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Design And Construction Issues At Hazardous Waste Sites

Conference Program

Hyatt Regency
Dallas, Texas
May 1-3, 1991

DESIGN AND CONSTRUCTION ISSUES AT HAZARDOUS WASTE SITES

May 1-3, 1991 • Hyatt Regency at Reunion • Dallas, TX

Welcome. This is the first EPA-sponsored hazardous waste conference oriented toward design and construction issues. The conference is providing a forum for 95 technical presentations and 3 panel sessions on relevant and timely topics. As you can see in the conference agenda, the topics encompass the remedial design and remedial action processes; planning, investigation, and post construction activities; along with design and construction policy. A luncheon has been scheduled for Thursday, May 2, 1991, with a guest speaker, Dr. Donald Brown, Quality Director of Stubbs, Overbeck, and Associates. You may sign up for the luncheon at the registration desk. At the completion of the conference, please fill out the enclosed review form (also available at the registration desk) so that we get your impressions. Once again, welcome and enjoy the conference.

DESIGN AND CONSTRUCTION ISSUES AT HAZARDOUS WASTE SITES
CONFERENCE AGENDA

WEDNESDAY --- MAY 1, 1991

8:00 -- 10:00 — **REGISTRATION**

10:00 - 12:00 — **PLENARY SESSION/OPENING SPEAKERS**

Opening Remarks:
Paul Nadeau, Acting Chief, Hazardous Site Control Division, USEPA
Col. Wayne Scholl, Chief, Environmental Restoration Division, USACE
Henry L. Longest II, Director, Office of Emergency and Remedial Response, USEPA
Robert E. Layton, Jr., Region 6 USEPA Regional Administrator

Keynote Speaker:
James W. Poirot, Chairman of the Board, CH2M Hill, Inc.

12:00 -- 1:00 — **LUNCH**

Conference Room	PULLMAN A	PULLMAN B	STATIONMASTER	DEALEY ROOM
	POLICY/MANAGEMENT ISSUES Moderator: Paul Nadeau, USEPA	DESIGN MANAGEMENT Moderator: Tracy Loy, USEPA	CASE STUDIES Moderator: Paul Lancer, USACE	GROUNDWATER REMEDIATION Moderator: Jennifer Haley, USEPA
1:00 -- 1:30	**EPA's New Indemnification Guidelines: Their Effect on RD/RAs** Kenneth Ayers USEPA	**Accelerating the ROD to Remedial Action Process** Bruce Hanna USEPA	**Soil Remediation in the New Jersey Pinelands** Edward Hagarty C.C. Johnson & Malhotra	**A Comprehensive Approach to Groundwater Quality Assessment and Corrective Action for Multiple Facilities in One Hydrologic Province** C.M. Lewis, USDOE
1:30 -- 2:00	**Surety Bonds -- Superfund Projects** August Spallo USACE	**Constructability Input to the HTRW Process** James Moore USACE	**Access Issues During RD/RA at the Helen Kramer Landfill Site** Romona Pessella USEPA	**Advances in Hazardous Waste Alluvial Sampling** Lowell Leach USEPA
2:00 -- 2:30	**Lessons Learned During Remedial Design and Remedial Action Activities at Superfund Sites** Dev Sachdev EBASCO	**Applications of a Design/Build Advisor Expert/System to Remediation Projects** Thomas Napier USACE	**Value Engineering Studies of the Helen Kramer Landfill Superfund Site** Amy Monti URS Consultants	**Where Groundwater Pump and Treat Can Work and Where It Can't Work: APL Sites and NAPL Sites** Mark Mercer USEPA
2:30 -- 3:00	**Superfund -- Program Standardization to Accelerate Remedial Designs and Remedial Action at NPL Sites** Shaheer Alvi USEPA	**Remedial Design of Superfund Projects -- What Can Be Done Better?** John Holm USACE	**Lessons Learned From Remedial Design of Helen Kramer Landfill Superfund Site** Vern Singh URS Consultants	**Verifying Design Assumptions During Groundwater Remediations** Michael Crain USACE

3:00 -- 3:30	BREAK			
Conference Room	**PULLMAN A**	**PULLMAN B**	**STATIONMASTER**	**DEALEY ROOM**
	POLICY/MANAGEMENT ISSUES Moderator: Thomas Whalen USEPA	GOVERNMENT OVERSIGHT Moderator: Stan Hitt USEPA	CASE STUDIES Moderator: Steven Gilrein USEPA	GROUNDWATER REMEDIATION Moderator: Richard Willey USEPA
3:30 -- 4:00	**Remedial Design Schedule Management** Charles F. Wall EBASCO	**State Oversight at Two Uranium Mill Superfund Sites in Colorado** Donald Simpson Colorado Department of Health	**The Sikes Disposal Pits Superfund Site -- A Study in Bid Solicitation** James Steed Texas Water Commission	**Successful Program Management for Remedial Design/Remedial Action** James Kilby Monsanto
4:00 -- 4:30	**Innovative Design Review and Scheduling Tools: Potential Benefits to HTW Remedial Projects** Gregg Bridgestock, USACERL	**Practical Approach to Project Management For Efficient Long-term Oversight** Patti Collins USEPA	**Bayou Bonfouca Superfund Site Case Study** Robert Griswold USEPA	**Optimising and Executing a Multi-Faceted Remedial Action Plan** Dennis Peek Geraghty & Miller
4:30 -- 5:00	**Acquisition Selection for Hazardous Waste Remediation** William Zobel USEPA	**Comparitive Roles of the EPA and the Bureau of Reclamation During the Lidgerwood, North Dakota Superfund Project** Laura Williams, USEPA	**Remedial Design Approach and Design Investigations at the Bayou Bonfouca Site** Kevin Klink CH2M Hill	**Hydrologic Risk Aspects of Hazardous Waste Site Remediations** William Doan USACE
6:00 - 8:00	**SOCIAL RECEPTION**			
	THURSDAY --- MAY 2, 1991			
	POLICY/MANAGEMENT ISSUES Moderator: William Zobel USEPA	CONSTRUCTION ADMINISTRATION Moderator: Larry Wright USEPA	CASE STUDIES Moderator: Carolyn Offutt USEPA	PRE-DESIGN ACTIVITIES Moderator: Kenneth Skahn USEPA
8:00 -- 8:30	**Remedial Management Strategy** Thomas Whalen USEPA	**Mobilising for Remedial Construction Projects** Gary Stillman Weston	**Fast Tracking Remedial Design at the Cape Fear Wood Preserving Site** Thomas Clark, CDM	**Writing an ROD to Expedite Remedial Actions: Lessons from the Delaware PVC Site** Stephen Johnson, DE DNR
8:30 -- 9:00	**Specifications for HTW Designs** Gregory Mellema USACE	**Permitting Superfund Remedial Actions or Nightmare on NW 57th Place** Lynna Phillips BCE	**Remedial Design and Construction at the Charles George Landfill Superfund Site** Robert K. Zaruba USACE	**Overview of the RI/FS Process and its Impact on the RD/RA at the New Bedford Harbor Superfund Site** Mark Otis, USACE
9:00 -- 9:30	**Forecasting Staffing Requirements for Hazardous Waste Cleanup** Robert Salthouse Logistics Management Institute	**Acquisition of Permits and Permit Equivalencies for the Implementation of Superfund Remedial Actions** Mark Wheeler, USACE	**Ambient Air Quality Management at French Ltd.** Bruce Dumdei ARCO	**RI/FS and ERA Impacts on RD/RA at Superfund Sites** William Bolen USEPA
9:30 -- 10:00	BREAK			
	HEALTH & SAFETY Moderator: Rodney Turpin USEPA	CLAIMS MANAGEMENT Moderator: Thomas Whalen USEPA	PRE-DESIGN ISSUES Moderator: Donald Williams USEPA	CONSTRUCTION CASE STUDIES Moderator: James Moore USACE
10:00 -- 10:30	**Airborne Exposure at an Acid Sludge Remedial Site** Stephen Davis IT Corporation	**Identifying and Managing the Risks of Construction Claims** Norman Lovejoy Kellogg Corporation	**The Importance of Pre-Design Studies in Superfund Remediation** Jeffrey Bennett Malcolm Pirnie, Inc.	**Remedial Construction at the Industrial Waste Control Site, Fort Smith, Arkansas** Santanu Ghose USEPA

Conference Room	PULLMAN A	PULLMAN B	STATIONMASTER	DEALEY ROOM
10:30 -- 11:00	**Emergency Response Issues** Les Murphy IAFF **Safety & Health Training** Denny Dobbin, NIEHS	**Management of Change Order Conditions: A Superfund Case History** Myron Temchin West HAZMAT	**Optimisation of the Planning/Investigation Process Based on the Two NPL Case Studies** John Gorgol EBASCO	**Landedowne Radiation** Victor Janosik USEPA
11:00 -- 11:30	**Worker Protection Standard** Vicki Santoro USEPA **USEPA Health & Safety Certification** Vicki Santoro, USEPA	**Construction Disputes on Hazardous Waste Projects** Theodore Trauner TCS	**Site Characterisation Data Needs for Effective RD and RA** John Moylan USACE	**When is a Superfund Remedial Action "Complete"? A Case Study of the Crystal City Airport RA** Bryon Heineman U.S. EPA
11:30 -- 12:00	**EPA/Labor Health and Safety Task Force** Joseph Cocalis USEPA	**HTW Construction Documentation Report: A Necessary Element in a Successful Remediation** Heidi Facklam, USACE	**Pre-Design Technical Summary** Kenneth Skahn USEPA	**WEDZEB Enterprises Remedial Action: Planning for an Efficient Remedial Action Completion** Tinka Hyde, USEPA
12:00 -- 1:30	LUNCH/PRESENTATION **Guest Speaker: Donald J. Brown, Ed.D.** **Quality Director** **Stubbs, Overbeck & Associates**			
	HEALTH AND SAFETY Moderator: Joseph Cocalis USEPA	COMMUNITY RELATIONS Moderator: Melissa Shapiro USEPA	POLICY/MANAGEMENT ISSUES Moderator: Garrett Bondy USEPA	CONSTRUCTION COST ESTIMATING Moderator: John J. Smith USEPA
1:30 -- 2:00	**Overview of Hazard Waste Health and Safety Requirements** Rodney Turpin, USEPA **Hazardous Waste Site Worker Protection** John Moran, LHSFNA	**Effects of Public Input and the Sampling Protocol on the Remedial Design Process at Smuggler Mountain Superfund Site** Raymond Plieness Bureau of Reclamation	**The Effects of the Davis Bacon Act on the LaSalle Electrical Utilities Remedial Action** David Seely USEPA	**Cost Estimating Systems for Remedial Action Projects** Gordon M. Evans USEPA
2:00 -- 2:30	**USEPA Generic HASP** Vicki Santoro USEPA	**Bells and Whistles: Community Relations During RD/RA** Karen Martin USEPA	**QA/QC, Present and Future Requirements for Remedial Action Projects** David E. Foxx Fox & Associates	**Remedial Action Bids and Cost Estimates** Amy Halloran CH2M Hill
2:30 -- 3:00	BREAK			
3:00 -- 5:00	**Health and Safety Panel Session** Joseph Cocalis (Chair) Office of Emergency and Remedial Response USEPA John Moran Health and Safety Director LHSFNA Sella Burchette USEPA Les Murphy International Association of Fire Fighters Denny Dobbin, NIEHS Thomas Donaldson Omaha Division, USACE Ira Nadelman USACE Mary Ann Garrahan OSHA Diane Morrell EBASCO	**Design and Construction Policy Panel Session** Ken Ayers (Co-Chair) Hazardous Site Control Division Office of Emergency and Remedial Response USEPA Charles Schroer (Co-Chair) Acting Chief, Construction Division USACE James Feeley Chief, Superfund and Emergency Response Section Texas Water Commission Doug Smith U.S. Department of Energy John J. Smith, Acting Branch Chief Remedial Operations and Guidance Branch USEPA James Moore Baltimore District, USACE	**Community Relations Panel** Melissa Shapiro (Chair) Office of Emergency and Remedial Response USEPA Michael McGaugh USEPA Region I Betty Winter USEPA Region IV Karen Martin Superfund Community Relations Coordinator USEPA Region V Louis Barinka Remedial Project Manager USEPA Region VI Betty Williamson Community Relations Coordinator USEPA Region VI George Hanley, USACE Pat Ferrebee U.S. Navy	

FRIDAY --- MAY 3, 1991

Conference Room	PULLMAN A	PULLMAN B	STATIONMASTER	DEALEY ROOM
	INCINERATION Moderator: Carl Edlund USEPA	**SOILS TREATMENT** Moderator: Michael Crain USACE	**OFF-SITE TRANSPORTATION ISSUES** Moderator: Greg Jordan USACE	**RADIATION CASE STUDIES** Moderator: Randall Kaltreider USDOE
8:00 -- 8:30	**RPM/OSC Summary Guide: Remedial/Removal Incineration Projects** Laurel Staley USEPA	**Remediating TCE Contaminated Soils: A Case Study of a Focused RI/FS and Vacuum Extraction Treatability Study** Winslow Westervelt Gannett-Flemming Inc.	**Remedial Design and Construction at the Picillo Farm Site** Mark Allen Bechtel	**Streamlining Remedial Design Activities at the DOE's Monticello Mill Tailings NPL Site** Deborah Richardson Chem Nuclear
8:30 -- 9:00	**Trial Burn at MOTCO Site, LaMarque, Texas** MaryAnn LaBarre USEPA	**European Soil Washing for U.S. Applications** Michael Mann Geraghty & Miller	**Transportation and Disposal of Denver Radium Superfund Site Waste** Richard Ehat U.S. Bureau of Reclamation	**Remedial Action In and Around Light Industrial Activity at the Denver Radium Superfund Site** Timothy Rehder USEPA
9:00 -- 9:30	**Tower Chemical: Remedial Design for a Small But Complex NPL Site** Victor Owens EBASCO	**The Challenge of Treating Superfund Soils: Recent Experience** Carolyn Offutt USEPA	**Transportation and Disposal of Hazardous Substances as Part of the CERCLA Remediation Process** Philip Kessack ACRC	**Composite Concrete Liners for Low Level Radioactive Sites** Thomas Ambalam Kaiser Engineers
9:30 -- 10:00	**BREAK**			
	GROUNDWATER TREATMENT Moderator: Robert Zaruba USACE	**CONSTRUCTION ISSUES** Moderator: John Moylan USACE	**INNOVATIVE TREATMENT** Moderator: Linda Fiedler USEPA	**GEOTECHNICAL ISSUES** Moderator: Heidi Facklam USACE
10:00 -- 10:30	**The Construction and Operation of the New Lyme Landfill Superfund Site Groundwater Treatment Facility** Donna Hrko USACE	**Construction Contract Claims Guidance System: A Knowledge-Based System** Moonja Park Kim USACERL	**Bioremediation of Toxic Characteristic Sludges with Biological Liquids/Solids Slurry Treatment** Donald Sherman RTI	**Soil Bentonite Backfill Mix Design/Compatability Testing: A Case History** Jane Bolton USACE
10:30 -- 11:00	**Design and Construction of the Groundwater Treatment Plant at the Conservation Chemical Company Site** Peter Harrod ABB Environment Services	**Change Orders Can Ruin Your Day** Mark Fite USEPA	**Remedial Design for Solvent Extraction of PCB Contaminated Soils at Pinette's Salvage Yard** Steven J. Graham EBASCO	**Construction of Groundwater Trenches** Gary Lang USACE
11:00 -- 11:30	**Arsenic Removal at the Lidgerwood Water Treatment Plant -- Design** Harry Jong Bureau of Reclamation	**Case Study: Geneva Industries Site--Houston Texas** Paul Cravens Texas Water Commission	**United Creosoting Company Superfund Site, A Case Study** Deborah Griswold USEPA	**The Importance of Test Fills for the Construction of HTW Caps and Liners** David Ray USACE
11:30 -- 12:00	**Areawide Implementation of Groundwater Institutional Controls for Superfund Sites** David Byro U.S. EPA	**Remedial and Post-Construction Activities at the Triangle Chemical Company Site** Roger Brown Weston	**Fund - Lead Procurement of Innovative Technologies at Superfund Sites** Edward Hanlon USEPA	**Remedial Design Procedures for a RCRA Cap** Donald Moses USACE

ABSTRACTS
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Title: REMEDIAL DESIGN AND CONSTRUCTION AT THE PICILLO FARM SITE

Authors: Mark L. Allen
Stephen J. Buckley

The Picillo Farm Site is located in rural Kent County, Rhode Island, approximately 20 miles south of Providence. Consisting of about eight acres of cleared property, the site is surrounded by woodlands and was listed on the first National Priorities list.

In 1977, bulk waste and drums containing hazardous materials were disposed in a series of trenches on the site. Following an explosion and fire in September of that year, a series of investigations were conducted. These led to removal and off-site disposal of the drummed waste and other remedial measures conducted from 1980 to 1982. The final public hearing on the RI/FS was held in May, 1985.

In 1987, four private parties entered into a Consent Order requiring the removal and off-site disposal of soil piles and debris remaining from the previous work. Bechtel, representing the private parties, developed and received approval of the Remedial Action Work Plan in March, 1988. Final design documents were approved in May, 1988, and site work began later that same month.

Approximately 8,100 cubic yards of soil contaminated with PCBs and phenol were removed and disposed off-site during the field effort. In addition, 5,111 sample jars were opened, tested, combined and transported for off-site disposal. PCB-contaminated liquids were isolated and incinerated at an approved facility.

Following removal of the specified waste materials, areas of the site were backfilled, graded and seeded to minimize erosion and stabilize the soil. These activities were completed in October, 1988.

A required one-year operations and maintenance (O&M) period began with the completion of field work. During the O&M period, periodic inspections were conducted, and necessary maintenance performed. EPA and the Rhode Island Department of Environmental Management concluded that the O&M period had been successfully completed in January, 1990. Later that month, all parties agreed that the terms of the Consent Order had been satisfied.

In the course of completing this very successful project, the following are among the conclusions developed:

- Where possible, define operable units such that fixed price contracts can be used (limit contamination chasing), enabling improved cost/schedule performance.
- Involve the EPA Off-Site Policy coordinator in disposal site selection from an early date to avoid last minute changes in site status.
- Coordinate site activities with local emergency services and local governments and enlist their help in community relations.

