##
	14. Lower Depth	Depth from surface to the bottom of the place where the sample was collected if the sample was collected over a range of depths.	**Acceptable Format:** #####.##
	15. Depth Range Units	Units associated with the upper and lower depths where a sample was collected.	**Valid Values:** ft or m
	16. Sample Comments	Text comments to be associated with a sample.	**Free Text:** 256 character limit
R	17. Parameter	Name of the characteristic that was measured.	**Valid Values:** Refer to Appendix B
R	18. Sample Fraction	Fraction of the sample that was analyzed to obtain a Result Value.	**Valid Values:** Total Dissolved Suspended Settleable Non-settleable Filterable Non-filterable Volatile Non-volatile Acid Soluble Vapor Supernate Fixed Total Recovrble
R	19. Result Value	Value that was measured.	**Acceptable Format:** #########.##### **Valid Values:** *Non-detect *Present >QL *Present <QL *Present
R	20. Result Value Units	Units associated with the value measured.	**Valid Values:** Refer to Appendix
	21. Result Type	Type of result that was measured.	**Valid Values:** Actual Calculated Estimated
	22. Result Comment	Comments associated with the measured value.	**Free Text:** 256 character limit
	23. Detection Limit	Detection limit to be associated with the result of a sample analysis.	**Free Text:** 8 character limit
	24. Detection Limit Units	Units of measure associated with the detection limit that is being reported.	**Valid Values:** Refer to Appendix C
	25. Detection Limit Comment	A description of the type of detection limit that is being reported.	**Free Text:** 254 character limit
R	26. Analytical Procedure	The lab analytical procedure that was used to obtain a result from a sample.	**Valid Values:** Refer to Appendix A
R	27. Analytical Procedure Source	The source of the lab analytical procedure.	**Valid Values:** Refer to Appendix A
	28. Analysis Date	Date that the sample was analyzed.	**Acceptable Format:** MM/DD/YYYY
	29. Analysis Time	Time that the sample was analyzed.	**Acceptable Format:** HH:MM

APPENDIX C

Lefthand Watershed Fact Sheet

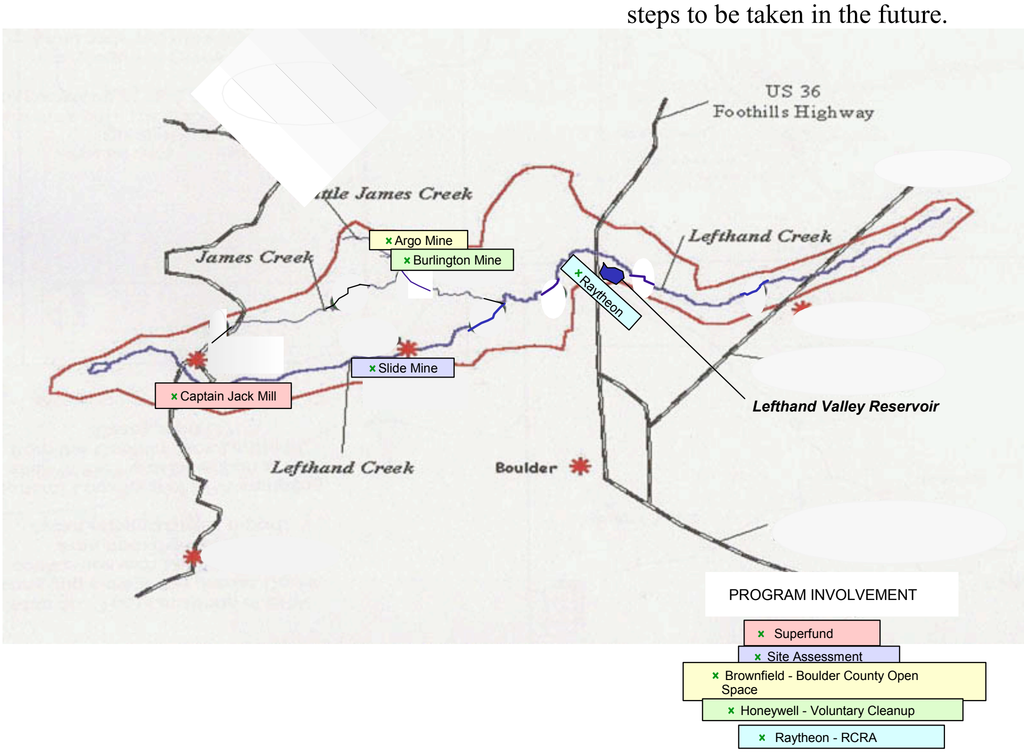
Lefthand Watershed

FEBRUARY 2004 INFORMATION SHEET

INTRODUCTION

The Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) will examine opportunities to coordinate environmental and water quality assessments and funding efforts within the Lefthand Watershed. This effort will promote a holistic approach to assure coordination in establishing and achieving environmental cleanup and water quality goals. A key component of this effort will be assuring participation between local, state and federal stakeholders.

The Lefthand Watershed Oversight Group (LWOG) and the James Creek Watershed Initiative (JCWI) are local stakeholder groups working collaboratively with local, state and federal agencies to address environmental contamination in the Lefthand Watershed. The group currently focuses on the impacts on human health and the environment from historic mining practices. Metals such as cadmium, copper, lead and zinc are the primary contaminants of concern. This fact sheet will highlight the progress made to date, current activities, and steps to be taken in the future.



BACKGROUND

The Environmental Protection Agency (EPA), Colorado Department of Public Health and Environment (CDPHE) and the Boulder County Health Department (BCHD) have worked on environmental issues in the Lefthand Watershed since the mid-1980s. Lefthand Creek is the primary source of drinking water for more than 14,000 customers of the Left Hand Water District. In the 1980s, EPA site assessment activities revealed significant impacts to fisheries and wetlands from the discharges of metal-contaminated water from the major abandoned mining and milling areas of Captain Jack, adjacent to the town of Ward, the Slide Mine and Mill, downhill from Gold Hill and adjacent to Rowena and from the numerous abandoned mines and mills of the Jamestown area, on Little James and James Creeks, tributaries to Lefthand Creek. In May 2002, the Boulder County Board of Health sent a letter to the Colorado Governor's office requesting support for the National Priorities List (NPL) or Superfund designation for the Captain Jack Mill site. The site was listed on the NPL on September 29, 2003.

EPA has also been involved in the Lefthand Watershed at the Raytheon site, located about two miles north of Boulder. The Raytheon site originally consisted of 1,500 acres on the east and west sides of the North Foothills Highway. Raytheon sold 1,237 acres on the east side of the highway to Boulder County Open Space. In 1996, 225 acres were sold to the Santa Fe Land company, leaving Raytheon with approximately 38 acres. Sampling in 1991 and 1995 identified low residual concentrations of Volatile Organic Compounds (VOCs) in ground water migrating across the highway to open space property. The contaminated ground water emerges as surface water in seeps that flow into a wetland area in a drainage approximately a half mile uphill of Left-hand Reservoir, a drinking water supply for the Left Hand Water District. No contaminants from this seepage water have been detected in the reservoir.

The James Creek Watershed is listed on the State of Colorado's 1998 303(d) list as impaired for not supporting the aquatic life use classification. The stream exceeds water quality standards for cadmium, copper, manganese, lead and zinc. The segment is designated as high priority for Total Maximum Daily Load (TMDL) development.

THE WATERSHED PROCESS

In 2001 the BCHD facilitated the formation of a Lefthand Watershed Task Force to assess existing environmental and health data related to the watershed, determine if a cleanup action was necessary and, if necessary, evaluate cleanup options and recommend the preferred option to the Boulder County Board of Health. In March 2002, the findings and recommendations of the Lefthand Watershed Task Force included: establishment of a Watershed Oversight Group (WOG) to serve as a hub for communication and information dissemination, further assessment and remediation using the Superfund NPL for the Captain Jack Mill site, and further assessment using alternatives to Superfund throughout the remainder of the Lefthand Watershed and the communities of Rowena and Jamestown.

The 2002 Lefthand Watershed Task Force report indicated that, despite numerous individual studies of the watershed, no comprehensive, systematic study of the entire watershed can conclusively establish:

- the exact extent of potential risks to aquatic life and human health;
- the potential effects on water quality of a catastrophic storm or similar event;
- the source(s) of contaminants;
- the appropriate remediation strategies to remove contaminants.

This community-based watershed effort will utilize watershed-based data and solutions to make site-specific cleanup decisions. EPA and CDPHE are working together to provide cross-programmatic assessment and remediation alternatives to the community. The **goal** of the watershed-based assessment is to provide a transparent and efficient cleanup in partnership with the community and local, state and federal agencies.

PROGRAM OVERVIEWS:

TMDL Study

When pollutants affect the use of a water body, a study is required by the Clean Water Act to restore the impaired water and remove pollutants. This study is called the Total Maximum Daily Load or **TMDL**. This establishes the amount of a pollutant allowed in the water. Colorado is required by law to identify polluted waters on the 303(d) list and to develop **TMDLs** to help address the problem.

The TMDL study follows a process that includes the following steps:

1. Identify the sources and causes of the pollutant responsible for impairment.
2. Quantify the TMDL by determining the total amount of pollutant that can be allowed into the water and what reductions are needed to achieve that amount. Surrogate endpoints may be established that are directly linked to the impairment to assure the achievement of the water quality goals.
3. Identify the water quality goal. How much does the pollutant need to be reduced to meet water quality objectives?
4. Identify and implement the practices needed to reduce excess pollutants.
5. Monitor the water bodies to assure the goals are being met and modify the plan if needed.

A TMDL has been completed for Little James Creek for cadmium and zinc. In addition, the James Watershed is currently listed for copper and lead on the Colorado State draft 2004 303(d) List.

319 Nonpoint Source Program

Congress enacted Section 319 of the Clean Water Act in 1987, establishing a national program to control nonpoint sources of water pollution. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground and carrying natural and human-made pollutants into lakes, rivers, streams, wetlands, estuaries, other coastal waters and ground water. Atmospheric deposition and hydrologic modification are also sources of nonpoint pollution.

Since 1999, Section 319(h) funds have been awarded to state nonpoint source agencies in two categories; incremental funds and base funds. ***Incremental funds*** are designated for the development and implementation of watershed-based plans and Total Maximum Daily Loads (TMDLs) for impaired waters. ***Base funds***, are used to provide staffing and support to manage and implement the state Nonpoint Source Management Program. Base funds help support projects that identify and address nonpoint source problems and threats, and also can be used for water-body specific, statewide or regional projects. A portion of these base funds (up to 20 percent) may be used for conducting assessments, developing TMDLs, and creating programs to solve nonpoint source problems.

Site Assessment Program

The Superfund Site Assessment Program conducts screening investigations to evaluate potential threats to human health and the environment associated with a specific site. The program also helps identify and prioritize the sites that should be on the Superfund National Priorities List

(NPL). The following site assessment steps are taken prior to NPL listing or any remedial activities.

1. Site Identification or Discovery - Sites may be discovered by anyone, but are frequently identified by concerned citizens, who call the local or state health department or EPA to report a release (or the threat of a release) of a hazardous substance to the environment. Once identified, EPA enters the site into a database that tracks all sites investigated using funds from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Superfund.

2. Complete a Preliminary Assessment (PA) - The PA is a limited-scope investigation where available information about a site and its surrounding area is compiled. The PA is designed to distinguish between sites that pose little or no threat to human health and the environment and sites that may pose a threat and require further investigation. If the PA results in a recommendation for further investigation, a Site Inspection is performed.

3. Conduct a Site Inspection (SI) - The SI involves collecting on-site characterization samples and off-site ground water, surface water/sediments, soil, air or fish tissue samples to determine if substances at the site are being released to the environment and assess if they have reached nearby targets. The SI can be conducted in one stage or two. The first stage, or focused SI (FSI), tests hypotheses developed during the PA and can yield information sufficient to prepare a Hazard Ranking System (HRS) scoring package. If further information is necessary to document an HRS score, an expanded SI (ESI) is conducted. To save time and money, the PA and SI phases may be completed at once.

4. Calculate a preliminary HRS score using data collected during the PA and SI Sites with a preliminary HRS score of 28.50 or greater are eligible for listing on the NPL and require the formal preparation of an HRS scoring package.

Superfund Program

The Superfund program was created in 1980 to address the worst abandoned hazardous waste sites in the United States. In the Rocky Mountain states, many Superfund sites are associated with past mining activities. Once a potential site has been discovered and reported to the state and/or EPA, it becomes eligible for investigation. At this point, the Site Assessment program (explained above) investigates the site and uses the HRS to determine if the site can be on the National Priorities List (NPL), a list of sites needing the most attention. A site on the NPL becomes eligible for cleanup funding from Superfund. Wherever possible, EPA attempts to find those responsible for causing the problem and makes them pay for the cleanup. In cases where viable responsible parties cannot be found, Superfund is used to clean up the site.

If a site is scored on the NPL, a remedial investigation (study) must take place to define the extent of the problem. Next, a feasibility study picks the best way to clean up the site and EPA issues a Record of Decision (ROD) outlining the official clean up plan. Once the ROD is issued, a remedial design (a detailed engineering plan for the cleanup) and remedial action (clean up) take place. Depending on the size of the problem and the availability of funding, this process can take several years.

Brownfields

On January 11, 2002, The Small Business Liability Relief and Brownfields Revitalization Act was signed, expanding EPA's Brownfields program. This law defines a brownfields site as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." The law further defines the term "brownfields site" to include sites contaminated by controlled substances, petroleum or petroleum products, or mining wastes.

Properties and/or facilities that are on the NPL, subject to legal proceedings and determinations under CERCLA, or owned by the federal government are not covered under the Brownfields program.

Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (enacted in 1976) governs the management of solid and hazardous waste and underground storage tanks. RCRA programs are designed to address active facilities that manage, use or dispose of hazardous wastes. These programs include taking clean up and containment actions where threats to human health and the environment have been identified.

USFS Abandoned Mine Lands Program

The Department of Agriculture Forest Service has established an Abandoned Mine Lands (AML) Program to clean up and reclaim abandoned mines sites on National Forest System (NFS) Lands. The Forest Service has CERCLA authority for investigations and remediation of non-emergency hazardous waste sites on lands they manage. The Forest Service AML program conducts CERCLA removal and remedial actions following the National Contingency Plan. Once a site is identified, a Preliminary Assessment (PA) and Site Investigation (SI) are conducted as described above.