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Mark Allen is a Project Manager in the Oak Ridge, Tennessee office of Bechtel Environmental, Inc. As a Project Manager, Mr. Allen is responsible for the successful execution of assigned projects and monitoring cost and schedule performance. He has conducted several remedial design projects for both the EPA and private parties. During the Picillo Farm work, Mr. Allen was Project Engineer and responsible for planning and executing required technical tasks and ensuring field operations were carried out according to plan.

Mr. Allen has a B.S. in Biology from Tennessee Technological University and a B.S. in Civil Engineering from the University of Tennessee, and is registered as a Professional Engineer in five states.

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Title: SUPERFUND — PROGRAM STANDARDIZATION TO ACCELERATE REMEDIAL DESIGN AND REMEDIAL ACTION AT NPL SITES

Authors: M. Shaheer Alvi, P.E.
Ming Kuo, Ph.D., P.E.

The Alternative Remedial Contracting Strategy Contracts (ARCS) were designed to provide flexibility, accountability and rapid response capability for hazardous waste site clean-up. It is also the intention of these ARCS Contracts to be able to quickly put together and assemble bid specifications and other materials to initiate the Remedial Design and Remedial Action at hazardous waste sites. The concept of "Superfund Program Standardization" is to support the attainment of the above-mentioned ARCS goals.

USEPA Region II under the ARCS Program has developed various Generic Technical Documents and Drawings to facilitate the preparation of documents and reports efficiently and cost effectively. These standardized documents and drawings were intended to provide consistency and uniformity of technical requirements, and eliminate duplication and uncertainty, thereby resulting in a significant savings of time and cost in the preparation of site-specific documents. The generic technical documents developed include a Generic Work Plan, a Generic Field Sampling and Analysis Plan, a Generic Health & Safety Plan and a Generic Quality Assurance Plan for project planning. A generic Subcontract Bid Package for survey and Drilling Services and a Cost Screening Database were repaired for Remedial Investigations and Feasibility Study activities, respectively. In addition, Generic Remedial Design Specifications and Drawings were developed for a variety of treatment technologies and equipment including pumps, air stripping, carbon adsorption, extraction and injection wells, capping and fence details.

The generic technical documents were designed in a template format so that the standard sections with generic description can be easily used in site-specific documents with minor changes. In addition, the boilerplate sections can be incorporated by filling the site-specific information in the blanks. All generic documents are available in PC diskettes in order to minimize typing requirements. The generic remedial design specifications were prepared in accordance with the Construction Specification Institute (CSI) format. The generic Remedial Design (RD) drawings were developed with the aid of an Automatic Computer Aided Design (Auto CAD) System, incorporating the standard details (database) common to most major treatment systems. The Auto CAD standard detail drawings/files can be retrieved for ease of reference and/or modified for new drawings in various scales. The utilizations of the standardized documents and drawings for project planning, remedial investigation, feasibility study and remedial design should result in reasonable savings in budget and time.

M. Shaheer Alvi, P.E., Chief
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Shaheer Alvi possesses over twenty-five years of experience in the environmental and civil engineering fields. He has been responsible to manage and direct the Superfund remedial and enforcement support contracts ins Region II for the past six years. Shaheer Alvi has extensive involvement in planning, design and remediation at NPL sites. Prior to his involvement in Superfund program, Shaheer Alvi managed the design and construction of wastewater conveyance and treatment facilities under the construction grants program of the Clean Water Act.

Earlier in his career, for several years he worked as a consulting engineer on numerous environmental and civil engineering projects. Shaheer Alvi is a licensed professional engineer in the State of New York and has authored/co-authored several technical papers.

Ming Kuo, Ph.D., P.E.
ARCS II Program Technical Support Manager
Lyndhurst, NJ

Dr. Ming Kuo has over 25 years experience in environmental engineering field and has handled many hazardous waste remedial design and construction projects. During the past 10 years, Ming Kuo has been a feasibility study leader, site manager and technical consultant for the Superfund Programs. As ARCS II Technical Support Manager, he has over-all technical support, quality assurance and quality control responsibilities for the program. Ming Kuo is a registered professional engineer in the States of New York and New Jersey and has authored/co-authored numerous technical papers.

Title: COMPOSITE CONCRETE LINERS FOR LOW LEVEL RADIOACTIVE WASTES

Authors: Tom Ambalam, P.E.
Gary Koci

BACKGROUND: Solidification offers a means of permanent disposal for the disposal of low-level radioactive wastes. Cement grout mixed with liquid radioactive wastes for solidification requires a containment vessel. Concrete vaults designed for containment with composite liners meet the requirements of Resource Conservation and Recovery Act and Department of Energy (DOE) waste disposal criteria. This paper reports the design approach and construction techniques employed in meeting the Minimum Technology Guidance requirements of USEPA, for the Grout Waste Disposal Facility, under construction, at a DOE site in Hanford, Washington.

ANALYSIS: Concrete vaults are designed with structural integrity and environmental safeguards. The design is unique in that the vault serves as a containment vessel until the solidification is complete and as a component of the composite liner system throughout its life in compliance with RCRA rules. The protective coating of the interior of the vault and concrete serves as a primary leachate collection system. The vault is supported by a concrete catch basin which serves as a secondary leachate collection system. The basin is overlaid with a high density polyethylene liner to serve as secondary composite liner. A leachate sump pit, diffusion barriers and drainage path are some special design features of this facility.

FINDINGS: Once solidification is complete, no leachate generation is possible. However, during the mixing process the concrete, liners and barriers should be protected against thermal gradients to prevent migration of leachate. The vault needs to be protected against infiltration/exfiltration of water and vapor to prevent leachage generation. In addition to a closure cover at the top of the vault, diffusion barriers around the vault were to be designed with a hydraulic asphalt mix.

CONCLUSION: Concrete is an effective alternative for liquid radioactive wastes when solidification is a means of disposal. The new developments in thermoplastic membranes and geotextiles enhance the potential of concrete liners to meet the minimum technology guidance criteria. Barriers using asphalt mix can be used as supplemental liners where clay may not be effective.

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Tom Ambalam is employed as an environmental engineer with Kaiser Engineers Hanford Inc. He has a B.S. in Civil Engineering from Annamalai University, India and a M.S. in Environmental Engineering from University of Roorkee, India. He is registered as a Professional Engineer in the State of Colorado. He has served as a Chief Utilities Engineer and Director of Natural Resources for the City of Northglenn, Colorado for more than ten years. He has worked in several public sector projects for water, waste water, solid waste and reuse projects in the U.S. for more than twenty years. He has published several papers in waste treatment processes and water reclamation management.

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Gary Koci is a civil/structural engineer with over twenty years of design and construction experience. He has a B.S. in Civil Engineering from the University of Nebraska. In the last fifteen years, he has been involved with the construction of nuclear process and power plants. He is also experienced in mining and industrial design work.

Title: EPA'S NEW INDEMNIFICATION GUIDELINES: THEIR EFFECT ON REMEDIAL DESIGNS AND REMEDIAL ACTIONS

Authors: Kenneth W. Ayers, P.E.

After operating for more than three years under "interim" guidelines, the Office of Waste Program Enforcement will issue in March 1990 final guidelines for granting indemnification for pollution liability by EPA to response action contractors. These new guidelines will drastically alter both the amount of indemnification available from EPA and the time period covered when indemnification is provided.

This paper will detail the changes from the interim guidance and the potential impacts, both cost and time, on remedial action contractors providing remedial design and action services to EPA. It will also explore the impact the guidelines will have on EPA's current operating protocols for the program.

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Mr. Ayers received a B.S. degree in Civil Engineering from the University of Texas at Austin in 1974, an M.P.A. at the University of Oklahoma in 1978, and a M.S. degree in Civil Engineering from the University of Minnesota in 1980. Mr. Ayers worked as an Environmental Engineer in the U.S. Army from 1974 to 1978, and was a Graduate Assistant at the University of Minnesota from 1978 to 1979. He also served as an Environmental Engineer in the U.S. Army Corps of Engineers from 1979 to 1980, and for the U.S. Public Health Service (Indian Health Service) from 1980 to 1987. At present, Mr. Ayers is the Chief of the Design and Construction Management Branch at the USEPA.

Title: THE IMPORTANCE OF PRE-DESIGN STUDIES IN SUPERFUND REMEDIATION

Authors: Jeffrey Bennett, P.E.
Richard McCollum, P.E.
William McCabe, P.E.

The Marathon Battery Superfund Site involves heavy metal contamination along the Hudson River in Cold Spring, NY. The remediation overview is being handled by the U.S. EPA with project management by the U.S. Army Corps of Engineers. Malcolm Pirnie is the design engineer.

The contamination was created by an old battery manufacturing operation which discharged nickel, cadmium, and cobalt wastes. Cleanup is complicated by the variety of environments involved, the proximity of a 200 plus acre wildlife refuge, the historical significance of the site and associated archeological investigations, and a high level of concern from the abutting community.

This project involves a number of interesting design and construction issues including:

- o development of a dredging program for an environmentally sensitive wetland,
- o bench and pilot scale treatability testing to develop an effective fixation procedure, and
- o extensive evaluation of transport options for movement of construction materials and stabilized waste.

This paper will focus on the importance of studies performed after the RI/FS and ROD were finalized. These include efforts to better define areas of contamination using geostatistical analysis; evaluation of alternative dredging procedures based on cost effectiveness and environmental impacts; and material transport analysis of rail, road and water-based options.

The results of these pre-design efforts substantially affected design and construction by reducing the proposed remediation zones, providing for isolation and safeguarding of a sensitive waterfowl sanctuary and developing a balanced transportation plan which will reduce both project costs and local impacts of construction.

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A licensed engineer, Mr. Bennett has a BSCE degree from Tufts University and an MBA from the University of New Hampshire. He is a Diplomate of the American Academy of Environmental Engineers and is active in a number of professional societies.

As a Vice President of Malcolm Pirnie, Inc., Mr. Bennett is responsible for directing a variety of hazardous waste projects for industrial and military clients. He is also the firm's overall coordinator of DoD projects.

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William McCabe, P.E.
Chief, NY/Caribbean Remedial Action Branch
U.S. Environmental Protection Agency, Region II

Title: RI/FS AND ERA IMPACTS ON RD/RA AT SUPERFUND SITES

Authors: William J. Bolen
Earl H. Brown
James A. Werling

BACKGROUND: An initial Remedial Investigation was started at a former metal plating facility located in Indiana. This NPL site is located approximately 800 feet away from a city wellfield utilizing the same aquifer that was subsequently found to be contaminated via leaching from the site. During RI scoping, a preliminary public health evaluation identified excess health risks associated with chromium, and a fast-track approach for site remediation was taken. In order to remove the source of the contamination, the former metal plating building and soils were removed during the conductance of an Expedited Response Action (ERA).

ANALYSIS: ERAs were created in response to the February 1986, update to the National Contingency Plan (NCP) which redefined the response categories of removal actions and remedial actions. The primary purpose of ERAs is to enable fast-track cleanups of site contamination by streamlining the Remedial Feasibility Study (RI/FS) process. The ERA also accomplishes partial or potentially complete site remediation consistent with a permanent remedy. The implementation of the ERA allows ongoing or future RI/FS activities to progress more easily by removing or controlling on-site wastes. In this case the ERA process was further streamlined by applying USEPA expert technical system analysis and cost system model, enabling the USEPA to produce a decision document on the preferred method of remediation in 2 weeks.

FINDINGS: After completion of the ERA, the FS was greatly simplified in that the only remaining media of concern was groundwater. The selected remedial action to remediate the threat, pump and treat, was further simplified by the conductance of an aquifer test during the ERA. This resulted in a complete system design for technical pump and treat system prior to initiation of the Remedial Design. The only remaining significant task is the completion of a piping system before remediation activities can begin.

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Title: SOIL-BENTONITE BACKFILL COMPATIBILITY TESTING

Authors: Jane M. Bolton
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During the 1940's and 1950's wastewater from the production of Army agents was discharged into the Lime Settling Basins at the Rocky Mountain Arsenal, Commerce City, Colorado, causing extensive groundwater and soil contamination. A containment system consisting of a 360-degree soil-bentonite slurry trench cutoff, vegetative cover, and groundwater extraction trench will be built at the site. The presence of chemical contaminants in soil and/or groundwater may significantly alter the rate of water movement through a soil medium. The purpose of this testing program is to find the mixture of backfill material; coarse and fine-grained soil, bentonite, and water to produce an in-place hydraulic conductivity of 1×10^{-7} cm/sec or less and shows the least variation in hydraulic conductivity between tap water and contaminated groundwater.

Four suppliers provided bentonite samples for this project. A bentonite source will be chosen based on results of free swell and filter cake compatibility tests. Optimization testing (2 to 3 day fixed wall permeability tests) determines the most economical combination of bentonite, fines, coarse grained soil and water with a laboratory hydraulic conductivity of 1×10^{-8} cm/sec or less. The amounts of bentonite (up to 4% dry) and fines (up to 30% greater than the natural borrow soil) are varied during these tests. Long-term (approximately 2 months) flexible wall permeability tests are conducted utilizing the optimization testing results. Three permeameter tests will be run; a control test with tap water as the permeant using the optimum mix, a test using the same mix with contaminated groundwater as the permeant after the first pore volume of effluent, and a test using a mix with 2% greater than optimum bentonite and the contaminated groundwater permeant after the first pre volume of effluent. The mix which exhibits the lowest hydraulic contaminated groundwater, and visual alteration during testing will be chosen for construction.

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Title: INNOVATIVE DESIGN REVIEW AND SCHEDULING TOOLS: POTENTIAL BENEFITS TO HTW REMEDIAL PROJECTS

Authors: Gregg Bridgestock
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The Nation faces a task of great magnitude to restore its contaminated sites. Conservative estimates indicate a cost of hundreds of billions of dollars of remedial work. In addition to the magnitude, other issues add to the challenge: (1) hazardous nature of handled materials; (2) need to utilize cutting edge restoring technologies; and (3) uncertainty on degree of contamination or amount of contaminated material.

Because of these demanding characteristics, the performance of remedial projects is far from optimal. Substantial time delays and cost overruns are too common. Errors, omissions and inconsistencies in design documents may account for a large percent of all change orders encountered during construction. Even though these documents pass through multiple reviews by various design disciplines during the stages of design creation, major deficiencies still manage to be overlooked.

The utilization of innovative project management techniques could make the management of remedial projects more effective. USACERL has developed a number of tools to enhance the management of traditional construction projects, which could also benefit Hazardous Toxic Waste (HTW) remedial projects if properly adapted.

One current research project being conducted at USACERL has concentrated on developing a system that will assist project design reviewers in performing their task more accurately and efficiently. This paper will describe an easy-to-use personal computer (PC)-based system, which incorporates expert-system technology (knowledge-based system), being designed to act as a desk-top consultant that can effectively assist and interact with reviewers. The system currently focuses on the Biddability, Constructability and Operability (BCO) areas of review by providing specialized checklists of information to aid the reviewer in conducting a thorough review. USACERL is considering developing a fourth review category to add to this existing system which will cover issues pertaining to Construction Claims Prevention. This paper will also discuss the approach and potential benefits of this expanded system and its application to HTW remedial projects.

Another USACERL project is developing innovative techniques that facilitate the estimation of construction project durations and the generation of construction schedules, at early design stages. A pilot knowledge-based system has been developed that, based on basic building information (size, main system alternatives, etc.), is able to produce a construction schedule template. It is believed that the application of the same concepts to HTW remedial projects could result in improved time estimation and time control tools. A proposed approach for applying these concepts and their potential benefits will also be examined in the paper.

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Title: REMEDIAL AND POST-CONSTRUCTION ACTIVITIES AT THE TRIANGLE CHEMICAL COMPANY SITE

Authors: Roger C. Brown, P.E.

Triangle Chemical Company is a bankrupt, abandoned chemical blending and packaging company located on a tributary of Cow Bayou in Bridge City, Texas. This NPL Site is a state-lead Superfund Site administered by TWC. EPA took control of the site in 1982 and conducted an immediate response action, removing 1000 drums containing 21,000 gallons of liquid waste stored in the open with no containment. Contamination at the site was generally volatile organic compounds in the soil and upper aquifer. There were several large tanks with another 50,000 gallons of various chemicals, which were emptied and cleaned during the Remedial Action. Following a detailed remedial investigation and feasibility study, mechanical aeration of the soil and natural attenuation of groundwater were chosen as the selected treatment methods. Mechanical aeration was tested, utilizing a full-scale pilot study during the pre-design phase. The results of this pilot study were used to form the basis for development of field controls for the remediation. The remediation was conducted on a compressed schedule, and was completed in February, 1987. Data from quarterly groundwater samples collected since 1987 has produced a data bank to realistically project the natural attenuation rates expected. The Project Close Out Report produced by EPA is now available for review by the public.

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Roger Brown was educated as a Civil/Structural Engineer and has done the Remedial Design and Construction Management assistance on the Triangle Chemical Company Superfund Site and the Highlands Acid Pit Superfund Site. Mr. Brown has been the Lead Construction Inspector on the Texas Highway Department SPUR 548 project which involved the demolition of a creosote plant and the permanent on-site encapsulation of the waste under the Hardy Toll Road. He has been the On-Site Construction Manager for the construction of a groundwater recovery system and treatment plant for Fisher Scientific, and provided Construction Oversight for a groundwater recovery, treatment and re-injection project for Occidental Petroleum at the Zoecon Facility in Dallas. Mr. Brown has also worked in numerous functions in Design and Construction on water and wastewater projects.

Title: AREAWIDE IMPLEMENTATION OF GROUNDWATER INSTITUTIONAL CONTROLS FOR SUPERFUND SITES

Authors: David G. Byro

BACKGROUND: A large percentage of residents in Chester County, PA, rely on individual private wells for their water supply. Within Chester County there are nine NPL sites, eight of which have contaminated groundwater. A number of RODs for those sites have or will require institutional controls on the installation of new wells within the plume. These controls have been difficult if not impossible to implement in the past.

ANALYSIS: Concerned for the health of residents who may unknowingly develop new wells within contaminated groundwater from the NPL sites, Chester County Health Department (CCHD) requested assistance from EPA. Seeing an opportunity to meet the institutional control requirements of a number of RODs, EPA developed and assisted CCHD in implementing a well permitting procedure that effectively controls this health threat.

FINDINGS: This simple interagency coordination has provided a significant environmental benefit for little resources, while providing support to CCHD in enforcing their well permit review program and enabling EPA to implement the institutional control requirements of its RODs.