In support of the National Forest Plan revisions, which occur every five years, the U.S. Geological Survey and U.S. Forest Service coordinate on an assessment of geological resources on NFS lands. Beginning in 2004, the Geological Survey will be conducting the Central Colorado Assessment Project, which will include the Arapaho and Roosevelt National Forests. This current assessment will include biological and water chemistry components. The Forest Service has proposed the Lefthand Watershed as its priority watershed for the USGS assessment of the Roosevelt National Forest.

SURFACE WATER QUALITY ASSESSMENT – Lefthand Watershed

Site Assessment Program

Left Hand Watershed PA/SI Activities
The following subsections summarize the Site Assessment work done at the Captain Jack Mine and Mill, the Golden Age Mine, and the Slide Mine/Corning Tunnel.

<u>Captain Jack Mine and Mill</u>
Around 1986, and before EPA Site Assessment Program involvement, the Colorado Mined Land Reclamation Division (CMLRD) and the CDPHE investigated the Captain Jack. In 1988, the EPA PA reported the potential for significant impacts to the local environment. In 1992, EPA conducted an SI, in which elevated concentrations of several organic compounds, pesticide/PCB compounds, radionuclides and metals were reported. Arsenic, barium and lead were detected in Left Hand Creek downgradient of the mine. In 1992, there was also an illegal cyanide discharge that released cadmium, copper, lead and zinc.

In 1997, the EPA conducted another SI. Analyses showed elevated levels of arsenic, cadmium, chromium, copper, lead, manganese, mercury and zinc at the Big Five tailings pile and settling pond. Surface water and sediment samples collected along Left Hand Creek and its tributaries indicated elevated concentrations of site-related metals. In addition, ground water samples collected indicated elevated concentrations of cadmium, calcium, copper, lead, manganese and zinc.

EPA identified downstream targets including a fishery, wetlands, and threatened and endangered species habitat within Left Hand Canyon. All of the data from the investigations noted above were used to support HRS documentation and placement on the NPL. Currently, remedial dollars are being made available to fund further characterization, risk assessment, and cleanup of the Captain Jack site.

<u>Golden Age Mine</u>

This mine has also been investigated under the Site Assessment program. In 1994 a PA was completed, which recommended that a SI be conducted. In 1997, EPA evaluated the Jamestown District, in which the Golden Age Mine is located. The 1997 FSI and 1998 ESI showed that mining sources in the Jamestown District have impacted wetlands and a fishery. Since that time, EPA Superfund programs have been coordinating with a local community-based effort to address mining impacts in this part of the watershed.

<u>Slide Mine/Corning Tunnel</u>

The Slide Mine/Corning Tunnel site consists of an abandoned mill building, a large tailings pile and a collapsed adit/seep area comprising about 12 acres on a hill terrace approximately 1,000 feet above Left Hand Creek on the south side of the creek. The site also includes the abandoned Corning Tunnel and a collapsed mill structure with associated foundations and debris. At certain locations on the hill, slope water emerges and discharges to the unnamed drainage that joins Left Hand Creek.

Sampling efforts performed in and around the site consist of incidental sampling events prompted by reports of stream discoloration by the citizens of Rowena. These reports as well as past CDPHE observations indicate that the Slide Mine runoff discharges to Left Hand Creek during periods of snowmelt and high precipitation. During a May 2001 tour of the Left Hand Creek drainage, personnel from CDPHE, Boulder County Health, and representatives of news media and local elected officials observed runoff from the Slide Mine drainage entering Left Hand Creek. The discharge discolored the creek from the Probable Point of Entry (PPE) at the base of the Slide Mine Drainage to a location approximately 0.25 miles below the town of Rowena. At the time of the observation, the creek above the PPE for the Slide Mine was clear and the source of the discharge was visually evident.

In March 2002, reports to the Boulder County Health Department indicated that the Slide Mine was again discoloring the stream during a runoff event. Rowena residents characterized the runoff as a milky-white substance entering Left Hand Creek from the Slide Mine area and discoloring the creek for an undetermined distance below town. EPA Emergency Response Branch (ERB) personnel responded and samples collected from the stream during this run-off event indicated the presence of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc.

In November 2002 and February 2003, CDPHE Site Assessment staff conducted a combined PA/SI. Total metals analysis of the tailings samples indicated the presence of arsenic, cadmium, copper, mercury, lead, silver and zinc. Comparisons of metals in sediment samples collected downstream of the site to those levels reported in the upgradient sample indicate releases of site-related contaminants. The elevated levels of metals are documented in sediments as far as 0.3 miles downstream of the PPE.

Surface water pathway targets include the fishery and riparian wetlands that are present along Left Hand Creek downstream of the site as well as the Left Hand Water District's Haldi intake, which serves 6,318 connections and is situated approximately 8.2 miles downstream of the site. EPA is working with state and local partners to develop a strategy to address the Slide Mine site.

319 Nonpoint Source Assessment

The Lefthand Watershed Oversight Group (LWOG) received a $25,000 grant from CDPHE Nonpoint Source program for the development of a Watershed Plan for the upper Lefthand Watershed that can be used to plan corrective actions. The plan will formalize the organizational structure of numerous stakeholders in the watershed and provide a framework for project implementations. The LWOG will utilize existing and future data compiled during the project from the EPA, CDPHE, U.S. Geological Survey, James Creek Watershed Initiative, University of Colorado, Lefthand Watershed Task Force, and other available sources. Areas that need additional characterization or evaluation will be identified and additional data will be gathered. Once developed, this plan will be used to solicit additional funding from the Nonpoint Source program and other funding sources for development of a TMDL, including assessment work and implementation of the watershed-based plan.

Brownfields Assessment

In FY 2003, Boulder County Open Space submitted a proposal to receive a grant of $200K to conduct further assessment (sampling) of the Argo Mine, which had been acquired by the County. Unfortunately, they were not eligible to receive the grant due to liability prohibitions associated with EPA brownfields grants. As a result, Boulder County Open Space met with the State to seek direct assessment support through the Targeted Brownfields Assessment program.

The State has agreed to support Boulder County by assessing the Argo Mine. To date, a sampling plan has not been prepared, however, CDPHE does not anticipate the sampling to be very extensive. The approximate cost of the assessment will be between $5,000 - $10,000 and will include analyzing for metals in the surface water of Little James Creek and sampling of waste rock. The State anticipates that the sampling will occur sometime during the spring of 2004.

Superfund Remedial Investigation/Feasibility Study

The Captain Jack Mill site has been included on the National Priorities List. The first step of this process is the Remedial Investigation/ Feasibility study (RI/FS). The RI will collect data to characterize site conditions, determine the nature of the waste, and assess the risk to human health and environment. The FS is the mechanism for the development, screening and detailed evaluation of alternative remedial actions. The RI and FS are conducted concurrently.

Voluntary Cleanup – Burlington Mine

The primary objectives of the CDPHE lead Voluntary Cleanup Plan (VCUP) for the Burlington Mine Site are to fill the subsidence features, cover mine wastes, manage surface water, realign Balarat Gulch, and revegetate the entire disturbed area.

Resource Conservation and Recovery Act activities at Raytheon

RCRA

The RCRA Facility Investigation (RFI) completed in October 2002 focused on three areas at the Raytheon property in the Left Hand Creek Watershed: The Clean Room Annex/former impoundment area, the Unnamed Drainage/Seep Area, and the Target/Missile Fueling Area (TMFA).