CONCLUSIONS: Institutional controls have often had a negative impact on RD/RAs by consuming the manager's time trying to implement them. The well permit review procedures implemented in Chester County, PA, resolved this problem. There is the potential to gain further environmental benefits nationwide by implementing similar procedures wherever a local government agency has a well permitting program.

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Title: FAST-TRACKING REMEDIAL DESIGN AT THE CAPE FEAR WOOD PRESERVING SITE

Authors: R. Tom Clark, P.E.
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Fast-tracking, a method to accelerate RD and RA projects by eliminating and/or rearranging various tasks, can be successfully applied to the Remedial Design (RD) and Remedial Action (RA) work elements in the cleanup of hazardous waste sites. Traditional fast-tracking techniques are applied most often to projects which exhibit the following characteristics:

- The applied technology remedy utilizes a proven technology.
- Treatability studies are not required, or have already been completed during the Remedial Investigation or Feasibility Study, and only minimal additional field data is required.
- A value engineering study is usually not necessary.
- Intermediate design tasks are not required, and third party design reviews can be accomplished concurrently.
- The site and conditions present no unusual property access problems or permitting requirements.

This paper presents a case history in which innovative fast-tracking techniques were applied to remedial design. Although this project did not exhibit all the characteristics usually conducive to fast-tracking, it was completed in an expeditious manner by omitting tangential design tasks, carefully scheduling select tasks, and combining intermediate and prefinal design. Most importantly, a preliminary design meeting was held between the U.S. Environmental Protection Agency (EPA) and its consultants during a critical phase of the project to resolve key design issues and facilitate design completion.

In August 1989, EPA retained Camp Dresser & McKee Inc. (CDM), through its CDM Federal Programs Corporation subsidiary, to complete a remedial design of the Cape Fear Wood Preserving Site, an abandoned wood treating facility located in Fayetteville, North Carolina. EPA's original Statement of Work included eleven major design tasks, each typical of an RD work assignment for a Superfund site. After the Final Work Plan and Field Operations Plan were approved, EPA, in an effort to obligate funds for the Remedial Action phase, directed CDM to finish the design by the end of EPA's fiscal year 1990. As a result, five major changes were made to the original scope of work, three tasks were eliminated, and the design schedule was ultimately shortened by approximately five months.

This paper presents a history and description of the Cape Fear Site and elements most suited to fast-tracking, compares the original and final scope of work for the site, and presents specific techniques used for fast-tracking the remedial design for this project.

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Title: EPA/LABOR HEALTH AND SAFETY TASK FORCE

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In response to worker protection issues arising from activities on two NPL sites in 1989, Mr. Donald Clay established a Special Health and Safety Task Force. The Task Force, focusing only upon worker safety and health issues pertaining to hazardous waste sites, is composed of key EPA personnel from headquarters and Edison, N.J., and personnel representing the three principal construction trade unions involved in hazardous waste site clean-up. OSHA and the U.S. Army Corps of Engineers are technical advisors to the Task Force.

The Task Force has dedicated substantial effort to reviewing site safety and health issues and all OSWER Superfund safety and health directives and guidelines. Revisions to some of these and the issuance of guideline documents resulting from the Task Force efforts will be reviewed.

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Title: A PRACTICAL APPROACH TO PROJECT MANAGEMENT FOR EFFICIENT LONG-TERM OVERSIGHT

Authors: Patti Collins

A practical project management system has been developed to facilitate the long-term oversight of the remediation at the MEW (Middlefield, Ellis, and Whisman streets) Superfund site in Mountain View, CA. The MEW study area encompasses the contamination from the facilities of 17 potentially responsible parties (PRPs) including private semiconductor industries and 2 Federal Facilities (U.S. Navy and NASA). Cleanup of the contaminated soils and groundwater is proceeding under a combination of EPA enforcement orders, and negotiated settlements, and is estimated to continue for over 100 years.

By early 1990, the process of project management and PRP oversight was becoming increasingly complicated because each PRP's contractor had a different report format using only small facility maps. No current area-wide maps existed. In addition, the work being conducted by the various PRPs was proceeding on different schedules with volumes of design deliverables and field reports to be reviewed. And after the 1989 earthquake, the historical data was inaccessible in storage.

Efficient, comprehensive oversight and long-term continuity from one project manager to the next was impossible without a radical change in the project's management. Otherwise, the need for ready access to the engineering, geological, and regulatory data could not be met.

The solution was to automate the site data with the objective of efficient long-term management. Automation would allow a quick overview of any aspect of the cleanup process. For example, the progress of soil remediation at each of the facilities could be quickly shown on one computer generated map; a map that would take weeks to create by hand. A series of maps showing changes in chemical concentrations would show any movement of the plume, allow a faster evaluation of the effectiveness of the remediation system, and be quickly generated by computer since the chemical data from the monitoring wells would be in the computer database.

The project management plan included: 1. design the database such that any engineering, geological, and/or regulatory information could be plotted on a map using the geographical information system (GIS) called ARCINFO, 2. index all the documents in the site file using a computer indexed document retrieval system, 3. track the complicated schedules of deliverables and activities using software like Viewpoint, and 4. create a uniform report format for all text, drawings, and maps, including submission of well monitoring data on disc.

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Title: VERIFYING DESIGN ASSUMPTIONS DURING CONSTRUCTION OF GROUNDWATER REMEDIATIONS

Authors: Michael E. Crain
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BACKGROUND: The goal of the construction of a groundwater remediation system is to achieve and maintain a system which accomplishes remedial objectives. Design of such systems often involves many unknowns, even with good predesign investigations. Data which become available during construction can be used to improve the latter stages of construction and/or the operation and maintenance of the system. We emphasize the need to properly gather and assess this data.

Parameters such as stratigraphy, well/trench yield, aquifer properties, well efficiencies, chemical concentrations (contaminant and natural ion), and water levels are assumed or estimated to some extent in design. Often, however, data from construction are not gathered or utilized to confirm or refine these estimates. Often, specifications do not require accurate logs, as-built drawings of the wells or trenches, or other construction records. There is also often poor communication of such data collection needs between the designers and the field inspectors. As examples, two case histories are referenced: the Phoenix-Goodyear (AZ) and Millcreek (PA) Superfund sites.

CONSTRUCTION GENERATED DATA AND ANALYSIS: We recommend that the following data be gathered during construction, either by the contractors, trained field inspectors, or even the designers: 1) accurate logs of borings and trench excavations, 2) accurate records of pumping rates and associated water levels during dewatering and/or test pumping, 3) good as-built drawings of wells, trenches, and collectors, 4) initial well-specific chemical sampling for contaminants and natural ions, 5) well development records, 6) water levels from edge of well pack during test pumping (for well efficiency), and 7) seasonal water levels from production wells before pump placement (if schedule permits). These data should be analyzed by the designers during construction for comparison with assumed values. Potential changes in design of other project components, such as the treatment plant, should be considered, if warranted. The information should also be analyzed for any effects on start-up and operation procedures.

RECOMMENDATIONS: Specifications must require good data collection during construction. This information needs to get back to designers during construction. The designers must prepare good instructions to the field defining their needs. Well/trench construction should be done before treatment plant construction, if possible, to allow time for any changes in plant design. Finally, construction generated data must be considered in preparing the operations and maintenance plan.

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Title: CASE STUDY: GENEVA INDUSTRIES SUPERFUND SITE — HOUSTON, TEXAS

Authors: Paul B. Cravens, P.E.

BACKGROUND: The Geneva Industries is an abandoned chemical manufacturing plant and oil refinery. Soil and shallow groundwater on the site had been contaminated with PCBs and related by-products from the plant operations. Geneva was placed on the NPL in 1983, and the EPA performed emergency cleanup operations soon thereafter. Following an investigation of the site conditions and a feasibility study for remediation, a Record of Decision was issued providing for the removal of the grossly contaminated soils and the construction of a permanent cap and slurry wall. The groundwater remediation phase is to follow the completion of the source control. Work on the source control phase of the project began in May 1988 and was completed in June 1990. The project was delayed for about ten months due to outside factors, including a lawsuit by the State of Alabama.

ANALYSIS: The contract between the contractor and the Texas Water Commission for the source remediation allowed for the negotiation of changes in contract time or cost when changes in the scope of work were necessary. A total of 39 formal claims were made by the contractor within the period of the contract, and a total of 29 change orders have been issued to date based upon these claims, including five credit change orders for changes in the scope that were beneficial to the contractor. The change orders increased the project cost by about 30 percent of the original contract price.

FINDINGS: A great number of man-hours were expended by all parties in the management of change order claims. Each claim required detailed negotiations, dispute resolution, and contract interpretation. The contract wording became critical in these negotiations and the presence of unclear or contradictory language greatly affected the ease of negotiations.

CONCLUSIONS: Clear contract language is necessary for effective good-faith negotiations. Field orders should be the basis of all change orders. Early negotiations of cost and time are essential to avoid conflicting views of claims for work performed, since determination of compensation after the work is done will more often than not draw out the claim processing procedure.

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Title: AIRBORNE EXPOSURE CONTROL AT AN ACID SLUDGE REMEDIAL SITE

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BACKGROUND: The project involved a lagoon that was used to dispose of various acidic wastes from the petroleum refining industry during the period from approximately 1935 to approximately 1975. In the late 1970's, a part of the lagoon wall failed, allowing sludge to enter a nearby creek. This initiated a series of responses culminating in the neutralization and stabilization of the site during 1989 and 1990. During the early stages of this effort (1983), a significant release of acidic aerosols and/or vapors occurred, requiring temporary cessation of activities and a complete redesign of the project.

ANALYSIS: Examination of the site's history made it clear that a significant potential existed for hazardous exposures to on-site personnel as well as to residents of the adjacent town. A program of air monitoring and sampling was instituted to assess airborne contaminants and hopefully aid in their control. This included real time monitoring from an all terrain vehicle as well as from perimeter sensors. The perimeter sensors were connected to a datalogger and computer located in the Corps of Engineers office. The datalogger/computer combination provided a real-time alarm and the accumulation of data from six sensors.

FINDINGS: During the period covered by this report, 1989 and 1990, a number of offgassing events occurred, which if allowed to continue, would have presented serious risk to unprotected workers and possibly to nearby residents.

CONCLUSIONS: The use of on-site monitoring coupled with a real-time alarm system connected to perimeter monitors provided the opportunity to address offgassing events in a proactive fashion. When the detection system indicated that a particular activity was generating unacceptable airborne concentrations, suppression activities were initiated which returned airborne concentrations to previously established acceptable levels.

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Mr. Bhupi Khona is a Remedial Project Manager for the USEPA Region III. This position includes managing an NPL site from start to finish. Mr. Khona was responsible for all site remedial activities including Health and Safety. Before joining USEPA, Mr. Bhupi Khona was the Regional Health and Safety Officer for USEPA Region III Technical Assistance Team. As the Regional Health and Safety Officer, Mr. Khona approved health and safety plans, conducted safety audits, designed air sampling plans for on-site and off-site monitoring, trained USEPA personnel and the Technical Assistance Team members on health and safety.

Mr. Khona is a member of Delaware Valley Chapter of the American Industrial Hygiene Association, American Institute of Chemical Engineers and has 15 years of industrial hygiene experience.

Title: HYDROLOGIC RISK ASPECTS OF HAZARDOUS WASTE SITE REMEDIATIONS

Authors: William Doan, P.E.
Tom Scott, P.E.
Robert Buchholz, P.E.

BACKGROUND: Many hazardous waste sites developed from light industrial processes which were frequently located in flood plains near creeks or rivers where the real estate was relatively inexpensive and a steady water source and discharge point were available. Federal guidelines state that before any federal agency takes any action in a potential floodplain, the agency must first identify if the area is indeed a floodplain. If the action involves a hazardous waste treatment, storage, or disposal facility, the facility must be constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.

ANALYSIS: A detailed hydrologic study of the hazardous waste site should be an integral part of all remedial investigations when the site is located near a creek or river.

FINDINGS: Hydrologic studies would greatly aid in the final design of the cleanup by identifying the frequency and magnitude of flooding, existing and future erosion problems, and to quantify the depth and extent of flooding. When these processes are analyzed, the final design can be accomplished with a firm understanding of the hydrologic risks associated with the various design alternatives. If the hydrologic risks are not identified, there exists a potential for having a project that could continue to transport contaminants downstream, enlarge the contamination area, and induce health risks to a much larger population.

CONCLUSIONS: The cleanup design of a hazardous waste site in a floodplain should be based on a detailed analysis of the flooding potential of the site in order to develop the optimum engineering design and to prevent further contaminant transportation during and after construction.

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Mr. Doan has a Bachelor of Science Degree in Civil Engineering from the University of Nebraska at Omaha. He has performed hydrologic investigations and designs for the cleanup of several hazardous waste sites. The investigations/designs involved: rainfall-runoff simulation, discharge and stage frequency analyses, dynamic river modelling, reservoir routings, wind/wave analysis, etc.

Hazardous waste sites at which Mr. Doan has performed hydrologic analysis include: EPA Superfund sites at Charles George Landfill, Baird and McGuire, Rhinehart Tire Fire, Brown's Battery Breaking, Douglasville Disposal and Millcreek; DoD sites at Rocky Mountain Arsenal, Hamilton AFB and West Virginia Ordnance; and DOE sites at Rocky Flats.

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Title: SAFETY AND HEALTH TRAINING PROGRAM

Authors: D. Dobbin
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The Superfund Amendments and Reauthorization Act of 1986 established a training grants program to provide for a national cadre of workers and supervisors trained in the varied aspects of hazardous waste operations and emergency response as categorized in the OSHA hazardous waste operations regulations under 29 CFR 1910.120. NIEHS awarded grants for the first year of the five-year program in September 1987.

NIEHS sponsored a National technical workshop in April 1990 which focused on "Minimum Criteria for Worker Health and Safety Training for Hazardous Waste Operations and Emergency Response" and has established a National Clearinghouse to provide training information and materials developed under the grants program.

The grant's program, minimum training criteria, and the National Clearinghouse will be reviewed and discussed.

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Title: AMBIENT AIR QUALITY MANAGEMENT AT FRENCH, LTD.

Authors: Bruce E. Dumdei
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Ted Davis
Judith Black

It was recognized, early in the RI phase of the French project, that the volatile organic compounds present in the sludges, subsoils, and groundwater could create ambient air issues during remediation. Our Ambient Air Quality Management program was developed by the EPA, TWC, and the responsible parties in conjunction with the RI, the FS, and the RD phases of the project.

The ambient air quality, upwind and downwind, of the site, was carefully defined during all on-site activities; meteorological data has been collected continuously on a 24-hour per day basis for over three years; ambient air quality was measured hourly during remedy demonstration tests at the site; continuous 24-hours per day, upwind and downwind, ambient air samples were collected and analyzed for over 19 months. All of the ambient air quality data has been correlated with actual on-site activities.

The ambient air data and the known health effects data were used to model the short-term and the long-term health risk to the nearest receptors. A management system was developed to continuously measure ambient air quality upwind and downwind of the site and at the nearest receptors during remedial activities and to control the activities on the site so as to protect the nearest receptors from any adverse health effects.

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Mr. Davis is a chemical engineering graduate of Iowa State University and is a professional engineer registered in the state of Texas. His background includes over 20 years experience in engineering, design, and supervision of projects while working for Bechtel and Foster Wheeler. Additionally Mr. Davis has 10 years consulting experience for the petroleum and chemical industries concentrating on engineering design/project supervision with a particular emphasis on environmental considerations.

Currently Mr. Davis is the Project Manager for FLTG Inc. with responsibilities for the engineering, construction, and operation for the remediation of the French Ltd. Superfund site.

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Title: TRANSPORTATION AND DISPOSAL OF DENVER RADIUM SUPERFUND SITE WASTE

Authors: Rick Ehat
Elmer Haight

The Bureau of Reclamation (Reclamation) and Department of Energy (DOE), both under contract to the Environmental Protection Agency (EPA), have embarked on a monumental task involving the excavation and disposal of an estimated 385,000 tons of low level radium-contaminated soil and debris in the metropolitan Denver, Colorado, area. The efforts are divided into two separate contract areas and are expected to continue well into 1992. DOE is handling excavation and site restoration and Reclamation is providing the transportation and disposal of the waste.

The area of contamination has been designated as the Denver Radium Superfund Site (DRSS) and consists of over 44 properties that have low levels of radioactive contamination that could potentially endanger public health or the environment. The contamination is believed to have come from the residues of radium processing in Denver in the early 1990's, at which time carnotite, a radium-bearing material, was identified in Colorado. The National Radium Institute (NRI) was established in Denver in 1912 to develop and refine the process for extracting radium from carnotite. Other radium processors were also active during the same period. In the 1920's, the United States radium industry was unable to compete with foreign sources, and the Denver radium industry closed almost overnight.

Although much of the radium was recovered, process residues containing radioactive materials were discarded. Because the hazards were not known, this material was used indiscriminately as fill under and around buildings, for parking lots, road base material, and other uses within the city. In 1979, EPA rediscovered the past existence of the NRI, and studies were conducted to identify associated hazards. As a result, the DRSS was placed on the National Priorities List. The material is classified as Naturally Occurring Radioactive Material (NORM) waste.

As a means of completing the requirements for transportation and disposal of the waste, Reclamation contracted for these services. The Reclamation contract was awarded in May of 1989 to Chem-Nuclear Systems, Inc. (CNSI) and will continue well into 1992. The contract was a competitively negotiated procurement. The chosen contract type is a fixed-price requirements type contract using unit prices.

The construction management personnel provided by Reclamation for the transportation and disposal contract are few in number, but sufficient to have daily control over the operations. The contracting challenges have included getting the job done within schedule when the type of material to be disposed of changes.

In one instance, a value engineering study was performed in order to try to solve a difficult schedule and engineering problem at a logistically complex site. This process was extraordinarily challenging because it included active participation with five divergent groups consisting of two contractors and three Government agencies.

The challenges of transporting and disposing of the NORM waste material have been considerable in light of conducting operations over a 2-1/2-year period and receiving material from several different remedial action contractors with substantial short term schedule fluctuations. The logistics of coordinating the efforts of all parties involved has presented a significant challenge for the EPA, DOE, and Reclamation.

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Mr. Ehat holds B.S. and M.S. degrees in Civil Engineering from the San Jose State University. He began working for a structural testing firm in 1975 and continued working as a civil engineer with that firm until he began working for the Bureau of Reclamation (Reclamation) in 1979.

Between 1979 and 1988, Mr. Ehat worked on the San Felipe Project, a $330 million water resources construction job as part of Reclamation's Central Valley Project in California. His responsibilities included all aspects of the work from office engineering to field engineering.

In 1988, Mr. Ehat began work on the Central Arizona Project. His primary responsibility was the construction of the $100 million Waddell Pump-Generating facility northwest of Phoenix, Arizona.

In the spring of 1990, Mr. Ehat joined the Reclamation's Denver Office staff as a Construction Liaison Engineer. His primary responsibility is to assure that the Reclamation construction projects meet the design intent and are constructed to appropriate standards. Also, Mr. Ehat has served as the Contracting Officer's Technical Representative for the Denver Radium Site Transportation and Disposal contract administered by Reclamation for the Environmental Protection Agency (EPA).

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Mr. Haight holds an A.A. in Engineering from Norfolk Jr. College in Norfolk, Nebraska, and a B.S. in Civil Engineering from the University of Nebraska. Mr. Haight is an Army veteran and a member of various Professional Engineering societies. Mr. Haight began his career with Reclamation in 1956 and worked on the construction of major water projects throughout Nebraska and Colorado. Mr. Haight's experience is varied through all aspects of construction management.

In 1976 Mr. Haight became the Chief of the Construction Coordination and Estimates Branch in the Lower Missouri Regional Office in Denver, Colorado.

In addition to the above, Mr. Haight worked at various times as the Regional Engineer for Reclamation's Lower Missouri Regional Office. In this position, he was responsible for a design and construction staff on many multi-discipline jobs.

Mr. Haight moved to the position of Construction Liaison Engineer at Reclamation's Denver Office in 1985. This position has included construction oversight for many Reclamation construction jobs. Mr. Haight was instrumental in developing Reclamation's role for the Denver Radium Site Transportation and Disposal contract for EPA. He served as the Contracting Officer's Technical Representative until receiving a temporary overseas assignment with Reclamation.

Title: COST ESTIMATING SYSTEMS FOR REMEDIAL ACTION PROJECTS

Authors: Gordon M. Evans
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Given the great uncertainties surrounding cost estimating at hazardous and toxic waste sites (HTW) and the strong need to have tools to provide rapid and flexible cost estimation and uncertainty evaluation, the US EPA and the USACE are developing complementary cost estimating computer programs to be used at several stages in the remedial action process.

The EPA system, RACES (Remedial Action Cost Estimating System) is a technology based program that allows the user to input known and assumed site characteristics along with selected clean-up and treatment technologies to provide comprehensive and easily modified estimates of capital and operating costs, both on a life cycle and present value basis. This system is designed primarily for preliminary and intermediate design cost estimating, but can also be used for budget estimating.

The USACE cost estimating program, M-CACES (Micro Computer Aided Cost Estimating System) is being developed for detailed design estimation and for bid estimates. It is based on the USACE detailed construction cost data base.

These two systems are being integrated to provide cost estimators with a comprehensive estimation system which can provide various levels of detail in the programs' outputs. These will form the core of a larger coordinated effort across several agencies for remedial action cost estimating.

These programs will be of use to Superfund contractors, PRP's and enforcement officials.

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Title: HTW CONSTRUCTION DOCUMENTATION REPORT: A NECESSARY ELEMENT IN A SUCCESSFUL REMEDIATION

Authors: Heidi L. Facklam, P.E.

BACKGROUND: To most people a remedial action consists of two elements, the design phase that culminates in plans and specifications, and the construction phase that implements the plans and specifications. The design phase is based on the data gathered during previous investigations and studies. Many times the construction phase reveals some inaccuracies in design assumptions. Unanticipated site conditions are often uncovered during site excavation.

ANALYSIS: Changes are made to the original design during construction to incorporate actual subsurface conditions. Construction procedures, equipment and materials are site-specific and Contractor-dependent. Information gathered during one operable unit, such as subsurface conditions, quantities excavated, clean-up levels and dewatering quantities, is valuable to subsequent operable units.

FINDINGS: A third element, a documentation and evaluation phase, is needed to record and preserve construction records, conditions and activities in a readily accessible form. Prepared jointly by the construction and design staff, it would provide a record of construction activities including modifications and changed conditions; contain information required for long-term performance monitoring and site maintenance; and provide baseline information for design of repair/modifications in case of failure. Lessons learned would provide valuable insight for future projects. Similar reports have historically been required for engineering structures constructed by the U.S. Army Corps of Engineers.

CONCLUSIONS: A HTW Construction Documentation Report should be required for each remedial action accomplished. They are equally important for PRP-lead projects as well as Federal- or state-lead projects. The knowledge gained during the construction process is lost if not accurately documented and evaluated.

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Title: CHANGE ORDERS CAN RUIN YOUR DAY

Authors: Mark J. Fite

BACKGROUND: Change orders are a reality in any construction project. The Superfund program in Region 6 is no exception, and as the program matures, more and more sites are moving into the Remedial Action phase. As site remedies grow in size and complexity, the management of change orders will become a critical element in meeting the mandate of Congress to achieve cost-effective site cleanups.

ANALYSIS: An analysis of the nature and cost of change orders on completed Region 6 construction projects will show trends in the types of changed conditions found at Superfund sites and will analyze change order costs with respect to cost of the remedy and type of construction (i.e., earthwork, incineration, etc.).

FINDINGS: Many change orders result from changing site conditions found once the contractor mobilizes to the site and begins construction activities. This phenomenon frequently results from poor or inadequate site characterization. In the past, EPA and the states have been reluctant to do additional site characterization during the Remedial Design, and much of the design is developed based on old site data.

CONCLUSIONS: While some change orders are inevitable, they can be minimized with thorough site characterization during the Remedial Investigation and design studies. Remedial Project Managers can plan for change orders by setting aside contingency funds to address change orders resulting from unforeseen site conditions and establishing a change order management mechanism in which the roles and responsibilities of the RPM, State Project Officer, and Oversight engineer are well defined.

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Mr. Fite has been a Remedial Project Manager in Region 6 since May 1987. During this time, he has overseen the successful completion of three Superfund Remedial Actions with a combined value of over $21 million. He currently manages one enforcement and two State-lead projects in the Remedial Design phase. Mark graduated from Rice University with a B.S. in Civil Engineering, and he is currently pursuing his M.E. in Civil Engineering at the University of Texas at Arlington. Mark serves as the Region 6 Superfund Value Engineering coordinator, and he is a member of the RD/RA Planning Peer Review Committee.

Title: QA/QC – PRESENT STATE AND FUTURE REQUIREMENTS

Authors: David E. Foxx

BACKGROUND: We are currently conducting a study of QA/QC practices for Remedial Action projects. The purpose of our study is to determine current practices and to identify the opportunities for methodology improvements. The scope of our study will cover both private and public sector practices. This paper will present our findings.

ANALYSIS: The process of data gathering will be conducted using a factually oriented measurement system, devoid of judgment. Sample measurements will be taken at each stage of QA execution for various RA activities. With the resultant measures, we will determine:

- Which QA processes achieved documented requirements and how?
- Which QA processes did not achieve documented requirements and why?
- What TQM principles are presently being utilized for QA?

FINDINGS AND CONCLUSIONS: We expect to present our findings and conclusions on the following:

- What are the key elements of a successful QA/QC program?
- What are the typical causes of quality breeches (not achieving documented requirements) and methods of prevention?
- What are the key opportunities for improving QA/QC and the optional strategies to accomplish these improvements.
- Which TQM strategies should be incorporated for continuous QA improvement?:

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Title: REMEDIAL CONSTRUCTION AT THE INDUSTRIAL WASTE CONTROL SITE FORT SMITH, ARKANSAS

Authors: Santanu Ghose
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The Industrial Waste Control site is a closed and covered industrial landfill. The landfill was built in an abandoned surface coal mine and it accepted a wide variety of solid and liquid wastes. These included solvents, industrial process wastes and metals.

The site was added to the National Priorities List in 1982. The RI/FS was completed early in 1986. A ROD was issued in 1988. The remedy selected includes excavation and off-site disposal of liquid filled drums, stabilization and on-site solidification of contaminated soils, installation of a French drain and slurry wall, and a multilayer cap and diversions to control surface water.

In mid-1988 a PRP Steering Committee agreed under a Consent Decree to finance and perform the Remedial Design (RD) and Remedial Action (RA). The RD was approved by EPA in August 1989 and the RA began in October 1989.

Drum excavation has been completed and approximately 600 drums have been excavated. Of these, 250 were liquid filled, and the rest were either solid filled or empty. The liquid filled drums are to be thermally destroyed off-site while the solid filled drums are to be stabilized and solidified in the excavation. The slurry wall and the French drain have been completed. Approximately 12,800 yd^3 of soil have been excavated. Approximately 1800 yd^3 were found to be contaminated and were stabilized and solidified *in situ*. A multilayer capping operation is about 80% complete.

This paper will detail the methods adopted to excavate the buried drums, and to construct the slurry wall and French drain system. The pilot project, which delineated parameters for on-site stabilization, will also be described.

The paper will also detail the problems and issues encountered during construction and the methods used to address these. The paper will discuss an incident when, during drum excavation, water was inadvertently mixed with a drum's contents. A violent chemical reaction occurred and the drum was hurled 250 ft into the air. The paper will discuss the methods adopted to prevent further such incidents. The paper will discuss methods used to expedite stabilization of contaminated soil to conform to the TCLP requirements.

The presentation will include photographs of the drum excavation, the exploding drum and the construction of the French drain and the slurry wall.

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Garret Bondy is Chief of the EPA Region 6 Superfund Enforcement Section that is responsible for all activities performed by Potentially Responsible Parties at sites in Arkansas and Louisiana. Prior to this position, Mr. Bondy was a Remedial Project Manager and, previous to that, was the Region 6 water quality modelling expert. Mr. Bondy has worked as a consultant in hydraulic and water quality modelling, is a graduate of the University of Michigan and is a registered professional engineer.

Title: EXCAVATION/OFF-SITE INCINERATION RD/RA – OPTIMIZATION OF THE PLANNING/INVESTIGATION PROCESS BASED ON TWO SITE NPL CASE STUDIES

Authors: John F. Gorgol, P.E.
William Pencola

Current trends in the RI/FS—RD—RA process are towards the reduction of field investigation activities during the RI phase with the intent to perform more extensive site sampling and analyses during the RD phase. The degree of delineation of the horizontal and vertical extent of wastes often becomes a site-specific judgment decision. This paper addresses the remediation situation of excavation of solid waste materials followed by off-site treatment (incineration) and disposal. Case studies for two different NPL sites for which RAs were recently completed in the $2-4 million range are analyzed. Costs and savings are estimated for hypothetical situations in which higher and lower amounts of site characterization were completed: i.e., better and worst quantity estimates were available during the design phase. The total costs for these hypothetical situations are compared to the actual study and remediation costs.

Remediation of NPL Site A, located near a large National Forest, addressed waste wood tar from surface and shallow subsurface areas. Actual waste quantities at this site were almost an order of magnitude higher than the RI/FS estimate. This was due primarily to the subterranean movement of the wood tar over time.

Remediation of an Operable Unit at NPL Site B, located in Pennsylvania, addressed a carbon waste pile generated from a hot oil wire stripping process. Actual waste quantities at this site were almost double the design estimate.

Both of these remediation subcontracts were procured as fixed unit-price. For Site A, a volume discount was successfully negotiated during implementation of the RA. It was not possible to negotiate a volume discount for the Site B RA.

Project Managers should realize the importance of the decisions regarding the extent of site characterization which is justified during, or prior to, the RD phase. The cost figures provided in this paper should assist Project Managers in achievement of a more optimal decision for excavation/off-site treatment and disposal actions. The administrative implications regarding appropriate funding contingency factors and alternate bidding strategies for actions of this type are also discussed.

Interestingly enough, NUS did RI/FS work and design as well as construction at each site (subcontracted to Ebasco).

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Title: REMEDIAL DESIGN FOR SOLVENT EXTRACTION OF PCB-CONTAMINATED SOILS AT PINETTE'S SALVAGE YARD, WASHBURN, MAINE

Authors: S. J. Graham
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Pinette's Salvage Yard in Washburn, Maine was the location of a release of approximately 1000 gallons of dielectric fluid in 1979, allegedly during accidental rupturing of industrial-grade transformers at the site. The U.S. EPA and Maine DEP conducted a Removal Action in 1983 to clean up the most highly contaminated soils, followed by RI/FS activities which documented residual PCB- and VOC-contaminated soil and groundwater and evaluated remedial alternatives for the site. A May 1989 Record of Decision specified Source Control by a combination of off-site incineration and on-site solvent extraction treatment; and Management of Migration by groundwater extraction and treatment. In September 1989, EPA contracted Ebasco Services Incorporated to perform the Remedial Design, the first under the EPA Region I ARCS program.

The Remedial Design faced several challenges, including EPA's intent to accelerate remediation to the maximum extent practicable; extreme northern New England weather conditions limiting the length of the construction season; and difficult site conditions including a high water table, abundant wetlands, and limited working area hindered by ongoing salvage operations by the property owner. In addition, the ROD required the use of an innovative technology, solvent extraction, and dictated separate cleanup goals for soils above and below the water table.

These challenges were met by separating the SC and MOM components of the RD and pursuing a fast-track approach to Source Control RD. The RD further separated excavation/incineration and excavation/treatment into discrete phases and specified attainment of cleanup goals through a combination of off-site incineration and on-site soil treatment and replacement. The RD incorporated a strategy which utilized a single RA subcontractor and specified performance-based criteria tied to the ROD cleanup levels. Accelerated design completion was facilitated by constant dialogue between EPA and Ebasco and formal submittals limited to 60, 95, and 100 percent completion stages, with continued design concurrent with Agency review. In addition, RA procurement was incorporated as the final activity of the RD assignment to expedite initiation of remediation. Source Control RD was completed in July 1990 with receipt of vendor proposals.

In addition to technical challenges, State participation and funding were critical in this Superfund-lead project. Statutory and NCP requirements regarding property access, Capacity Assurance Plan, and a Superfund State Contract were successfully met on this fast-tracked project.

The completion of Source Control RD for Pinette's Salvage Yard demonstrated effective methods to address multi-component, multi-cleanup goal remedies incorporating innovative technologies. The approach utilized at Pinette's can serve as a model for Remedial Design at similar sites requiring use of innovative technologies. The EPA-State-Contractor interactive approach utilized on the Pinette's RD may also be of use on other projects.

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Title: THE UNITED CREOSOTING COMPANY SUPERFUND SITE, A CASE STUDY

Authors: Deborah D. Griswold
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BACKGROUND: The United Creosoting Superfund Company site is an abandoned wood preserving facility over which two businesses and a residential subdivision have been built. The United Creosoting Company operated from 1946 to 1972, producing formed lumber by the pressurized addition of creosote and pentachlorophenol.

RECORDS OF DECISION (RODs): Two RODs have been written for the site. The first one, for an interim remedy, was signed in September of 1986. it specified the purchase and demolition of six houses, consolidating surface soils with greater than 100 ppm of polynuclear aromatic hydrocarbons, constructing a temporary cap over the soils, and periodically evaluating the availability of permanent remedies. In September of 1989 a second ROD was signed selecting critical fluid extraction as the remediation technology and significantly reducing the target action levels. This led to a need for more information on the vertical and lateral extent of contamination in the residential area.

FOCUSED INVESTIGATION (FI): The FI was conducted as technical assistance by an ARCS contractor. The sampling was extensive, entailing 241 samples taken on 59 residential properties. Sampling was also conducted on the two commercial properties. Access agreements were acquired for all of these properties. Evaluation of the data included determining the excavation limits for each property. An air pathway analysis was also conducted.

REMEDIAL DESIGN (RD): The RD, being produced by the State's contractor, will entail innovative contracting as it will involve the sole-source procurement of the vendor whose technology was selected as the remedy for the site. In addition, over 30 residential properties will be eligible for varying depths of excavation, requiring complicated access negotiations and yard replacement specifications.

COMMUNITY RELATIONS: Community relations for this site have been extensive and thorough. The community is active, politically aware, and vocal in their disagreements with how the project has been handled.

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Deborah Griswold has been a Remedial Project Manager in Region VI since April 1986. She is Co-Chair of the Engineering Forum, a group of EPA professionals committed to the identification and resolution of engineering issues impacting the remediation of Superfund sites. Prior to working for EPA she was employed as a project engineer in the technical services group of a Fort Worth petroleum services company. She received her bachelors degree in Chemical Engineering in 1984 from the new Mexico State University. Active in the American Institute of Chemical Engineers since college, she is a director of the Dallas section and a past Chairman of the section.

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Paul Cravens has been a Project Manager with the Superfund Section of the Texas Water Commission since October 1989. Previously, he practiced Geotechnical and Construction Materials Engineering in the private sector, most recently as a Regional Division Manager for Raba-Kistner Consultants Inc. He earned his Bachelors Degree in Civil Engineering and Naval Officer's Commission at the University of Texas at Austin in 1977. Following a four year tour with the Navy, he returned to Austin to practice engineering. He has been active in the local chapters of the Texas Society of Professional Engineers and the American Society of Civil Engineers, as well as several public service organizations.

Title: BAYOU BONFOUCA SUPERFUND SITE CASE STUDY

Authors: Robert M. Griswold, P.E.
Stephen A. Gilrein, P.E.

I) Record of Decision Overview

1) Site History
2) Geology
3) Alternatives
4) Remedy Selection

II) Design Investigations

1) Variations from that presented in the ROD

III) Explanation of Significant Differences

1) V-E Study
2) Operable Units

IV) Groundwater Operable Unit

1) Overview of Extraction/Treatment
2) Current Status

V) Source Control Operable Unit

1) Remedial Design - Request for Proposal
2) RA Advertisement

a) Phase Funding
b) Reduced Bonding

3) Closing Remarks

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Robert has been the Remedial Project Manager for the Bayou Bonfouca Superfund Site since the start of design investigations. He has Bachelor of Science Degrees in Civil and Geological Engineering from new Mexico State University and a Master of Engineering in Civil Engineering from the University of Texas at Arlington. He is also a Registered Professional Engineer in both New Mexico and Texas. Prior to employment at the EPA, Robert spent four and one-half years working for the U.S. Army Corps of engineers as a Design Engineer in their Geotechnical Branch. He is a member of the American Society of Civil Engineering and the Society for Mining, Metallurgy and Exploration.