The area around the Clean Room Annex/former impoundment area show elevated concentrations of acetone, Freon 113, TCE and its decomposition products exist in fractured bedrock and groundwater. A dissolved-phase plume of VOC’s from the Clean Room/Impoundment area follows the valley formed by the Unnamed Drainage and emerges at the ground surface off-site area of natural ground-water discharge. The RFI included a series of pumping tests conducted in the Unnamed Drainage to assess hydraulic characteristics within the drainage and identify and evaluate possible boundary effects. A barrier boundary, possibly a fault, was identified. Pilot scale hydraulic recovery and soil vapor extraction tests were conducted on three angle borings; the results indicate that both groundwater and soil vapor extraction are effective. In addition, results of the pumping tests show that the groundwater in the Fort Hays and overlying Niobrara Shale is not strongly interconnected.

Contaminant concentrations in the TMFA are several orders of magnitude less than those found in the Clean Room Annex/ Impoundment Area. The resultant contaminant plume in the shallow groundwater at the TMFA is confined within the former Facility boundaries.

Raytheon has begun a Phase II RFI to make a final determination of nature and extent of groundwater contamination by drilling five deep sampling wells and additional shallow wells to understand the complex site geology. A parallel, Corrective Measures Study is testing five techniques to remediate chlorinated hydrocarbons in groundwater.

The Interim Remedial Measure started in 1997 provided continuous UV/hydrogen peroxide, carbon polishing, and air stripping of contaminated groundwater. The contaminated groundwater is pumped from eight wells located near the Clean Room Annex/Impoundment area. To date, 2.5 million gallons of groundwater have been treated.

When the Phase II RFI and the Corrective Measure Study are completed a Corrective Measures Workplan will be prepared. Corrective Measures will continue indefinitely, until acceptable water quality standards are met.

EPA Consolidated Funding Process

A proposal submitted from LWOG for 2004 Regional Geographic Initiative (RGI) funding requests $20,000 to quantify, over varying flow conditions, the metal contributions of potential sources of significant water quality impairment.

One Cleanup Pilot Program

The work to be performed has not been finalized. It is anticipated that a guidance manual will be developed documenting the integration of multiple programs and Superfund in the assessment and cleanup of Lefthand Watershed.

USFS Abandoned Mine Lands

In the mid-1990s, the Forest Service contracted with the Colorado Geological Survey to conduct an inventory of abandoned mine sites on the Arapaho and Roosevelt National Forests. The Forest Service has been using this inventory to prioritize sites for assessment and evaluation. The Forest Service will be working on several sites in the Lefthand Creek Watershed in 2004.

Fair Day Mine

A PA/SI has been completed for the Fair Day Mine and will be available for public review and input in the near future. The Forest Service intends to conduct a removal action at the Fair Day in late summer 2004.

Golden Age

EPA has conducted a PA and SI on the Golden Age Mine and determined that a portion of the Mine workings is located on NFS lands. The Forest Service will be developing an Engineering Evaluation/Cost Analysis (EECA) in 2004, which may include some additional site investigation work.

Loader Tailings
The Loader Tailings are located along Lefthand Creek downstream of the Captain Jack Mine. These tailings may have resulted from operations at the Loader Smelter located a short distance upstream. The Forest Service will be conducting a Site Inspection of the Loader Tailings in 2004.

Bueno Mine Tailings
The Bueno Mine is located west of Jamestown between James Creek and Little James Creek. The mine site itself is located on private property; however, tailings were slurried from the mine site to the end of the ridge and onto NFS lands. The Forest Service will be conducting a Site Inspection of the Bueno Tailings in 2004.

The Arapaho and Roosevelt NFs will be submitting a proposal to the U.S. Department of Agriculture for funding to conduct Removal actions at these and other sites in the Lefthand Creek Watershed. The Department is requesting watershed-based proposals and the Lefthand Watershed has been targeted as a priority watershed for the Forest's AML program.

FUNDING OPPORTUNITIES

Brownfields

Assessment Grants

Assessment grants provide funding for a grant recipient to inventory, characterize, assess and conduct planning and community involvement related to brownfields sites. An eligible entity may apply for up to $200,000 to assess a site contaminated by hazardous substances, pollutants, or contaminants (including hazardous substances co-mingled with petroleum) and up to $200,000 to address a site contaminated by petroleum.

Revolving Loan Fund Grants
Revolving Loan Fund (RLF) grants provide funding for a grant recipient to capitalize a revolving loan fund and to provide subgrants to carry out cleanup activities at brownfields sites. An eligible entity may apply for up to $1 million for and initial RLF grant. Proposals may be submitted by "coalitions," or groups of eligible entities, to pool their revolving loan capitalization grant funds. A coalition is a group of two or more eligible entities, which submits one grant application under the name of one of the coalition participants. Coalitions of eligible entities may apply together under one recipient for up to $1 million per eligible entity. These funds may be used to address sites contaminated by petroleum and hazardous substances, pollutants, or contaminants (including hazardous substances co-mingled with petroleum). An RLF award requires a 20 percent cost share.

Cleanup Grants

Cleanup grants provide funding for a grant recipient to carry out cleanup activities at brownfields sites. An eligible entity may apply for up to $200,000 per site. Due to budget limitations, an entity can only apply for funding cleanup activities at no more than five sites. These funds may be used to address sites contaminated by petroleum and hazardous substances, pollutants, or contaminants (including hazardous substances co-mingled with petroleum). Cleanup grants require a 20 percent cost share. In order to receive a cleanup grant, the applicant must own the property for which they are applying by the time the grant is awarded.

Job Training Grants

The Brownfields Job Training Grants bring together community groups, job training organizations, educators, labor groups, investors, lenders, developers and other affected parties to address the issue of providing environmental employment and training for residents in communities impacted by brownfields. An eligible entity may apply for up to $200,000 for the development of a job training program.

Other Brownfields Assistance

Targeted Brownfields Assessments

EPA's Targeted Brownfields Assessment (TBA) program is designed to help communities —especially those without EPA Brownfields Assessment grants— minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides technical assistance for environmental assessments at brownfields sites throughout the country. Under the Small Business Liability Relief and Brownfields Revitalization Act, EPA's TBA assistance is available through two sources: directly from EPA through EPA Regional Brownfields offices under Subtitle A of the law, and from state or tribal voluntary response program offices receiving funding under Subtitle C of the law. A TBA may encompass one or more of the following activities: 1) a screening or "all appropriate inquiry" (Phase I) assessment, 2) a full (Phase II) environmental assessment, including sampling activities to identify the types and concentrations of contaminants and the areas of contamination to be cleaned; and 3) establishment of cleanup options and cost estimates based on future uses and redevelopment plans.

319 Nonpoint Source Grants

Colorado annually funds 18-22 projects statewide to implement their NPS management program. These projects compete for approximately $2 million annually. Within the context of the management program, priority project categories are identified, such as: NPS activities in CWA 303(d) listed waters, information/education, watershed planning, agriculture, and stormwater management for non-permitted activities. Grants require a cost-share match. No more than 60 percent of the project's cost can be from federal funds (including Section 319 dollars or any other federal funds). The 40 percent cost-share can come from individuals, organizations, local governments, or state agencies. In-kind donations can also be used for the match; this might involve the use of equipment or space, a donation of time or services, or other support. Volunteer services can also provide part of the match. No more than 10 percent of a 319 grant can be used for administrative costs. Administrative costs include salaries, overhead, or other indirect costs. management program.