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Title: SOIL REMEDIATION IN THE NEW JERSEY PINELANDS

Authors: Edward P. Hagarty
Dev R. Sachdev
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The Lang Property Superfund Site located in the environmentally sensitive New Jersey Pinelands was a former cranberry and blueberry farm where 1200 to 1500 drums of hazardous waste were indiscriminently stored. The hazardous waste in the drums included a variety of volatile organic as well as some inorganic contaminants. In December 1978 the State of New Jersey ordered that these drums be removed. The drums were removed, but not before their contents were emptied on-site, resulting in the contamination of the sandy surface soil and underlying Cohansey Aquifer. The site was listed on the National Priority List in December 1982, and a remedial investigation/feasibility study (RI/FS) was initiated in May 1985. A record of decision was issued in September 1986 and by November 28, 1988, the remedial design (RD) was complete and the soil was remediated. Completion of the RI/FS, ROD, RD and the remedial action was ahead of schedule and within budget.

Several items contributed to the successful completion of this remediation in a relatively short time frame. These included: 1) the use of the results of the RI/FS to separate the soil and groundwater contamination into two separate operable units; 2) the use of the geophysical investigation and subsequent test pits to identify potential excavation problems; 3) the cooperation among USEPA, NJDEP and the consultants; and 4) the dedication of the team to completing the remediation prior to enactment of the Land Ban provisions which restrict disposal of the soil in a landfill without additional treatment. One of the highlights of the remedial design was a three-day meeting with the representatives from various divisions within the Corps of Engineers, EPA and the consultants who had conducted both the RI/FS and the RD for soil remediation. Questions that were raised by the approving and implementing agencies were satisfactorily and quickly answered by the RD consultant. Additionally, consultation was available from the RI/FS team regarding details of the site conditions. Another time saving item was omitting the 60% design submittal from the usual submittals of 30%, 60%, 90% and 100% complete.

This paper will compare the information gathered during the RI/FS to that needed during the RD. It will also compare the FS level cost estimate to the RD cost estimate to the actual bids received. This paper will also address the benefits of contractor continuity, a key element of EPA's 10-year Alternative Remedial Contracting Strategy.

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Title: REMEDIAL ACTION BIDS AND COST ESTIMATES

Authors: Amy R. Halloran
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Cost estimates for Superfund Remedial Actions (RA) are made during the Feasibility Study (FS) for the ROD and after the Remedial Design (RD) by the design engineer. According to EPA's RI/FS Guidance, these two cost estimates are targeted to fall within +50/-30 percent and +15/-5 percent, respectively, of the actual cost of the RA. The Hazardous Site Control Division of the EPA, in conjunction with CH2M HILL, has developed a data base of the bids that were received for RAs at federal-lead Superfund sites. The information in this data base was analyzed to see if the RA estimates are within the target limits and to determine any trends in the data.

For this study, the differences between the ROD estimate, the engineer's estimate, the contractor's bids, and the final cost of the RA, including change orders, were calculated for each of the 45 sites currently in the data base. These differences were then compared to the desired cost ranges to determine if they were within the target ranges. The data were also analyzed for any trends in the cost estimates.

As expected, the ROD estimates were further from the actual RA costs than the engineer's estimates were. In most cases, the ROD estimates were much less than the actual cost. However, the engineer's estimates were greater than the actual cost for most of the sites in the data base. Approximately two-thirds of the ROD estimates were within the prescribed +50/-30 percent of the actual cost. However, less than half of the engineer's estimates were within +15/-5 percent of the actual costs.

There was a large spread in the contractor's bids received for each RA. In general, the most expensive bid received was much greater than the next most expensive bid, while the low bid was closer to the second and third lowest bids. For most of the sites in the data base, the contractor's award bid was closer to the actual RA cost than the engineer's estimate was. According to the RPMs for the RA sites, many of change orders were issues because more contamination was found during the RA than was anticipated from the FS. It should be noted that the results of this study are preliminary and that the data trends may change as more RA sites go to completion.

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Ms. Halloran has been lead engineer and project manager for a variety of hazardous and industrial waste projects for government and private clients. Currently, she is managing the RA Bid Tabulation Data Base for EPA, the Oversight of the Craig Farms Superfund Site, and a wastewater evaluation for a large chemical company.

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Dr. Kashkashian has successfully applied his background in economics and science to solve environmental and economic development problems for government and private clients. Recently, he has assisted EPA with the revisions to the Hazard Ranking System, evaluated the Defense Environmental Restoration Program for the Department of Defense, and developed a data base to determine the financial burden to states completing O&M at Superfund sites.

Title: FUND-LEAD PROCUREMENT OF INNOVATIVE TECHNOLOGIES AT SUPERFUND SITES

Authors: Edward J. Hanlon

CERCLA, as amended by SARA, requires that EPA give strong preference towards achieving protective remedies through the use of treatment technologies that significantly reduce the toxicity, mobility, and/or volume of hazardous waste. The recently updated National Contingency Plan (NCP) identifies EPA's expectation that innovative technologies be utilized where feasible. The USEPA Administrators' "Management Review of the Superfund Program" (i.e., 90 Day Study), as well as Congress' Office of Technology Assessment, also stressed that EPA improve the promotion and use of innovative technologies in the Superfund Program. While EPA has selected innovative technologies more frequently in recent years (52% of the FY-89 RODs involving source control treatment were innovative technologies), specific guidance on how to overcome certain barriers for the Fund-lead government procurement of innovative and patented technologies is needed.

This paper will present options to procure a responsive and responsible remedial action contractor in order to construct and operate an innovative technology under a Federal or State Fund-lead scenario. Applicable requirements of Superfund-specific regulations, including the NCP and 40 CFR Part 35, subpart O, will be identified and discussed. Any specific restrictive provisions of federal procurement regulations, including the Federal Acquisition Regulations (FAR) and the Environmental Protection Agency Acquisition Regulation (EPAAR), and 40 CFR Parts 31 and 33, as well as certain State-specific procurement regulations, will also be explored. Requirements for competition and sole-source procurement will be provided. Pre- and post-ROD solutions to innovative technology procurement barriers, including use of non-inhibiting Record of Decision wording and consideration of early design 'prequalification' of potential vendors, will be included. The pros and cons of fixed price, cost reimbursement, time and materials, and 'two-step' contract types, as well as whether sealed bid or negotiated procurement is preferred, will be discussed. A brief discussion on procurement barriers under the PRP-lead scenario will also be provided. Where possible, site-specific examples will be referenced and analyzed.

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Title: DESIGN AND CONSTRUCTION OF THE GROUNDWATER TREATMENT PLANT AT THE CONSERVATION CHEMICAL COMPANY SITE IN KANSAS CITY, MISSOURI

Authors: Peter E. Harrod, P.E.

BACKGROUND: ABB Environmental Services, Inc. (ABB Environmental) designed, constructed, and started up the Front Street (former Conservation Chemical Company Site) Groundwater Treatment Plant in Kansas City, Missouri for the Front Street Remedial Action Corporation (FSRAC). The Treatment Plant operates 24 hours a day pumping groundwater at an average rate of 164 gallons per minute to the 5-step treatment train, which removes organic chemicals, such as TCE and PCE, as well as heavy metals, such as cyanide and lead.

For about 20 years, beginning in the early 1960's, the Conservation Chemical Company in Kansas City, Missouri, processed chemicals at its plant situated on the floodplain near the confluence of the Missouri and Blue Rivers. As part of the company's operations, treated materials were deposited in a 6-acre landfill at the site located at 8900 Front Street. The materials included organic chemicals, such as TCE and PCE, and heavy metals, such as cyanide and lead.

ANALYSIS AND DESIGN: There were two major issues to be faced for this remedial design and construction project. The first, and most difficult, was managing the project through a multitude of reviews and reviewing parties while still meeting the mandated contract deadlines. The second issue was the technical complexity and construction limitations of the site.

- Management Issues: The contract time periods for the project were tight considering the number of parties requiring review and approval of work products. The contract stipulated that design of the Groundwater Treatment Plant be complete within 5 months, that construction be substantially complete within 15 months of contract signing and that the entire work be completed within 16 months of contract signing. During this time period, a treatability study was also required to be conducted to verify the anticipated effectiveness of the various treatment unit processes.

  The reviewing parties were many and varied. They included the following:

  - U.S. EPA Region VII
  - U.S. EPA's independent review engineer
  - Four PRP clients who had formed the Front Street Remedial Action Corporation
  - The PRP review engineer
  - Missouri DNR
  - U.S. Army Corps of Engineers
  - City of Kansas City, Missouri

  The project requirements involved gaining appropriate approvals from the above parties, contained liquidated damage penalties for delays beyond specified contract times, and required design verification through treatability tests. All this was to be performed for a lump sum contract price.

- Technical Complexity and Construction Limitations: Though site-specific problems dictate the type and extent of any hazardous waste treatment, effective remediation relies not only on the appropriate use of current technology and engineering principles, but on effective communications, scheduling and project management.

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Mr. Harrod holds a B.S. and M.S. in Civil Engineering from the University of Vermont and is a registered Professional Engineer in Vermont, Maine, Massachusetts, New Hampshire and Missouri. He has more than nineteen years of experience in Design Engineering and Project Management. His experience has included management of design and construction of contaminated groundwater sites, management of multi-million dollar industrial design projects, environmental design projects, permit application preparation services, master plan studies and construction management.

Mr. Harrod is a member of the National Society of Professional Engineers, American Society of Civil Engineers, American Concrete Institutes and the Earthquake Engineering Research Institute.

Title: WHEN IS A SUPERFUND REMEDIAL ACTION "COMPLETE?" A CASE STUDY OF THE CRYSTAL CITY AIRPORT RA IMPLEMENTATION AND TRANSITION TO O&M

Authors: Bryon Heineman

BACKGROUND: The Crystal City Airport, Crystal City, Texas, located 120 miles south of San Antonio was listed in 1986. The ROD, signed in September of 1987, selected on-site consolidation under a RCRA cap as the Agency's remedy. Primary contaminants included toxaphene, arsenic and DDT. Construction activities began on 2-5-90 and were completed on 9-25-90. Since ongoing PRP searches have not uncovered any viable, responsible parties, this project has been a Fund-lead, State-lead site under the Superfund Grants Program. Community and congressional interest has been high throughout the remediative process.

ANALYSIS: Management of a state-lead site, an unsupportive local community, and continually evolving remedial phase definitions combined to make a quality RA implementation at this site particularly challenging. A brief overview of Crystal City Airport RA highlights and the lessons learned during this RA will be presented. In addition, this paper will describe the sometimes conflicting terminology encountered between HQ Guidance, SCAP definitions, the NCP, the Region 6/Texas SMOA, and the state's RA contract and how 1991 STARS/SCAP definitions are being applied in "real life" to the RA and O&M phases in Region 6.

FINDINGS: Various roadblocks posed by local officials resulted in approximately seven to eight months in RA delays despite extensive community relations efforts by both the state agency and the EPA. Once construction activities began, substantial completion was achieved within the allowable contract framework. The O&F period has now started, and definitive transition milestones from RA to O&M are now being developed with the state.

CONCLUSIONS: There are varying degrees of RA "completion" that will differ on a site-specific basis. The current agency trend is toward defining these degrees in an increasingly rigorous manner with such revised SCAP items such as "RA Award" and "O&F" now being tracked. As more sites move toward Remedial Action, uniform Agency-wide interpretation of these definitions will be necessary. In addition, project management lessons learned from the Crystal City RA implementation may be of value at other Superfund sites.

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Title: REMEDIAL DESIGN OF SUPERFUND PROJECTS: WHAT CAN WE DO BETTER?

Authors: John D. Holm, P.E.

BACKGROUND: The design phase of a Superfund project is a critical time where the success of a remedial action may be determined. The design must turn the remedial alternative described by a ROD into a detailed set of plans and specifications that will effectively implement the remedial alternative.

ANALYSIS: During the investigative and administrative activities leading up to selection of a remedial action a general knowledge of the site and the selected technology is developed. During design a detailed knowledge of the site and the application of technology to implement the remedial action is required. Problems have developed on several projects because the designers have not made the transformation from a general knowledge level to a detailed design level. This is due to a variety of reasons, such as lack of experience, schedule requirements, or funding restraints. The end result often becomes evident during construction when problems arise. Several case studies will be used to illustrate the need for detailed design and the effects of limited design.

CONCLUSIONS: It is important that adequate design be provided on a Superfund project to ensure that an acceptable cleanup is accomplished. The design process must be understood by all project personnel, and the process must be more than a minor intermediatory step between the ROD and construction.

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Title: THE CONSTRUCTION AND OPERATION OF THE NEW LYME LANDFILL SUPERFUND SITE GROUNDWATER TREATMENT FACILITY

Authors: Donna P. Hrko, M.E.

The New Lyme Landfill Superfund Site is located in Ashtabula County, Ohio approximately 70 miles from Cleveland. Construction activities consist of capping the existing 43 acre landfill and construction of a 100 GPM treatment facility to treat the leachate generated in the landfill. The water treatment plant flow is created by thirteen extraction wells located on the perimeter of the landfill cap. The treatment facility consists of the following unit processes: Equalization tank, pH Adjustment tank, Chemical Clarifiers, Neutralization tank, Rotating Biological Contactors, Biological Clarifier, Dual Media Sand/Anthracite filters, Granular Activated Carbon Units, Effluent Storage tank, Gravity Thickener for chemical and biological sludges, and Sludge Filter Press. The treatment facility is also equipped with a laboratory and computer equipment for analytical testing and a complete maintenance program.

The paper will provide an in depth look at this multi-faceted treatment facility from a constructibility and operability standpoint. It will include specific problems encountered during the construction of the facility and offer suggestions for their elimination at future site remediations that are equipped with a similar facility. Discussion will also include how the treatment facility is currently operating and outline problems that existed during start-up.

The tasks of constructing and operating this sophisticated facility are secondary to the overall benefits gained. Treatment facilities of this caliber could make a monumental difference in site remediation where a diversity of contaminated leachate is present and the possibilities for site-adaption on other projects are endless.

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Ms. Hrko began her career with the Construction Division in May 1986, working on the rehabilitation of Montgomery Lock and Dam in Beaver Falls, Pennsylvania. She entered into the HTW program in august 1988 as Mechanical Engineer on the Old Mill Superfund Site in Rock Creek, Ohio. Currently, Ms. Hrko is serving as Mechanical Engineer on the New Lyme Landfill Superfund Site, Ashtabula County, Ohio.

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Title: WEDZEB ENTERPRISES REMEDIAL ACTION: PLANNING FOR AN EFFICIENT REMEDIAL ACTION COMPLETION

Authors: Tinka G. Hyde
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The Wedzeb Enterprises site, located in Lebanon, Indiana, was the result of a fire which completely destroyed a warehouse containing numerous capacitors and transformers containing PCBs. Although a removal action was completed to remove the debris generated by the fire, the analytical results indicated that additional surface soil and sediment remediation was necessary. The Record of Decision (ROD) specified that the remedial action (RA) involve cleaning and testing approximately 600 feet of sewer line, excavating approximately fifteen cubic yards of low-level PCB-contaminated surface soil and off-site disposal of sewer sediment, excavated soil and RI-derived waste. The cost of this remedial action was estimated to be $75,000.

Based on the relatively low cost of the remediation and the fact that the remedial action would need to be performed by two different contractors, the following phased approach was taken toward implementation of the remedial action:

1. Requested that the contractor utilize the small purchase procedures established in Part 13 of the Federal Acquisition Regulations.

2. Conduct the RA in two states: 1) sewer cleaning and 2) soil excavation and disposal.

3. Structure the Remedial Action Report similar to the Close Out Report.

The implementation of this plan allowed the RA to be completed under budget and only 15 months after signature of the ROD. If the contracts would have been obtained through the bidding process, it is very unlikely that the project would have been completed within 15 months. In addition, the phased approach provided for proper scheduling of activities for the RA to be efficiently completed. Finally, the similarity between the Remedial Action Report and the Close Out Report allowed both reports to be completed simultaneously. The result was RA completion and initiation of the deletion process in a short period of time.

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Title: THE LANSDOWNE RADIATION SITE

Authors: Victor J. Janosik

The Lansdowne Radiation Site consisted of a large twin house and the surrounding grounds located on a residential street in the Borough of Lansdowne, Pennsylvania, approximately two miles west of Philadelphia. The dwellings were contaminated with radium and other radionuclides as the result of work done in the basement of one of the houses to refine radium and produce medical devices from 1924 through 1944.

Analyses conducted by the Argonne National Laboratory showed elevated levels of radon and radon progeny in the dwellings, and that the surrounding soils were contaminated to a depth of several feet. The structural materials of the houses, particularly in the basement, were contaminated with radium. This contamination prompted the Centers for Disease Control to issue a Public Health Advisory stating that occupancy of the dwellings would constitute a significant health risk.

The selected remedial action consisted of the dismantlement of the buildings, excavation of contaminated soils and sewer lines, and off-site disposal of the wastes.

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Title: WRITING A ROD TO EXPEDITE REMEDIAL ACTION: LESSONS FROM THE DELAWARE CITY PVC SITE

Authors: Stephen F. Johnson

The author works with Randy Sturgeon of the EPA as Support Agency Coordinator implementing a 1985 ROD for upgrading the waste water treatment system at a PVC plastic manufacturer. In retrospect, the ROD contained deficiencies and inconsistencies which were not identified until the RA contracts were awarded. Experience on the site underscores the need for a strong, conclusive RI, a comprehensive FS, and a flexible, performance-oriented ROD. The paper specifically addresses the decision process for remediating unlined surface impoundments at the site. Early in RD, problems with the selected remedy, lining with plastic, became apparent. Better alternatives, such as the use of above ground tanks which became corporate policy at other facilities, were not explored in the FS or mentioned in the ROD. To keep to schedule, however, the ROD was not reopened and the project went ahead with plastic liners. In RA, the original construction schedule has tripled, and the cost has risen to above that of tank installation. To avoid such inefficiency in future projects especially those at operating facilities, the author proposes emphasizing clear performance goals in the ROD. Numerous alternatives meeting performance criteria should be discussed. Designers should have the flexibility to adapt to changing cost structure and engineering practices. In short the ROD should be a beacon, not a blinder.

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Title: ARSENIC REMOVAL AT THE LIDGERWOOD WATER TREATMENT PLANT — DESIGN

Authors: Harry T. Jong

BACKGROUND: The North Dakota Arsenic Trioxide Site is an Environmental Protection Agency (EPA) Superfund site placed on the National Priorities List. Routine sampling in 1979 found the water supply to the town of Lidgerwood exceeded the Maximum Contaminant Level (MCL) for arsenic. In addition, iron and manganese were found to exceed the allowable Secondary Drinking Water Regulation limits. Arsenic contamination of the groundwater supply was caused, at least in part, by widespread use of arsenic-based pesticides for grasshopper infestations in the 1930's.

The Lidgerwood Water Treatment package plant was installed in 1985 to provide a population of about 970 with potable water. The plant was designed to air and chemically oxidize (using potassium permanganate) ferrous iron and manganese ions, co-precipitate arsenic, clarify by activated sand filtration, and disinfect with chlorine, at a flowrate of 252 gal/min. In 1988 the plant had experienced frequent shutdowns and breakthroughs of arsenic and permanganate in the effluent. A plan of action was devised in October, 1988, between the city of Lidgerwood, the state of North Dakota, EPA, the city's consulting engineers, and Reclamation personnel.

ANALYSIS: The plan of action was later modified after further review of operational records, consultants' reports, on-site inspections, manufacturer's review, and laboratory analyses of raw water samples. This paper discusses the design modifications in operational procedures and in equipment retrofit, including a detention tank, a clearwell, a set of backwash pumps, an automatic backwash controller, and a color monitor with alarm.

FINDINGS AND CONCLUSIONS: Because of the imminent health threat and the limited construction season, an accelerated design and construction schedule was established. A laboratory verification was initiated concurrent to the development of design/specifications to confirm the effectiveness of the suggested remedies. Through team efforts, Reclamation awarded the contract in July, 1989. Construction was essentially completed by December, 1989. The modified plant has been operational and has consistently produced potable water with acceptable MCLs since January, 1990.

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Title: TRANSPORTATION AND DISPOSAL OF HAZARDOUS SUBSTANCES

Authors: Philip D. Kessack, Esq.

The focus of our proposed paper relates to the problems encountered by EPA and its Response Action Contractors ("RACs") relating to the transportation and disposal of hazardous substances as a part of the remediation process under CERCLA § 107(a)(3). Specifically, the paper will make recommendations on steps that EPA could take to enable the RACs to significantly increase their role in the coordination and administration of the transportation and disposal of hazardous substances once a transporter and/or TSDF have been selected.

At the present time, most of the experienced and larger RACs are hesitant to assume responsibility for the detailed coordination of the transportation and disposal of hazardous substances because of potential liability under CERCLA § 107(a)(3). Lack of clear guidance on such issues such as whether contractor/subcontractor status between the RAC and the transporter after the transporter has been selected by the Owner/EPA will qualify as "arranging for the transportation" under CERCLA § 107(1)(3) has led to a general reluctance on the part of the better qualified and knowledgeable RACs to assume this role. As a result, EPA may be faced with a diminishing pool of qualified RACs who possess both the experience and the resources to ensure that the hazardous material is disposed of in the most efficient and competent manner. This may also result in increased costs to EPA due to the reduction in meaningful competition and may impose a significant administrative burden on limited EPA field staff. Lack of clarification on this and similar issues also appears to have had a negative impact on the private sector and has apparently led to a substantial increase in cost relating to this activity.

The paper will provide an analysis of the applicable sections of CERCLA and will provide recommendations on steps that EPA can take to ensure that a sufficient pool of qualified RACs is available to meet EPA's future needs.

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Title: SUCCESSFUL PROGRAM MANAGEMENT FOR REMEDIAL DESIGN/REMEDIAL ACTION

Authors: James L. Kilby

BACKGROUND: The Seymour Recycling Center Site is located 2 miles southwest of the City of Seymour, Indiana. The site is the number one NPL site in the State of Indiana. The 14-acre site operated as a processing center for waste chemicals in the 1970's. As of 1980, in excess of 50,000 drums, 100 bulk storage tanks and numerous tank trucks were located at the site. Hazardous substances had leaked onto the ground, resulting in soil contamination, groundwater contamination, aquifer contamination, vapor emissions, fires and odor problems.

In 1982, USEPA conducted an emergency response action clearing the site of drums, tanks and some contaminated surface soil. The RI was completed in 1985, the FS was published in 1986. The 109 PRPs were party to a consent decree entered in the Indianapolis Federal District Court in December of 1988. The RD/RA is being conducted by the PRPs.

ANALYSIS: The consent decree for the remedial work allowed 58 months to complete the installation of the facilities. Strategies were developed with primary objectives of: (a) solve the environmental problems, (b) early completion, (c) avoid stipulated penalties, (d) operate and construct the site without excess exposure of the public to hazardous materials, (e) no lost work-day injuries to site personnel, (f) positive community relations, and (g) operate within budgeted funds.

The execution strategy developed for the project focused on: (a) develop aggressive schedule, (b) avoid interruption of engineering, (c) develop large bid packages, (d) utilization of experienced contractors/personnel, (e) shorten communication lines, (f) team approach between PRPs, contractors, USEPA, IDEM, City of Seymour, (g) cost sensitivity, (h) community relations, and (i) flexibility.

The PRP lead work utilized several techniques to expedite the work and to avoid work interruptions. The techniques included phasing of the project work, proceeding at risk to avoid engineering interruptions, informal technical reviews with agency personnel during the engineering process, and proceeding based on verbal approval from agency personnel.

CONCLUSION: The facilities at the Seymour Site will be completed two years ahead of schedule. The over-all strategy has facilitated early completion of the work. The team approach between all parties has had a positive impact. The program has operated without excess exposure of the public or workers to hazardous materials. As of the end of November, 1990, the project has operated without a lost work-day injury. Progress is being made on correction of the environmental problem. Cost will exceed the budget.

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Title: CONSTRUCTION CONTRACT CLAIMS GUIDANCE SYSTEM: A KNOWLEDGE-BASED SYSTEM

Authors: Moonja Park Kim
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Today, Change Orders and Claims are the final challenge to every construction project. Litigation has become a sporting event in our society. Our country is overrun by seminars giving chapter and verse geared toward contractors, engineers and owners, concerning how to prepare a claim, and how to defend against a claim. Clearly the subject has everyone's attention. We are being taught to prepare for confrontation whether it materializes or not. In the process, we are driving a stake through the heart of the cooperative spirit of problem solving among the people involved.

The resident engineer must be allowed to exercise a far more decisive role in change orders and claims. He is on the firing line; he knows best. He should be a top-flight professional whose judgement and conclusions are respected and trusted. However, resident engineers are not always supported by those engineers who are well informed of the laws related to contracting and potential litigation, especially the new problems concerning hazardous waste sites.

Taking advantage of the computer technology advances in the artificial intelligence area, it seems that a computerized change order/claims analysis system would be beneficial to assist the resident engineer and his jobsite engineers in analyzing change orders and potential claims. Thus a resident engineer can make a better and more appropriate decision concerning timely change orders. This paper will describe an expert system (knowledge-based system) being developed to help inexperienced jobsite engineers to make correct decisions, thus avoiding unnecessary litigations. It will also consider the possible use of the developed expert system as a tool to create cooperative spirit among people involved. With the use of this system the parties involved may improve negotiation, as the system will provide the same ground with all the facts exposed to all of the parties.

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Title: REMEDIAL DESIGN APPROACH AND DESIGN INVESTIGATIONS AT THE BAYOU BONFOUCA SITE

Authors: Kevin L. Klink, P.E.
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The EPA selected remedy for the Bayou Bonfouca Source Control Operable Unit includes removal of creosote contaminated materials from the abandoned site property and adjacent bayou, incineration of some contaminated materials, construction of an on-site landfill with a RCRA cap, and placement of consolidated site soils and incinerator ash in the on-site landfill. During the development of the design approach, design investigations (DI) were recommended and performed for the site to reduce design uncertainties. Key areas of focus were: extent of contamination, bayou bank slope stability, solids handling, air emissions testing, and solids dewatering. The design investigation activities included bank drilling and core samples, vibracore sediment sampling, full scale sediment dredging and screening, bench and pilot scale sediment dewatering tests, material size and density distribution characterization, field air emissions flux testing, and computer simulated air dispersion modeling. The design investigation results provided essential information that was used in the development and refinement of the design approach and in the completion of the design. Key issues addressed for the design investigation included: information needs specific to the design approach, regulatory implications for various design investigation activities, applicability of data to full scale remediation, and costs of design investigation activities.

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Title: TRIAL BURN AT MOTCO SITE, LaMARQUE, TEXAS

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At the MOTCO Superfund Site, the MOTCO Trust Group and the U.S. Environmental Protection Agency (EPA), have begun incinerating 11 to 15 million gallons of waste, consisting of waste oils, and industrial process wastes including styrene tars, vinyl chloride, and small concentrations of PCBs, mercury and lead.

In May 1990, EPA approved a plan for conducting trial burns of hazardous waste in two incinerators, constructed on-site, called Hybrid Thermal Treatment System (HTTS) units. One unit, HTTS-2, will be used to process solid material, sludges, aqueous waste, and organic liquids. The second unit, HTTS-3, is processing aqueous waste and organic liquids.

In early operations, the incinerators were tested using uncontaminated dirt, water, and oil. On May 23, 1990, waste was introduced into the HTTS-3 unit to begin to bring the incinerator up to full operation. IT Corporation conducted three pretests on July 4-5, July 25-26 and September 6. The trial burn for the HTTS-3 unit started October 9 and was completed on October 12. The HTTS-3 unit is continuing to burn waste at conditions based on the operating parameters demonstrated as safe during the pretests. Waste is expected to be fed into the HTTS-2 unit in late November and the trial burn is expected to begin some time in late 1990.

The results of the initial pretest conducted by the MOTCO Trust Group on July 4 and 5 met the performance standards for the Destruction Removal Efficiencies (DRE) of 99.9999% for carbon tetrachloride and 1,1,2-trichloroethane, and 99.9% for naphthalene. The emissions of particulates or solid particles did, however, exceed the performance standard of an allowable concentration of 0.08 grains per dry standard cubic foot during the first two pretests. Therefore, in August, IT installed a Hydro-Sonic Super-Sub steam assembly to increase the particulate removal. Results from the pretest conducted on September 6 show the particulate level met the performance standard.

Trial Burn results are to be received by EPA within 90 days from completion of the Trial Burn. Incineration of all on-site waste material is expected to take at least 14 months after the Trial Burn of HTTS-2. Decontaminated ash from the incineration process will be disposed of on-site, and, after the project is completed, the process equipment will be dismantled and removed from the site. An impervious clay cap will be constructed on-site over the decontaminated ash and covered with a layer of topsoil. The area will then be graded and seeded, and a security fence will be installed. The MOTCO Trust Group, with EPA oversight, will monitor the property for at least 30 years to ensure site safety and protection of human health and the environment.

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Title: CONSTRUCTION OF GROUNDWATER EXTRACTION TRENCHES

Authors: Gary Lang

BACKGROUND: At the Millcreek Superfund Site, located in Erie County, Pennsylvania, the remedial activity was divided into three (3) phases: 1) groundwater extraction trenches and collection sumps, 2) treatment plant, and 3) closure cap. Each phase was to be performed via separate contract. The contract mechanism for phase 1 of the activity, the groundwater extraction trenches and collection sumps, was a negotiated delivery order under a pre-placed remedial action contract with I T Corporation. During negotiations, a continuous trenching machine was chosen as the means for installing the extraction trenches in view of the potential cost savings and the attractive safety aspects from limited confined space entry. The trenching machine used was capable of excavating the trench, installing piping to a depth of 20 feet, and backfilling with granular fill all in one operation. Five (5) extraction trenches were installed. Each trench was 200 feet in length, exclusive of the flushing riser.

ANALYSIS: At this particular site, obstacles were encountered such as extremely wet subsurface conditions and clayey, sandy soils which, when trenched, resulted in a consistency that prohibited the trencher from providing a clean open trench for the granular fill hopper and pipe placement to follow. This soil/water condition apparently created such a hydrostatic pressure that, in some instances, the soil/water displaced the granular fill during trenching and also prevented free feeding of the 6" slotted polyethylene drainage piping, causing pipe breakage during installation. The contractor determined that substantial dewatering would be required under these soil conditions in order to properly install the groundwater extraction trenches. The extensive dewatering required to install the trench by means of the trencher was not anticipated by the contractor. Also encountered during excavation was glacial till that was untrenchable by means of the trencher, which necessitated revising the bottom elevations of three of the five trenches.

FINDINGS: The five groundwater extraction trenches appear to be functioning quite well at this point, as can be evidenced by the quantity of water flowing to the collection sump for each trench. For future design considerations, extensive exploratory drilling, i.e., soil borings, should be performed along the proposed trench alignment to assure that the sub-surface conditions are conducive to using a continuous trenching machine.

CONCLUSION: Under compatible subsurface conditions, groundwater extraction trenches can be installed more safely and cost-effectively by using a continuous trenching machine in lieu of a conventional trenching method.

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Title: ADVANCES IN HAZARDOUS WASTE SITE ALLUVIAL SAMPLING

Authors: Lowell E. Leach
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Groundwater remediation at hazardous waste sites often fails to meet established clean-up goals because restoration systems are traditionally designed based on the quality of water from monitoring wells alone. Such information is fundamentally inadequate for describing mass transport of contaminants, the indigenous microbial ecology and the subsurface plume geometry as well as the partitioned distribution of contaminants. To obtain the information required for more accurate design of most aquifer remediation projects, it is necessary to collect and characterize the gradation of contaminant concentrations in subsurface formation material. This characterization is necessary both above and below the water table, and often in cohesionless flowing sands. The paper describes advances in hollow-stem auger coring equipment which significantly increases core recovery by use of an internal vacuum piston. Core preservation procedures were developed which allow very precise stratigraphic location of plume interfaces and concentration gradient geometry. Identification of very low concentrations of volatile organics on the fringes of the plume can be detected within 5 cms elevation providing a three-dimensional description of contaminant isotherms.

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Title: A COMPREHENSIVE APPROACH TO GROUNDWATER QUALITY ASSESSMENT AND CORRECTIVE ACTION FOR MULTIPLE FACILITIES IN ONE HYDROGEOLOGIC PROVINCE

Authors: C. M. Lewis
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BACKGROUND: SRS has recently begun to prepare hydrogeologic assessments and corrective action plans simultaneously for adjacent facilities in the General Separations Areas (GSA). The GSA is a fifteen square mile area near the geographic center of the SRS which forms a single hydrologic province. Five RCRA sites and fourteen RFI/RI sites have been identified in the GSA. Various other spill and waste sites are potential sources of groundwater contamination. There is evidence of intermingling plumes of contamination.

ANALYSIS: An exhaustive hydrogeologic characterization has been completed for the F and H Area Seepage Basins (FHSB), which are waste sites in the GSA. An implementable groundwater remediation plan has also been prepared for the FHSB in accordance with RCRA and South Carolina Hazardous Waste Management regulations. Hydrogeologic investigations and preparation of corrective action plans at the other facilities are in various later stages of preparation. Schedules for environmental restoration work have been driven largely by regulatory deadlines.

FINDINGS: There are two primary findings of the hydrogeologic assessment and modeling studies of corrective action options. First, the plumes at FHSB should not be treated as isolated zones of groundwater. The FHSB areas exist as part of the larger hydrogeologic regime of the GSA. Any groundwater corrective action plan at the FHSB should take into account effects at adjacent facilities and effects on nearby streams and wetlands. Second, the most important corrective action is source control. Preliminary estimates indicate that groundwater remediation schemes will provide only minimal additional benefit to groundwater and stream water quality as compared to the effects of discontinuing discharge of waste to the basins and to basin closure.

CONCLUSIONS: A plan for comprehensive groundwater quality assessment and corrective action for the General Separations Areas of SRS has been developed and proposed as an alternative to groundwater remediation at individual facilities. The plan proposes to treat the entire area as a whole and is based on technical, logistical and cost/benefit considerations. The main obstacle to implementation of this environmental restoration program may be regulatory rigidity.

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Title: IDENTIFYING AND MANAGING THE RISKS OF CONSTRUCTION CLAIMS

Authors: Norman B. Lovejoy
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BACKGROUND: Hazardous waste cleanup is the public works program of the '90s. The public works program of the '70s and '80s was "Clean Water" and drew literally thousands of construction claims. Can lessons learned during and since the great "Clean Water" days be applied to hazardous cleanup?

ANALYSIS: Cleanup is accomplished through contracts. Contracts are never perfect and breed disputes. There is a misconception that the design professional is perfect and can be held to strict liability. That misconception coupled with a lack of understanding of the basic entitlements that offer an avenue for cost recovery through disputes is not well understood. Design professionals like to think they are a member of the "team", but liability issues are forcing parties further apart. Contractors must make a profit in face of the risk of differing site conditions, imperfect contract documents and poor contract administration. Contractors understand entitlement issues and subtleties of remedies under the contract and case law. Owners and design professionals are not as well versed in this area. How can they become a member of the team identifying and controlling risks while at the same time preserving the shield of protection needed against third party suits.

FINDINGS: Without knowledge and education as to the needs and goals of all parties in the design and construction team, contractors will continue to take advantage of available entitlements to create disputes and recover costs. Corrective action starts with the owner and the design professional, who often are more concerned about controlling the risk of liability and controlling the cost, than getting the job done in a risk-shared manner.

CONCLUSIONS: An insular view of the construction world creates the problems. The answer is in education, education, education and understanding of the needs and objectives of all parties. This starts with the basic understanding of the entitlement issues that create claims.

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Title: INTRODUCING AN INNOVATIVE TECHNOLOGY INTO THE REMEDIAL MARKET – EUROPEAN SOIL WASHING FOR U.S. APPLICATIONS

Authors: Michael J. Mann, P.E.

The purpose of this paper is to discuss the need for innovative technologies for the remedial action market and the barriers and possible solutions to successful implementation. The paper discusses the development of a Joint Venture with a Dutch company and the specifications taken to utilize this technology.

The NCP, the HSWA Amendments, and program economics continually drive remediation activities to on-site applications. A review of RODs issued during the period 1987-1989 indicates that 371 source control RODs were issued, only 82 of which utilized a so-called "innovative" technology. The trend, however, is significantly improving in later years. Innovative technologies today are generally defined as on-site incineration, thermal desorbtion, stabilization, bioremediation, VES, chemical extraction and destruction, and soil washing. All single technologies have matrix/contaminant limitations, and only one, soil washing, can handle a wide range of organic and inorganic contaminants.