EPA Consolidated Funding Process

The Region 8 Consolidated Funding Process (CFP) funds work identified under Section 104(b)(3) of the Clean Water Act which authorizes the award of grants for applied research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction and elimination of (water) pollution" to support the restoration of impacted watersheds, protection of pristine or high value watersheds or ecosystems, and water quality improvement. In the FY2003 CFP funding cycle, EPA Region 8 funded 57 projects out of 145 for a total of $2,942,000.

SUMMARY

The mining legacy in the Lefthand Watershed has left the local communities with environmental issues that EPA, CDPHE, BCHD and LWOG are working to address in a collaborative process that encourages efficient, cost – effective and workable solutions. The goal of this watershed process is to assess the sources that need to be cleaned up and to meet state water quality standards that protect human health and the aquatic environment.

CONTACTS
EPA Region 8:

Kathryn Hernandez	Program Manager 303-312-6101
Stan Christensen	Superfund RPM 303-312-6694
Sabrina Forrest	Site Assessment 303-312-6484
Peter Monahan	NPS Coordinator 303-312-6946
Noreen Okubo	RCRA RPM 303-312-6646
Kathie Atencio	Brownfields Coordin. 303-312-6803
Rob Henneke	Community Involvement 303-312-6734

USFS Contact:

Andrew Archeleta	AML Program Mgr. 303-245-6411

State of Colorado (CDPHE)

Angus Campbell	Superfund, VCUP, Brownfields Project Mgr. 303-692-3385
Phil Hegeman	TMDL Coordinator 303-692-3518
Bill McKee	Watershed Coord. 303-692-3583
Cathy Schuster	Community Involvement Specialist 303-692-3308
Margaret F. Schonbeck,	Health Assessment Program Mgr, Envir. Health Studies 303-692-2636
Rickey Tolliver,	Environmental Health Studies 303-692-2698
Beth Williams	Health-Related Comm. Involvement 303-692-2704

APPENDIX D
USFS Region 2 and EPA Region 8
Memorandum of Understanding

INTERAGENCY AGREEMENT
BETWEEN
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION 8
AND
UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE, REGION 2

This INTERAGENCY AGREEMENT is hereby made and entered into by and between the U.S. Environmental Protection Agency, hereinafter referred to as USEPA, and United States Department of Agriculture Forest Service, Region 2, hereinafter referred to as Forest Service, under the provisions of the Economy Act of June 30, 1932 (31 U.S.C. 1535, Pub.L. 97-258 and 98-216).

A. PURPOSE:

Pursuant to Executive Order 12580, as amended by Executive Order 13016, the President delegated authority to conduct various activities under CERCLA to several executive departments and agencies, including the USEPA and the United States Department of Agriculture (USDA). The delegated authorities include performing investigations, response activities, and cost recovery, entering into agreements with potentially responsible parties (PRPs) to perform investigations and response actions, and issuing unilateral administrative orders (UAOs).

The Secretary of Agriculture has redelegated the authorities under Executive Order 12580 to the Chief of the Forest Service with respect to land and facilities under Forest Service authority (7 CFR § 2.60(a)(39)). The Secretary of Agriculture has redelegated the CERCLA Section 106 Order authority with respect to National Forest System (NFS) lands and resources to the Director, Office of Procurement and Property Management, to be exercised with the Chief of the Forest Service and with the concurrence of the General Counsel (7 CFR § 2.93(a)(17)(xiv)). In the context of this Agreement, the Forest Service expects to exercise a variety of its CERCLA authorities beyond the authority to issue orders under CERCLA Section 106.

The Forest Service and USEPA have determined that the Bueno/Streamside Tailings Site warrants a CERCLA response actions due to the on-going uncontrolled release of mine waste and associated metals into James Creek and Little James Creek. This site is a “mixed ownership” site. Here, the term “mixed ownership” means the site is located partly on private or State-owned land and partly on NFS land. In order to perform a complete CERCLA action on this mixed ownership site, USEPA and the Forest Service must exercise their respective CERCLA authorities. By Memorandum of Understanding (MOU) dated June 2, 2005, the USEPA and Forest Service have agreed on a framework for coordination of CERCLA response actions on mixed ownership sites.

The Bueno/Streamside Tailings Site is located just west of Jamestown, Colorado in the Lefthand Creek Watershed. The Bueno Mill and associated mine wastes are located on lands with multiple private property owners as well as NFS Lands and lands owned by the Town of Jamestown. Because of the mixed ownership nature of the site, the USEPA and Forest Service need to coordinate CERCLA activities and designate a lead agency pursuant to the Mixed Ownership MOU. USEPA has a designated contractor for CERCLA Removal Actions that can be quickly mobilized for additional site characterization work and to implement a response action. In addition, because of USEPA's previous work in the watershed, some engineering survey and design work has been completed by USEPA's contractor. Based on this information and the Mixed Ownership MOU criteria, USEPA and the Forest Service have determined that it will be most efficient to designate the USEPA as the lead agency for this action.

This Interagency Agreement between the USEPA and the Forest Service is intended to 1) describe agency roles and responsibilities as related to the proposed CERCLA Actions at the Bueno/Streamside Tailings Site, 2) designate the USEPA as the lead agency for this Action, and 3) provide Forest Service funding to USEPA for specific CERCLA Action costs.

The USEPA and the Forest Service recognize that implementing CERCLA response actions on this site requires coordinating the agencies' respective use of their CERCLA authorities.

B. FOREST SERVICE SHALL:

1. Adhere to Agreements C-O as outlined in Part II of the Mixed Ownership MOU dated June 2, 2005 (Attachment A).
2. Provide funding to the USEPA in the amount of $500,000.
3. Designate an On-Scene Coordinator for this Action.

C. USEPA SHALL:

1. Adhere to Agreements C-O as outlined in Part II the Mixed Ownership MOU dated June 2, 2005 (Attachment A).
2. Limit the use of Forest Service Funds to the implementation of the CERCLA Response Action and subsequent maintenance of the remedy.
3. Designate an On-Scene Coordinator for this Action
4. To the extent possible, the EPA will limit the FS funds spent on overhead and personnel related costs.

D. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

1. <u>FUNDING EQUIPMENT AND SUPPLIES</u>. Federal funding under this instrument is not available for reimbursement of recipient/cooperator purchase of equipment (and supplies).
2. <u>MODIFICATION</u>. Modifications within the scope of the instrument shall be made by mutual consent of the parties, by the issuance of a written modification,

signed and dated by all parties, prior to any changes being performed. The Forest Service is not obligated to fund any changes not properly approved in advance.

3. EXTENSION OF PERFORMANCE PERIOD. The Forest Service, by written modification may extend the performance period of this instrument for a total duration not to exceed 5 years from its original date of execution.

4. TERMINATION. Any of the parties, in writing, may terminate the instrument in whole, or in part, at any time before the date of expiration.

   No parties shall incur any new obligations for the terminated portion of the instrument after the effective date and shall cancel as many obligations as possible. Full credit shall be allowed for each Party's expenses and all non-cancelable obligations properly incurred up to the effective date of termination. Excess funds shall be refunded within 60 days after the effective period.