In early 1990, Geraghty & Miller conducted a review of the European remedial market and found significant success in the use of soil washing in Holland. The system consists of screening, separation, froth flotation, sludge treatment, and residuals management. The process strength and limitations will be discussed in the paper.

No full-size soil washing plants for hazardous wastes have yet been constructed in the U.S. With the process flexibility, mobility, on-site capability, and cost-effectiveness, why is this so? The paper will focus on the issues of regulator acceptance, treatment standards, client perceptions, risk avoidance, and ideas to help introduce new technologies into the market.

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Title: BELLS AND WHISTLES: COMMUNITY RELATIONS DURING RD/RA

Authors: Karen M. Martin
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The purpose of this paper will be to outline RD/RA community relations (CR) at three PRP-lead sites in Indiana (Marion/Bragg Dump, Marion; Westinghouse, Bloomington; Seymour Recycling, Seymour). In each case, public reaction to remedial action started out negative, but stayed negative at Marion/Bragg, has improved at Westinghouse, and is now positive at Seymour. This paper will explore factors at each site which contributed to public acceptance of the ROD, and discuss the CR programs for each site.

NCP requirements for community relations were followed for each of the three sites. Because of various factors, however, the respective communities have either continued in their negative perception of EPA's actions, or come to accept the decision as outlined in the ROD. Factors include: the presence of environmental activists; PRP openness to the community; citizens involved in communicating with the public; and others.

At Marion/Bragg, public acceptance continues to be negative in part because local environmentalists were not actively involved in the Superfund process until after the ROD was signed. A small and influential group continues to vocally and actively fight the decision, even though RA is almost complete. They have taken the fight to Washington, D.C.

At Westinghouse, public acceptance has improved somewhat, in large part because a citizens' group was established to help communicate information about EPA's actions throughout the community. The public has a better understanding of EPA's actions, but some protesters continue to demonstrate against the ROD.

At Seymour, negative public comments led to revisions to the ROD. The PRP has been very cooperative and open with the public, and has built an observation tower and established a public information center at the site. The public is calm and accepts RA at this site.

Public acceptance is greatly enhanced when the community has been actively involved with the RI/FS through the ROD, and has had an impact on the ROD. PRP cooperation and openness adds to this. When the public gets involved late in the process, especially if there are angry activists who feel they were not listened to and can have no impact on what is happening now, acceptance suffers. Community relations can be improved with targeted and increased communication, and public involvement in helping communicate site work.

The goal of community relations is not to necessarily develop public acceptance of RA at a site. Sometimes the public may never accept what is being done. Rather, it is EPA's responsibility to be open and communicate as much information as possible, and be available for questions and concerns. But, when time and resources allow, efforts to bring the public into the "loop", even late in the process, can improve public perception, and ROD acceptance.

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He spoke at the National Safety Council's 1989 conference on the "Right to Know Revolution: Boom or Bust", organized a session at the 1989 Society of Risk Analysis convention on "Risk Communication as a Means of Community Empowerment", and spoke at HazMat '90 in Chicago on the "Warring Factions at Superfund Sites: EPA's Perspective."

Mr. Perrecone has been with EPA for eleven years. In 1979, he received his Masters Degree in Urban and Regional Planning from the University of Houston.

Title: SPECIFICATIONS FOR HTW DESIGNS

Authors: Gregory J. Mellema, P.E.

An essential component of any remedial design is the contract specifications. As the technology for Hazardous and Toxic Waste (HTW) remedial actions is rapidly advancing, it is imperative that specifications be prepared to accurately reflect the current technology.

Many HTW specifications are currently prepared from "scratch" as there are no "Guide Specifications" available for reference. Other specifications are modifications of existing general construction guide specifications which do not adequately address HTW concerns. Specifications which are poorly written or do not reflect the current technology become readily apparent when the project is under construction.

The Omaha District and Missouri River Division is currently reevaluating and preparing "Guide Specifications" specifically geared toward HTW remedial actions. Some of the specifications are: 1. Geomembranes; 2. Geonets; 3. Low Permeability Clay Liners; 4. Underground Storage Tank Removals; and 5. Slurry Walls. Other specifications such as Grading, Excavations, and Demolition, are being revised to incorporate HTW design considerations.

There is a need in the HTW field for specification uniformity and additional HTW guide specifications. Possible new guide specifications are Gas Venting Systems, Solidification, Hazardous Materials Handling, and other new technologies as they arise.

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Title: WHERE GROUNDWATER PUMP AND TREAT CAN WORK AND WHERE IT CAN'T WORK

Authors: Mark Mercer

Paper compares contaminant mass release rates to the subsurface at Class One and Class Two sites with contaminant mass removal rates possible with groundwater pump and treat. Mass removal rates possible with NAPL plume investigation and remediation are presented. Containment and clean-up approaches for Class Two sites (NAPL) are discussed. Some reasons for current groundwater pump and treat failures are discussed. Changes in groundwater site investigation procedures are presented.

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Title: VALUE ENGINEERING STUDIES FOR THE HELEN KRAMER LANDFILL SUPERFUND SITE

Authors: A. Monti

Construction of the selected remedial alternative at the Helen Kramer Landfill Superfund site in Mantua, New Jersey is currently underway. URS Consultants, Inc., as prime contractor to the U.S. Army Corps of Engineers, performed the detailed design of remedial alternatives at the site. In response to several outstanding technical issues that arose during this assignment, URS proposed and carried out a series of Value Engineering Studies. These studies identified a potential savings of $3 million by optimizing the design of remedial alternatives which had been proposed in previous designs. The proposed remedial plan consisted of a combination of slurry walls, subsurface drains, and a pretreatment facility. The design of each alternative needed to be cost-effective, having a minimal impact on the surrounding area.

Changes were recommended in the design of subsurface drains and slurry wall. This was done on the basis of a three-dimensional groundwater flow model, developed and calibrated to site conditions. Selected remedial alternatives were imposed upon the model, alone and in various combinations, and their impact on the hydrogeologic system was evaluated. A new combination of subsurface drains and slurry walls was chosen on the basis of both the modeling and benefit-cost analyses. Substantial savings were realized due to the fact that 1) a proposed upgradient drain was determined to be unnecessary, 2) the slurry wall could be keyed at a shallower depth than previously proposed, and 3) the leachage collection drain was located at an elevation which controlled inflow yet prevented off-site migration of leachate into the underlying aquifer. A sensitivity analysis was included to incorporate uncertainties associated with geologic and hydrologic conditions at the site; results were simulated for a 30-year period.

Following this, a series of two-dimensional flow simulations was conducted on the selected remedial alternative in order to more accurately model site conditions. It was the results of this analysis that led to a recommendation to downsize the pretreatment facility. This modification was responsible for substantial savings in the capital and particularly in the projected operation and maintenance costs of the project.

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Title: CONSTRUCTABILITY INPUT TO THE HTRW PROCESS

Authors: James P. Moore, P.E.

This paper will define the role(s) of constructability input (based on Corps of Engineers experience) to the traditional design/construction process and compare/contrast those with the HTRW process. It will emphasize the expanded role and importance of constructability input in all phases of HTRW, including the RI/FS, ROD, and RD/RA phases.

Examples of such input, and of the results when such input is lacking, will be presented, via case studies of several projects.

Outline:

1. Definition of Constructability
    a. Biddability
    b. Constructability
    c. Operability
    d. Feedback
    e. Lessons learned
2. Benefits and Costs of Constructability Review
3. Areas of Emphasis for Constructability Input
4. Policies and Procedures — Reporting Requirements
5. Case Studies

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Mr. Moore has been with the Baltimore District since 1978. Since 1985, he has served in his present capacity as a Resident Engineer. His Resident Office administers military, civil, and Superfund, DERP contracts in Eastern Pennsylvania and the Southern Tier of New York. He has been involved with the Superfund Program since 1986; his first contract was the RA at the Lackawanna Refuse Site. Since that time, his office has or is currently administering RA work at 8 NPL sites, with a current NTW workload at $70M. Mr. Moore received his B.S. degree in Civil Engineering in 1976 at the Pennsylvania State University.

Title: HAZARDOUS WASTE SITES: WORKER PROTECTION PERSPECTIVES

Authors: John B. Moran
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The Laborer's Health and Safety Fund, a jointly trusted labor-management group, has been intimately involved in hazardous waste activities with specific regard to worker safety and health issues for over two years. This involvement has been on a national scale involving NPL sties and state designated uncontrolled hazardous waste sites. Extensive interactions have occurred with local, state, federal agencies including EPA, OSHA, and the U.S. Army Corps of Engineers, contractors; construction management firms; LEPCs; and several construction labor unions.

What has emerged in the analysis of several case histories is a rather comprehensive view of the complexities of the implementation of the OSHA Hazardous Waste Operations regulations in a complex arena involving several federal, state, and local regulatory agencies and the contractors, training providers, LEPCs, community representatives, construction managers, and workers who are directly involved in remediation or removal activities. These relationships and their impact of worker protection issues will be reviewed and discussed.

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Moran pioneered research on respirators and other personal protective gear. For six years until February 1988, he was Director of the Division of Safety Research of the National Institute for Occupational Safety and Health, the federal agency responsible for researching workplace safety.

After that, he was Associate Director, Health and Safety, of the Laborers-AGC Education and Training Fund. In that post, he helped develop training programs for workers in such fields as hazardous-waste cleanup and hazard communication (the right-to-know law as it applies to workers).

He also has been a corporate research director and vice president, and a consultant to industry and government agencies.

Moran served two terms each on the Mine Health Research Advisory Committee, appointed by the Secretary of Health and Human Services, and on the Advisory Committee on Construction Safety and Health, appointed by the Secretary of Labor.

He was president of the International Society for Respiratory Protection from 1985 to 19876.

From 1984 to 1988, he was an adjunct associated professor of Mechanical Engineering at West Virginia University. He holds a B.S. degree in metallurgical engineering from Illinois Institute of Technology.

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Title: REMEDIAL DESIGN PROCEDURES FOR A RCRA CAP

Authors: Donald D. Moses, P.E.

RCRA caps are a common component of the selected alternative for remediating landfills containing toxic and hazardous waste. As with most types of remedial action, the technology of capping landfills has been rapidly advancing. The Omaha District has developed detailed, step-by-step procedures for designing a RCRA cap. The design procedures have continuously evolved based upon the experience gained by reviewing AE designs, conducting in-house designs, attending many EPA and privately sponsored short courses, and from lessons learned from actual construction activities. This paper is targeted for the practitioner who is responsible for actually preparing the plans and specifications for remedial action for caps and/or the person who must prepare the corresponding scopes-of-services and oversee contractor (AE) performance.

The paper first identifies the need for predesign considerations. Field investigations such as topographic surveys, horizontal and vertical control, boundary surveys, and property searches are explained. The purposes of geological subsurface investigations for a cap are varied and include the need to define the groundwater conditions, the limits of the landfill, the soil characteristics of the site and borrow area, the excavatability of material, and to determine if methane gas is present or if slurry walls can be used. Exploration techniques are included. The laboratory geotechnical testing requirements and the chemical data quality management issues are identified and explained.

The paper presents the various cover types and their effectiveness. Cap types include RCRA caps, synthetic caps, clay caps, soil covers, capillary barriers and other options such as composite synthetic/bentonite materials.

The design requirements are outlined and explained. The design includes such things as settlement analysis, a stability analysis, HELP modeling, identification and evaluation of borrow sources, grading criteria, groundwater control and monitoring, leachate collection systems, frost depth considerations, clay barrier design, geosynthetic design, landfill gas control systems, instrumentation, internal and surface drainage requirements, erosion control, test fill requirements and cap penetrations. Special features are also identified and explained. Nearly all construction activities include the need for decontamination facilities, access routes, staging areas, security fencing, utilities, easements and rights-of-way requirements, phasing requirements, operation and maintenance, demolition, material handling, health and safety, seeding requirements and disposal options. A generic list of drawings and specification sections are included. Average design times and design costs are included along with typical construction costs.

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Title: SITE CHARACTERIZATION DATA NEEDS FOR EFFECTIVE RD AND RA

Authors: John E. Moylan

In many instances, incomplete site characterization has been an impediment to the selection, design, and implementation of effective remediation of hazardous waste sites. The lack of adequate site data is probably the cause of more design delays and construction problems than problems associated with the more high-tech remediation processes. Too often, our concept of site characterization is confined to definition of the nature and extent of chemical contamination and the basic characteristics of the groundwater flow system. Many other important site characteristics are ignored or are not defined soon enough to be of maximum benefit.

This paper will discuss the need for integrated site characterization investigations, types of data required, when data should be acquired, why specific types of data are needed, and how we can better characterize a site for RD and RA. Large amounts of money and technical resources are being committed to site characterization. Those of us in the environmental professions must work together to optimize site characterization in a cost-effective manner.

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Title: EMERGENCY RESPONSE ISSUES AT HAZARDOUS WASTE SITES

Authors: Les Murphy

The OSHA Hazardous Waste Operations regulations under 29 CFR 1910.120 represent the only OSHA regulations specifically requiring contractor coordination with the local emergency response community. This required coordination activity has frequently been difficult, complex, and confusing and has, in some specific instances, resulted in temporary suspension of remediation work at hazardous waste sites.

The role of the local emergency response provider, coordination of services, training, risk communication, and protective equipment issues have frequently arisen in local communities where hazardous waste site clean-up activities are undertaken. These issues will be reviewed and recommendations provided to enhance this important area of worker protection and community coordination.

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Title: APPLICATIONS OF A DESIGN/BUILD ADVISOR EXPERT SYSTEM TO ENVIRONMENTAL REMEDIATION PROJECTS

Authors: Thomas R. Napier
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The U.S. Army Corps of Engineers Construction Engineering Research Laboratory (USACERL) is currently developing a knowledge-based expert system for Design/Build construction — a non-traditional approach to the design, contracting, and construction of facilities. A "DESIGN/BUILD ADVISOR" will provide expert-based guidance to support project planning and execution by those who may not have a great deal of first-hand personal experience. The DESIGN BUILD ADVISOR provides step-by-step procedure guidance, general advice, and project-specific advice in an interactive menu-driven environment.

The relative newness of environmental remediation construction and the limited expertise in this field strongly suggest that a similar type of advisory system would be applicable to environmental projects. Planning and execution will involve similar decisions such as selection of a contract type, development of technical requirements and specifications, use of in-house or contracted professional services, or evaluation of contractor capabilities. These decisions will be based on similar factors such as project objectives, the knowns and unknowns, project-specific conditions, expertise and capabilities available, applicable guidance, previous experiences, and the impacts on other project activities. Parallels between the DESIGN/BUILD ADVISOR and environmental remedial projects will be described in this paper.

The overall system architecture of USACERL's DESIGN/BUILD ADVISOR would be compatible with environmental remediation projects. Project phases and steps would be formalized in a process model. Expert-based rules would be synthesized into both general and project-specific advice. An interactive menu-driven environment would generate advice based on input from the system's user. Domain-specific expert input and knowledge base development would be necessary.

Significant benefits can be achieved with the application of a DESIGN/BUILD ADVISOR-type of expert system to environmental remediation projects. Individuals' capabilities will be enhanced through access to a knowledge base based on expert input, which would also broaden with additional project experience. The primary benefit would be in the improvement of the quality of decision making and, therefore, the probability of successful project execution.

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In his present position, Mr. Napier is responsible for conceiving, planning, and conducting research in the areas of Alternative Construction Methods and Construction Management. He works closely with USACE field offices in applying research to military construction in the US and abroad. Mr. Napier was invited to be a member of the USACE Hanford Support Team in 1990 and contributed to recommendations for improving construction management and control measures for radioactive waste disposal projects at Department of Energy sites.

Before coming to USACERL in 1978, Mr. Napier headed the Midwest office of Steven Winter Associates, NYC, where he conducted Value Engineering and Cost Engineering work primarily in the residential construction and building systems manufacturing fields.

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Title: THE CHALLENGE OF TREATING SUPERFUND SOILS: RECENT EXPERIENCES

Authors: Carolyn K. Offutt
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BACKGROUND: The treatment of Superfund soils is a challenging technical issue that is currently being addressed by a variety of different groups and programs within EPA. The Superfund Amendments and Reauthorization Act (SARA) of 1986 specifies a preference for permanent treatment of waste sources such as soil and there is a further preference for the selection and use of innovative technologies to accomplish permanent reduction in toxicity, mobility, or volume.

ANALYSIS: This paper covers five related areas presenting a total picture of this challenging issue including:

- Why is treating soils a Superfund priority?
- What unique considerations of these soils make their treatment challenging?
- What technologies will be effective at treating Superfund soils?
- What are the considerations for selecting treatment technologies for Superfund site?
- What technology transfer mechanisms exist regarding soil treatment technologies?

FINDINGS: Superfund soils have unique physical characteristics compared to the characteristics and requirements for the treatment/disposal of other industrial process wastes. The need to treat these contaminated soils has lead to interesting research and demonstrations of treatment technologies.

CONCLUSIONS: This paper discusses currently available and innovative treatment technologies including low temperature thermal desorption, chemical extraction, bioremediation, soil washing, stabilization, and high temperature thermal treatment. In addition to a summary of how each technology is employed, both the applicability as well as the problems experienced with each technology are summarized and supplemented with examples from recent and ongoing Superfund treatment experiences.

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Ms. Offutt received a B.S. in chemistry from the College of William and Mary and a MSCE in environmental engineering form George Washington University. She is a member of the American Chemical Society, the Water Pollution Control Federation, and the Society of Environmental Toxicology and Chemistry.

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Title: OVERVIEW OF THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY PROCESS AND ITS IMPACT ON REMEDIAL DESIGN/REMEDIAL ACTION AT THE NEW BEDFORD HARBOR, MA, SUPERFUND SITE

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The New Bedford Harbor site consists of over 17,000 acres of estuary, harbor and bay located in southeastern Massachusetts. Bottom sediments are contaminated with PCBs and heavy metals with PCB levels exceeding 100,000 ppm in some hot spots. The site was placed on the National Priority List in 1982 and numerous investigations and studies have been carried out since that time. A Record of Decision (ROD) was signed for the hot spot area in April 1990 which calls for dredging and incinerating contaminated sediments. Remedial design for the Hot Spot is underway. The ROD for the remainder of the site is scheduled to be signed by the date of this conference.