5. PRINCIPAL CONTACTS. The principal contacts for this instrument are:

Forest Service Project Contact	***Cooperator Project Contact***
Andrew Archuleta	Steve Way
On-Scene Coordinator	On-Scene Coordinator
Arapaho & Roosevelt NF's	US EPA, Region 8
3063 Sterling Circle, Suite #1	999 18th Street, Suite 300
Boulder, Colorado 80301	Denver, CO 80202-2466
Phone: 303-245-6411	Phone: 303-312-6723
FAX: 303-443-1083	FAX: 303-312-6962
E-Mail: asarchuleta@fs.fed.us	E-Mail: Way.Steven@epa.gov
Forest Service Administrative Contact	***Cooperator Administrative Contact***
LuAnn Waida,	Carol O'Donnell, Mail Code: 8TMS-G
Grants and Agreements Coordinator	Grants Specialist
USDA Forest Service	USEPA, Region 8
740 Simms Street	999 18th Street, Suite 300
Golden, CO 80401	Denver, CO 80202-2466
Phone: 303-275-5280	Phone: 303-312-6824
FAX: 303-275-5453	FAX: 303-312-6685
E-Mail: lwaida@fs.fed.us	E-Mail: ODonnell.Carol@epa.gov

8. BILLING. The maximum total cost liability to the Forest Service for this instrument is $500,000. Transfer of funds to the USEPA will be through the Treasury Intra-Governmental Payment and Collection System (IPAC) billing.

The IPAC billing document which the USEPA prepares shall contain the following information as the first line of the description or the reference section:

FS Reference Document No. (MO)	
FS Accounting Station	0216
Job Code	HWT2BT
FS Agreement No.	05-IA-11020000-077
FS Agency Location Code	12-40-1100-
Budget Object Code	2550
Performing Agency Location Code	68-01-0727
FS DUNS No.	929332484
Performing Agency DUNS No.	029128894

Send copy of bill to:

LuAnn Waida,
USDA Forest Service
Grants and Agreements Coordinator
740 Simms Street
Golden, CO 80401

A detailed list of charges incurred will be made available upon request. Any excess funds not used for the agreed costs shall be refunded to the Forest Service upon expiration of this instrument.

10. COMMENCEMENT/EXPIRATION DATE. This instrument is executed as of the date of last signature and is effective through July 1, 2010 at which time it will expire unless extended.
11. AUTHORIZED REPRESENTATIVES. By signature below, the cooperator certifies that the individuals listed in this document as representatives of the cooperator are authorized to act in their respective areas for matters related to this agreement.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the last written date below.

USEPA	USDA FOREST SERVICE
Max Dodson Assistant Regional Administrator	Glenda L. Wilson Director of Engineering
_______________ DATE	_______________ DATE

The authority and format of this instrument has been reviewed and approved for signature.

_______________________________________ DATE

FS Agreements Coordinator

Job Code - HWT2BT - $ 500,000

FOR FOREST SERVICE USE ONLY

Agreement #.:	04-IA-11020000-077
Spending Limit for FY05:	500,000
Burden (overhead rate):	N/A
Job Code:	HWT2BT
Billing Frequency (advance lump sum, monthly, quarterly, semi-annual, annual):	quarterly
Vendor ID (multiple partners?):	EPA
If Federal, Agency Location Code:	68-01-0727
Program Manager and phone #:	Suzanne Buntrock, 303-275-5457
Termination Date:	2009

CC: Mike Zimmerman, USEPA R8, Removal Program, 303-312-6828, Zimmerman.Mike@epa.gov

ATTACHMENT A: **Part II. Agreements from MOU between USEPA, Region 8 and USDA Forest Service, Region 2 for Mixed Ownership CERCLA Sites, Dated June 2, 2005**.

ATTACHMENT A

Part II. Agreements C through O from MOU between USEPA, Region 8 and USDA Forest Service, Region 2 for Mixed Ownership CERCLA Sites, Dated June 2, 2005.

C. EPA and the Forest Service agree to designate an overall Lead Agency for each mixed ownership site on a site-by-site basis. In determining which agency should be the Lead Agency, EPA and the Forest Service will evaluate such factors as: the ownership pattern of the site; the layout of any mine features or contamination; the benefits associated with cleanup work; and, the resources available from each agency. The designation of the Lead Agency will be by consensus and will take the form of a letter agreement. For each site that is addressed under this MOU, there may be Action Memoranda or Records of Decision (RODs) issued pursuant to the National Oil and Hazardous Substances Contingency Plan (NCP) found at 40 CFR Part 300, *et seq*. The agency that has not been designated as Lead Agency will still be required, per the requirements of the NCP, to issue an Action Memorandum/ROD or concur in the Lead Agency's Action Memorandum/ROD for that portion of any site for which the non-Lead Agency has jurisdiction. The non-Lead Agency will have the option, at its own election, of issuing its own Action Memorandum/ROD or of concurring in the Lead Agency's Action Memorandum/ROD. In determining whether to issue its own Action Memorandum/ROD or to concur in the Lead Agency's Action Memorandum/ ROD, the non-Lead Agency may evaluate such criteria as: whether the Lead Agency's Action Memorandum/ROD adequately addresses all issues of concern to the non-Lead Agency; the efficiency associated with issuing a single Action Memorandum/ ROD; community relations and public input into the selected remedy; and, any other factors as may be appropriate.

D. All response actions shall be conducted in accordance with the requirements of CERCLA and the NCP.

E. The EPA project representative and the FS project representative will coordinate with each other to implement response activities at each site. This coordination shall include reasonable prior notice of, and an opportunity to participate in, any scheduled meetings related to activities at each site, or any significant on-site activities. In most cases, reasonable prior notice shall be considered seven (7) days. In the event that EPA and the Forest Service wish to schedule a meeting on shorter notice, the EPA project representative or the FS project representative shall contact his/her counterpart and shall determine the counterpart's availability prior to scheduling the meeting.

F. A schedule of activities for each site will be established by mutual agreement of EPA and the Forest Service. The schedule will be for planning purposes and will be updated periodically to reflect actual progress on work at each site and current projections.

G. The EPA project representative and the FS project representative will provide each other with copies of documents such as project proposals, sampling and analysis plans, work plans, and enforcement documents as needed to fulfill the purposes of this agreement. The EPA project representative and the FS project representative will cooperatively determine which documents related to each site are to be copied and provided to the other agency, either directly by the agencies or by third parties. Where EPA or the Forest Service need to obtain comments of the other party on a document, the EPA project representative and FS project representative will cooperatively determine how and when those comments will be provided.

H. The EPA project representative and the FS project representative should communicate regularly to review work status and resolve any existing or anticipated technical issues. Status calls concerning all active sites will be held no less frequently than twice a year, and will generally be held quarterly or at such other regular interval as agreed by the EPA project representative and the FS project representative, based on need and the level of site activities, and will include the EPA project representative and the FS project representative. PRP and contractor representatives will be included when appropriate.

I. EPA and the Forest Service will develop a coordinated position on enforcement against any PRPs at each site.

J. For response actions on portions of each site that include private property and NFS land, the EPA project representative and the FS project representative will co-sign or concur on technical correspondence, including, but not limited to, comments on deliverables that might be required from PRPs, and approval of sampling and analysis plans.

K. For response actions on portions of each site that include private property and NFS land, EPA and the Forest Service will work cooperatively on the following major decision points:

1. The scope and extent of any additional Preliminary Assessment or Site Inspection work;

2. Enforcement activities against PRPs including the negotiation of Administrative Orders on Consent or issuing Unilateral Administrative Orders;

3. The scope and extent of Engineering Evaluation and Cost Analysis work and Remedial Investigation/Feasibility Study work;

4. Community relations activities such as the community relations plan, public notices and public meetings;

5. Preparation of the administrative record;

6. Selection of any response actions, including, but not limited to determination of Applicable or Relevant and Appropriate Requirements (ARARs), and selection of post-removal site control requirements for completed response actions;

7. Any Action Memoranda or Records of Decision;

8. Project management procedures and contracts;

9. Design plans for implementing a jointly selected response alternative;

10. Construction contracts and change orders; and

11. Certifications of completion issued for response actions at each site.

L If any site requires a common mine waste repository, EPA and the Forest Service will enter into a Repository Agreement prior to the construction of any such repository.

M. The Lead Agency will be responsible for notifying and/or coordinating with the State, the natural resources trustees, and the public, as required by CERCLA.

N. The EPA project representative should advise the FS project representative regarding any issues and concerns of special interest to EPA. The EPA project representative will assist the FS project representative in identifying and communicating with EPA personnel who can provide information concerning each site. The FS project representative should advise the EPA project representative regarding any issues and concerns of special interest to the Forest Service. The FS project representative will assist the EPA project representative in identifying and communicating with Forest Service personnel who can provide information concerning each site.

O. Resolution of and communication regarding legal issues will be coordinated among EPA counsel and USDA counsel and, as appropriate, United States Department of Justice attorneys.

USEPA Agreement #
USDA Forest Service Agreement # 04-MU-11020000-081

MEMORANDUM OF UNDERSTANDING

between

U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION 8

and

USDA FOREST SERVICE

ROCKY MOUNTAIN REGION - REGION 2

for

MIXED OWNERSHIP CERCLA SITES LOCATED IN THE

STATES OF COLORADO, WYOMING AND SOUTH DAKOTA

I. Recitals

A. Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC §§ 9601- 9675, the President is authorized to respond to the release or threat of release of hazardous substances to protect the public health or welfare or the environment.

B. Pursuant to Executive Order 12580, as amended by Executive Order 13016, the President delegated authority to conduct various activities under CERCLA to several executive departments and agencies, including the United States Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA). The delegated authorities include performing investigations, response activities, and cost recovery, entering into agreements with potentially responsible parties (PRPs) to perform investigations and response actions, and issuing unilateral administrative orders (UAOs).

C. By Memorandum of Understanding (MOU) dated February 19, 1998, EPA and the USDA, along with the U.S. Coast Guard, Department of Commerce, Department of the Interior, Department of Defense, Department of Energy, and Department of Justice entered into an agreement concerning the exercise of authority under Section 106 of CERCLA. This MOU between the USDA Forest Service - Region 2 and U.S. EPA - Region 8 is intended to supplement the provisions of the nationwide MOU.

D. The Secretary of Agriculture has redelegated the authorities under Executive Order 12580 to the Chief of the USDA Forest Service (Forest Service) with respect to land and facilities under Forest Service authority. 7 CFR § 2.60(a)(39). The Secretary of Agriculture has redelegated the CERCLA Section 106 Order authority with respect to National Forest System (NFS) lands and resources to the Director, Office of

Procurement and Property Management, to be exercised with the Chief of the Forest Service and with the concurrence of the General Counsel. 7 CFR § 2.93(a)(17)(xiv). In the context of this MOU, the Forest Service expects to exercise a variety of its CERCLA authorities beyond the authority to issue orders under CERCLA Section 106.

E. Authority to issue orders pursuant to Sections 104 and 106 of CERCLA was delegated to the Administrator of the U.S. Environmental Protection Agency on January 23, 1987 by Executive Order 12580, 52 Fed. Reg. 2923. This authority was further delegated to EPA Regional Administrators on May 11, 1994 by EPA Delegation No. 14-14-E. The authority to take administrative actions through unilateral orders was redelegated to the Assistant Regional Administrator (ARA) of the Office of Ecosystems Protection and Remediation (EPR) by Regional Delegation No. 14-14-B on December 20, 1996. The authority to take administrative actions through consent orders was delegated to the ARA for EPR by Regional Delegation No. 14-14-C on December 20, 1996. The authority to enter into or exercise Agency concurrence in administrative consent orders for the recovery of costs was delegated to the ARA for the Office of Enforcement, Compliance, and Environmental Justice (ECEJ) by Regional Delegation No. 14-14-D on December 20, 1996. In the context of this MOU, EPA may exercise statutory authorities beyond the authority to issue orders under CERCLA Sections 104 and 106 (e.g., the authority to make a determination of imminent and substantial endangerment under CERCLA Section 106(a)).

F. In general terms, EPA has been delegated the President's CERCLA authority where a release or threat of release of hazardous substances occurs on private property, State-owned public land and National Priorities List sites. With certain limitations, the Forest Service has been delegated the President's CERCLA Section 104 authority where a release or threat of release of hazardous substances is on or the sole source of the release is from a facility or lands under the jurisdiction, custody or control of the Forest Service, such as NFS land.

G. There are numerous sites in Colorado, Wyoming and South Dakota that may warrant CERCLA response actions. Many of these sites are of "mixed ownership." Here, the term "mixed ownership" means sites that are located partly on private or State-owned land and partly on NFS land. In order to perform a complete CERCLA action on these mixed ownership sites, EPA and the Forest Service must exercise their respective CERCLA authorities.

H. This MOU between EPA and the Forest Service is intended to govern CERCLA actions at mixed ownership sites within the States of Colorado, Wyoming and South

Dakota. EPA and the Forest Service recognize that implementing CERCLA response actions within these States requires coordinating the agencies' respective use of their CERCLA authorities. EPA and the Forest Service wish to communicate a coordinated position to PRPs, the States of Colorado, Wyoming and South Dakota, and others.

I. This MOU provides a framework for coordination between EPA and the Forest Service on any future CERCLA response actions on mixed ownership sites in Colorado, Wyoming and South Dakota. This MOU also provides a process for resolving disputes between EPA and the Forest Service that may arise during such response actions. This MOU is not intended to address coordination regarding natural resource damage.

II. Agreements

A. EPA and the Forest Service have designated the following persons to coordinate the exercise of the agencies' respective authorities at mixed ownership sites in Colorado, Wyoming and South Dakota:

EPA Representative

Max Dodson (8EPR)
Director, Office of Ecosystems Protection and Remediation
U.S. EPA - Region 8
999 18th Street, Suite 300
Denver, CO 80202-2466
Phone: (303) 312-6598
Fax: (303) 312-7025

Forest Service Representative

Suzanne Buntrock
Environmental Engineer
USDA Forest Service - Region 2
740 Simms Street
Golden, CO 80401
Phone: (303) 275-5457
Fax: (303) 275-5170

If EPA or the Forest Service change their representatives, the agency making the change will notify the other agency in writing as soon as possible.

B. EPA and the Forest Service will meet at least annually to establish joint priorities for mixed ownership sites. The agencies will strive to develop a coordinated, prioritized project list for mixed ownership sites for the following five years. The agencies will independently seek funding and resources for joint projects and will cooperatively develop strategies for funding and implementation of joint projects to ensure cost-effectiveness.

C. EPA and the Forest Service agree to designate an overall Lead Agency for each mixed ownership site on a site-by-site basis. In determining which agency should be the Lead Agency, EPA and the Forest Service will evaluate such factors as: the ownership pattern of the site; the layout of any mine features or contamination; the benefits associated with cleanup work; and, the resources available from each agency. The designation of the Lead Agency will be by consensus and will take the form of a letter agreement.

D. For each site that is addressed under this MOU, the Lead Agency may be issuing Action Memoranda or Records of Decision (RODs) pursuant to the National Oil and Hazardous Substances Contingency Plan (NCP) found at 40 CFR Part 300, *et seq*.

E. The agency that has not been designated as Lead Agency will still be required, per the requirements of the NCP, to issue an Action Memorandum/ROD or concur in the Lead Agency's Action Memorandum/ROD for that portion of any site for which the non-Lead Agency has jurisdiction. The non-Lead Agency will have the option, at its own election, of issuing its own Action Memorandum/ROD or of concurring in the Lead Agency's Action Memorandum/ROD. In determining whether to issue its own Action Memorandum/ROD or to concur in the Lead Agency's Action Memorandum/ ROD, the non-Lead Agency may evaluate such criteria as: whether the Lead Agency's Action Memorandum/ROD adequately addresses all issues of concern to the non-Lead Agency; the efficiency associated with issuing a single Action Memorandum/ ROD; community relations and public input into the selected remedy; and, any other factors as may be appropriate.

F. All response actions shall be conducted in accordance with the requirements of CERCLA and the NCP.

G. The EPA project representative and the FS project representative will coordinate with each other to implement response activities at each site. This coordination shall include reasonable prior notice of, and an opportunity to participate in, any scheduled meetings related to activities at each site, or any significant on-site activities. In most cases, reasonable prior notice shall be considered seven (7) days. In the event that EPA and the Forest Service wish to schedule a meeting on shorter notice, the EPA project representative or the FS project representative shall contact his/her counterpart and shall determine the counterpart's availability prior to scheduling the meeting.

H. A schedule of activities for each site will be established by mutual agreement of EPA and the Forest Service. The schedule will be for planning purposes and will be updated periodically to reflect actual progress on work at each site and current projections.

I. The EPA project representative and the FS project representative will provide each other with copies of draft and final documents such as project proposals, sampling and analysis plans, work plans, and enforcement documents as needed to fulfill the purposes of this agreement. The EPA project representative and the FS project representative will cooperatively determine which documents related to each site are to be copied and provided to the other agency, either directly by the agencies or by third parties. Where EPA or the Forest Service need to obtain comments of the other party on a document, the EPA project representative and FS project representative will cooperatively determine how and when those comments will be provided.

J. The EPA project representative and the FS project representative should communicate regularly to review work status and resolve any existing or anticipated technical issues. Status calls concerning all active sites will be held no less frequently than twice a year, and will generally be held quarterly or at such other regular interval as agreed by the EPA project representative and the FS project representative, based on need and the level of site activities, and will include the EPA project representative and the FS project representative. PRP and contractor representatives will be included when appropriate.

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N. If any site requires a common mine waste repository, EPA and the Forest Service will enter into a Repository Agreement prior to the construction of any such repository.

O. The Lead Agency will be responsible for notifying and/or coordinating with the State, the natural resources trustees, and the public, as required by CERCLA.

P. The EPA project representative should advise the FS project representative regarding any issues and concerns of special interest to EPA. The EPA project representative will assist the FS project representative in identifying and communicating with EPA personnel who can provide information concerning each site. The FS project representative should advise the EPA project representative regarding any issues and concerns of special interest to the Forest Service. The FS project representative will assist the EPA project representative in identifying and communicating with Forest Service personnel who can provide information concerning each site.

Q. Resolution of and communication regarding legal issues will be coordinated among EPA counsel and USDA counsel and, as appropriate, United States Department of Justice attorneys.

III. Dispute Resolution

A. Informal dispute resolution, through heightened consultation between the EPA project representative and the FS project representative should resolve the vast majority, if not all, technical issues between EPA and the Forest Service.

B. If the EPA project representative and the FS project representative do not reach agreement on a disputed item arising from activities at a site, the issue will be elevated to the Assistant Regional Administrator for the Office of Ecosystems Protection and Remediation within U.S. EPA - Region 8 and the Regional Engineer in the Forest Service - Region 2 within fourteen days (14) days. If these EPA and Forest Service personnel are unable to reach agreement within fourteen (14) days, the issue will be further elevated to the Regional Administrator for U.S. EPA - Region 8 and the Regional Forester for the Forest Service - Region 2.

IV. Limitations

A. Notwithstanding any provision of this MOU, EPA and the Forest Service reserve their rights and authorities under CERCLA, as well as other laws, the NCP, and applicable Executive Orders. No provision of this MOU may be used to limit those rights and authorities or to prejudge what those rights and authorities may be. This instrument in no way restricts EPA or the Forest Service from participating in similar activities with other public or private agencies, organizations, or individuals.

B. EPA and the Forest Service acknowledge and understand that the presumptive arrangement for cooperative work on mixed-ownership sites is that each party shall bear its own costs. The presumptive arrangement also is that EPA (or PRPs, as determined by EPA) would fund work related to the cleanup of mine waste from private or State land, and that the Forest Service (or PRPs, as determined by the Forest Service) would fund work related to the cleanup of mine waste from NFS land. EPA and the Forest Service will negotiate a written agreement (such as, for example, an interagency agreement or a cost share agreement) to provide for payment or reimbursement from the other agency for response costs incurred by them at specific mixed ownership CERCLA sites. Such written agreement may be jointly modified by EPA and the Forest Service at any time after the associated project begins. EPA and the Forest Service acknowledge and understand that funding arrangements will be contingent upon the availability of appropriated funds.

C. EPA and the Forest Service and their respective agencies and offices will handle their own activities and utilize their own resources, including the expenditure of their own funds, in pursuing the objectives of this MOU. Each party will carry out its separate activities in a coordinated and mutually beneficial manner.

D. Any information furnished to EPA or the Forest Service under this instrument is subject to the Freedom of Information Act, 5 U.S.C. § 552, and any privilege claims.

E. EPA and the Forest Service recognize that each agency must operate within the requirements of the federal budget process and legal restrictions concerning obligations of funds. No provision of this MOU shall be construed to require EPA or the Forest Service to obligate or pay funds in contravention of the Anti-Deficiency Act, 31 USC § 1341.

F. Nothing in this MOU shall obligate either EPA or the Forest Service to obligate or transfer any funds. Specific work projects or activities that involve the transfer of funds, services, or property among the various agencies and offices of EPA and the Forest Service will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations.

G. This MOU shall not be deemed to create any right, benefit or trust obligation, either substantive or procedural, enforceable by any person or entity in any court against the United States, its agencies, its officers or any other person.

H. This MOU will terminate five years after the effective date. Either party may terminate this MOU upon 30 days written notice. Prior to termination, this MOU may be modified or extended only upon the written agreement of both parties.

I. This MOU may be executed in counterparts by each of the signatories. Each of the counterpart documents shall be deemed an original, but together shall constitute one and the same instrument.

J. This MOU is effective upon the date signed by the last of the parties.

The undersigned parties hereby agree to the terms and conditions of this Memorandum of Understanding.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - REGION 8	**USDA FOREST SERVICE - REGION 2**
By: ______________________	By: ______________________
(Signature)	(Signature)
______________________	______________________
(Name)	(Name)
Regional Administrator U.S. EPA - Region 8	Regional Forester Rocky Mountain Region USDA Forest Service
______________________	______________________
Date	Date

The authority and format of this instrument has been reviewed and approved for signature.

____
Forest Service G&A Specialist

____
Date