The Army Corps of Engineers is responsible for remedial design and remedial actions at this site and was also extensively involved in the RI/FS process through the performance of an Engineering Feasibility Study and Pilot Study to evaluate dredging and dredged material disposal methods. The Pilot Study, which involved on-site dredging and disposal of contaminated sediments, introduced the local community, state and other groups to the technical concerns of the project at an early stage.

This paper reviews the extensive evaluations performed during the Remedial Investigation/Feasibility Study (RI/FS) phase and discusses their impact on the ongoing remedial design work and on the state/community role in the project. The authors believe that the extent of the evaluations, the participation of the Corps of Engineers in the RI/FS process, and the extensive state/community involvement should result in a smoother transition from RI/FS to remedial design/remedial action. Numerous technical, political and policy issues that impact activities have surfaced and have been addressed because of the extent of the preliminary work, which has also allowed the Corps of Engineers to utilize a two-phased construction approach so that preliminary site upgrade activities can be initiated prior to the completion of the entire design.

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Prior to working in Superfund, Mary worked in the RCRA program as an inspector and permit writer. She holds a B.S. in Civil Engineering and a M.S. in Applied Management.

Title: TOWER CHEMICAL: REMEDIAL DESIGN FOR A SMALL BUT COMPLEX NPL SITE

Authors: Victor H. Owens, P.E.
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The Tower Chemical Company NPL site near Orlando, Florida is a rural abandoned pesticide manufacturing facility that operated from 1957 to 1981. The site boundary encompasses approximately 14 acres with private residences in close proximity, in one case within 50 feet. The remedial investigation conducted in 1985 and subsequent site investigations revealed the presence of various pesticide manufacturing waste residues in the soil including DDT, dicofol, copper and xylene. Groundwater concentrations of dicofol, chromium, nickel and xylene were found to exceed cleanup criteria over an area of approximately 10 acres. Pond sediments covered with off-site backfill soil during a 1983 immediate removal measure were also found to contain manufacturing residue exceeding established cleanup criteria. The Record of Decision was signed in 1987 and selected excavation and on-site thermal treatment of contaminated soil, and groundwater extraction with on-site treatment and disposal of treated water. Design of site remediation started in 1989 and was completed in 1990 under the REM III Program. The completed Remedial Design was structured into two contracts, one for thermal treatment (TTS) and one for water treatment (WTS). These contracts were to be administered and managed by an existing ARCS IV contractor to Region IV EPA.

Several key issues arose during the Remedial Design. It was not possible to quantify the volume of soil requiring thermal treatment with any reasonable degree of accuracy before RD completion. This was anticipated to ultimately result in excessively high contingency during bidding for the TTS contract. Another key issue was the approach for contaminated pond sediment remediation. The pond was actually a 200 foot diameter relict sinkhole breaching the Hawthorn formation which would normally separate the surface aquifer from the underlying Floridan Aquifer. Excavation in the dry within the sinkhole could result in dewatering rates of several hundred gallons per minute of contaminated groundwater due to the direct hydraulic connection to the Floridan Aquifer. Treatment of this groundwater to meet the surface water discharge criteria would be prohibitively expensive. Finally, the division of the remediation into two contracts and the subsequent division of site work (roads, drainage, contaminated storm water retention pond and excavation of soil) was a major concern during design. Resolution of these issues, including the decision process and anticipated benefits from the remedial design approach are the focus of this paper.

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Title: OPTIMIZING AND EXECUTING A MULTI-FACETED REMEDIAL ACTION PLAN

Authors: C. Dennis Peek, P.E.

The purpose of this paper is to discuss the successful implementation of a multi-faceted, multi-PRP remedial action at the Seymour Recycling Corp in Seymour, Indiana. The Seymour Site was one of the first negotiated responses, and is now nearing completion after more than 10 years of work.

The Seymour Project began as an Emergency response by EPA Region V. The early work consisted of a very extensive surface clean-up. Eventually, more than 50,000 drums were removed and disposed at hazardous waste landfills and incinerators. In 1982, Geraghty & Miller began an investigation of the groundwater and surface soil contamination that resulted from the operations conducted at the site.

To respond to the findings of the investigation, a negotiation among the PRPs, EPA Region V, and the Indiana Department of Environmental Management ensued. In 1988, a Consent Order was signed that specifically defined the nature of the remedial response. The multi-faceted program included groundwater recovery, pretreatment on-site using air stripping, filtration, and carbon adsorption, discharge to the City of Seymour POTW, asbestos removal and building demolition, installation of a VES, bioremediation, and final capping.

Although the Consent Order attempted to anticipate every eventuality, the details of program design and implementation required nearly continuous coordination and adjustment. The paper will specifically discuss techniques used to accomplish this program in approximately 1/4 of the time initially projected. Particular focus will be on the impact on the design and construction process.

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Title: ACCESS ISSUES DURING RD/RA AT THE HELEN KRAMER LANDFILL SITE

Author: Romona Pezzella

The design of the remedial action for the Helen Kramer Landfill was completed in September 1988. Due to problems obtaining access, award of the construction contract was delayed until October 6, 1989. Access was needed to properties adjacent to the landfill owned by parties other than the landfill owner. There were three separate properties owners, two of which owned land uncontaminated by the landfill. This resulted in the first acquisition of property through the Superfund program in order to conduct a remedial action. Six different types of access procedures were utilized including purchase, leasing, relocation, condemnation, access agreement and an administrative order. Due to the lessons learned on this site, real estate has become a focal point during remedial design.

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Title: PERMITTING SUPERFUND REMEDIAL ACTIONS OR NIGHTMARE ON NW 57TH PLACE

Authors: Lynna R. Phillips, P.E.
Jim Orban
Gail E. Scogin

Local governments have a legitimate need to assure that activities conducted within their borders do not jeopardize the public health or welfare. Uncontrolled construction activities can damage or disrupt utilities, hinder traffic, impede fire or police services and generally restrict the local government's delivery of essential services. Construction activities may also create threatening or dangerous situations. Most local governments utilize a system of permits to protect their infrastructure from damage or undue disruption.

Many view the permit process as unnecessarily burdensome and time-consuming. While the National Contingency Plan (NCP) may convey the authority to conduct Superfund remedies without obtaining permits, in many cases it may be prudent to do so. In this manner, the EPA can be assured that its activities will cause a minimum of adverse effects and that the system of needed coordination created by the permit process is not bypassed. However, significant advance planning and substantial resources may be required to avoid project delays.

Extraordinary effort was required to permit the relatively simple remedial action at the Hollingsworth Solderless Terminal Company site where, from 1968 to 1982, electrical terminals were manufactured. The site consists of two buildings surrounded by paved parking lots, alleyways and streets in a light industrial park at 700 N.W. 57th Place, Fort Lauderdale, Broward County, Florida. The company's waste disposal practices resulted in volatile organic compound contamination of soil and groundwater. The site was included on the first official National Priorities List in December, 1982. The remedial design, which prescribes removal, off-site treatment, and disposal of soil and extraction, on-site treatment, and re-injection of groundwater, was finalized in early 1988. The permitting nightmare began in January, 1990, when the remedial action subcontractor applied to state and local governments and agencies for facility construction and well installation permits. This paper discusses the permitting aspect of the Hollingsworth remedial action and provides insights into permitting processes that may be applicable to other sites.

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Gail E. Scogin has, during the past four years, worked in the Region IV Superfund program. Since 1989 she has been a Remedial Project Manager for hazardous waste cleanup projects in Florida, primarily involving groundwater restoration. Previously, she successfully managed the regional development and implementation of a pilot information management system utilizing local area networks. This system, now used nation-wide, is designed to manage scheduling, reporting, and budget information for Superfund sites. Prior to working for EPA, Ms. Scogin was an industrial engineer for a major aerospace firm. In 1984, she graduated from the Georgia Institute of Technology with degrees in industrial engineering and applied biology.

Title: ACCELERATING THE ROD TO REMEDIAL ACTION PROCESS: SAND CREEK INDUSTRIAL SUPERFUND SITE (OI1), COMMERCE CITY, CO

Authors: Brian Pinkowski
Mikk Anderson
Bruce Hanna

BACKGROUND: A national agency goal has been to reduce the length of the average remedial design (RD) to 18 months. The paper compares the cost and duration of RD efforts from other Superfund sites and contrasts that information with projected remedial action (RA) costs. This national picture of historical performance is then compared to the case study location, the Sand Creek Industrial Superfund Site near Denver, Colorado.

ANALYSIS: This case study will discuss the compression of the steps involved in the production schedule of a $1 million RD completed within a six month period. The project, a $5 million RA at a former pesticide manufacturing facility is a fund-lead clean-up being performed by the U.S. Environmental Protection Agency and its contractors (URS Consultants, Inc.).

The remedial design involved preparation of plans and specifications for:

- Excavation and incineration of highly contaminated surface soils and debris (> 1000 ppm Halogenated Organic Compounds (HOC)).
- Removal of Volatile Organic Compounds (VOC) by vapor extraction.
- Demolition and off-site disposal of contaminated structures and vessels.
- Air Monitoring before and during remediation.

An overview of the site conditions and regulatory constraints is provided to set the stage for the project planning.

FINDINGS: Attention to schedule led to a tightly focused, intensive sampling program to provide data for remediation design. Careful attention to supportive functions such as field subcontractor procurement and optimized laboratory turn-around avoided delays. Typical of most sites, the field sampling produced some surprises which resulted in mid-project corrections. These were accomplished without significant schedule disruptions.

CONCLUSIONS: The authors will present a critique of those project management techniques used by agency and site contractor personnel to keep the project on track. An analysis of what worked (or did not work) and why, should help identify the applicability of these methods to decision-making and management of clean-ups at other sites.

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Mikk Anderson is a civil engineer with 18 years experience in planning, design and construction management of pollution control facilities. He is URS' Director of Hazardous/Toxic Waste programs, Southern California. He served as Technical Manager for the Sand Creek OU1 RD assignment, as well as supporting or managing four other Superfund locations in Regions VIII and IX. He received his BSCE and MSCE from the University of Washington and is a registered Professional Engineer in several states.

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Title: EFFECTS OF PUBLIC INPUT AND THE SAMPLING PROTOCOL ON THE REMEDIAL DESIGN PROCESS, SMUGGLER MOUNTAIN SUPERFUND SITE

Authors: Raymond M. Plieness, P.E.

BACKGROUND: The 110-acre site, located in a residential section of Aspen, Colorado, was proposed for the National Priorities List (NPL) in 1984 and listed in 1986. Waste rock from the Smuggler Mine covers much of the site. Other mine wastes are either exposed, covered, or in many cases, mixed with native or imported soil. These soils contain high levels of cadmium and up to 65,000 ppm of lead. As changes in the Explanation of Significant Difference (ESD) remedial action plan became necessary, numerous meetings were held among representatives of the EPA, Pitkin County, and residents of the site. As a result of these meetings, a second ESD was completed in May 1990 providing for sampling and capping the contaminated soil on a property-by-property basis.

ANALYSIS: A soil sampling team consisting of private (Camp, Dresser, and McKee) and government (Bureau of Reclamation) forces was formed to develop and execute strategy and protocol for sampling each yard in the site area. Initial discussions centered on a statistical approach to establish a level of required remediation (entire yard or not at all). Concerns about this approach led to a plan that split properties into sampling blocks with individual block results being the basis for remedial action requirements.

The early development of design criteria was critical in assuring the community that the plan would work (including remediation around trees) and to ensure that the EPA and the State of Colorado would be able to approve all the criteria prior to field implementation.

FINDINGS: An integrated effort combining site investigations, public input and Superfund legislation can produce a successful remedial action program by utilizing a defined remedial design process that allows for individual owner needs and assures completion of specified remedial action.

CONCLUSION: A design process formed to ensure that remedial goals are met, yet flexible enough to meet individual owner requirements, can provide a successful project. This was demonstrated with the October 1990 completion of a demonstration project on two properties at the Smuggler Mountain Superfund site.

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In 1984 he worked in West Germany for the Department of the Army overseeing planning, design, and construction of the Vilseck Force Modernization Program.

In 1987 he became project engineer for construction of the Army Corps of Engineer's Malmstrom Comprehensive Care Facility in Great Falls, Montana.

He became Reclamation's Team Leader of the Smuggler Mountain Superfund Site in July 1989. The team completed designs on two repositories, finished a yard-by-yard sampling program, developed final criteria for the project, and completed remedial action on two properties as a demonstration project.

Title: THE IMPORTANCE OF TEST FILLS FOR THE CONSTRUCTION OF HTW CAPS AND LINERS

Authors: David P. Ray, P.E.

Construction problems related to site and material unknowns encountered while placing stabilized waste in lined impoundments, or cap components over existing landfills, can potentially be very costly in terms of schedule delays and project modifications.

One alternative to risking these delays is to plan a test fill operation in the contract specifications. The test fill is designed to simulate actual construction conditions in the field. Representative materials are placed on the prepared surfaces with the specified construction equipment. Stabilized waste and fill material can be placed and quality control testing methods used to evaluate the materials and placement methods. Adjustments in the condition of the fill material or the placement methods can be implemented to insure the most efficient methods and materials employed prior to full scale construction.

Test fill sections have been developed for some specific projects that the Corps of Engineers have designed and constructed and have been very useful during subsequent field activities. The relatively small cost of the test fill section has proved to be cheap insurance and an effective design tool especially when dealing with large liner or cap construction projects.

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Title: REMEDIAL ACTION IN AND AROUND LIGHT INDUSTRIAL ACTIVITY AT THE DENVER RADIUM SUPERFUND SITE

Authors: Timothy R. Rehder
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The Denver Radium Superfund Site consists of 16 separate sites located along the South Platte River Valley in Denver. Contamination at the sites is the result of widespread radium processing which occurred between 1914 and 1927. Operable Unit I of the Denver Radium Site makes up one city block and is the former location of a radium-processing facility. Currently, the site is zoned for light industry and is occupied by five local businesses: (1) a large warehouse/wholesale operation; (2) a metal fabrication business; (3) a small appliance repair business; (4) a hardware fabrication business; and (5) a tombstone manufacturer.

The primary challenge presented by the site is that of removing 40,000 tons of radiologically contaminated soils and debris and, at the same time, allowing the businesses on-site (none of which are responsible parties) to maintain a semblance of normal operations. This required multiple phasing of the decontamination and reconstruction work in order to maintain access to the site for routine business operations. Three of the structures on-site were underlain by contamination, which required relocating the businesses on-site to allow for demolition of the floors and excavation of the subgrade. This was accomplished by bringing mobile office space onto the properties and by temporarily relocating business operations into previously vacant space.

In order to transport waste from the site in the most expeditious and cost-effective manner, EPA renovated a rail spur that had been abandoned for more than 50 years. This allowed bulk transportation of contaminated material in railroad gondola cars. To maximize the efficiency of the loadout operations, an in-rail scale was installed at the Operable Unit along with a gantry to facilitate the placing of hard lids on the railcars. Prior to and during the rail renovation work, loadout of contaminated material was performed using 20-ton truck-mounted containers.

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Title: STREAMLINING REMEDIAL DESIGN ACTIVITIES AT THE DEPARTMENT OF ENERGY'S MONTICELLO MILL TAILINGS NPL SITE[1]

Authors: D. Richardson
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BACKGROUND/ANALYSIS: In September, 1990, the Record of Decision for the Department of Energy's (DOE) Monticello Mill Tailings Site (the millsite) was signed, initiating the CERCLA Section 120 requirement for Federal facilities to initiate substantial continuous physical on-site remedial action within 15 months. A four-day planning session with representatives from DOE, EPA, and the State of Utah was conducted to ensure compliance with this requirement in the most cost-effective manner and to identify and resolve remedial design/environmental compliance issues. Two approaches aimed at streamlining the remedial design effort were formulated at the session: the concept of regulatory agency reviews of working-level discussion documents, and the phasing of remedial design/remedial action (RD/RA) activities. This paper presents the two approaches as they are being incorporated into the planned RD phase of millsite regulations

CONCLUSIONS: The concept of allowing regulatory agency review of working-level discussion documents prior to the required agency reviews of major draft documents allows informal review and comment at the early stages of formal deliverable development. The working-level discussion documents, usually several pages in length, present technical issues and proposed solutions pertinent to the design of the remedial action. In addition to being submitted for regulatory agency review, the documents form the basis for technical discussions at periodic meetings required by the Federal Facilities Agreement between DOE, EPA, and the State, which governs site clean-up.

The phased approach to designing and performing remediation activities is based on the "bias for action" strategy advocated in draft EPA guidance for expediting RD/RA. In addition to ensuring that the 15-month requirement for initiation of RA activities will be met, phasing of RD/RA activities will facilitate the review process by allowing reviews of more focused design documents.

The draft remedial design work plan for the Monticello millsite currently breaks RD/RA activities into three phases. Phase I includes design and performance of several site preparation activities at the millsite and the repository location. Phase II is design and construction of the repository, and Phase III involves reclamation of the millsite and borrow areas, and final decontamination. The RD aspects of the three phases will occur in sequence over the next four years, and the phased RA activities will be initiated upon design approvals.

Work supported by the U.S. Department of Energy, Office of Environmental Restoration, under DOE Contract No. DE-AC07-86ID12584.

NOTE: EPA's OIG does not accept construction contracts for "site prep" as "real construction" or continuous physical on-site activities.

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Title: LESSONS LEARNED DURING REMEDIAL DESIGN AND REMEDIAL ACTION ACTIVITIES AT SUPERFUND SITES

Authors: Dev R. Sachdev, Ph.D., P.E.

This paper relates our experiences at various Remedial Design (RD) and Remedial Action (RA) Projects in U.S. EPA Region II on the Rem III and ARCS II Programs and focuses on the problem areas encountered at various sites and corrective actions taken jointly by USEPA and Ebasco. The corrective actions taken were to minimize claims and change orders. Innovative strategies such as standardizing, as far as possible, the specifications and drawings were implemented to reduce costs. Experienced and motivated employees were assigned to supervise design and remedial action projects to minimize schedule slippage.

Further, the paper discusses performance vs. detailed engineering specifications for various treatment processes. Also its effect in introducing and encouraging innovative technologies, especially when variability and non-predictability of the types and concentration of contamination during the operation of the treatment processes exist.

This paper also expounds on the importance of proper and adequate QA/QC, health and safety plans, and working cooperatively as well as motivating the new, small business entrepreneur contractor to successfully complete a project on time and under budget. Similarly, properly conducted community relations can be a great asset in satisfying the community concerns and minimizing adverse publicity.

Three projects have been selected to illustrate our experiences: (1) Bog Creek Farm, Monmouth County, NJ (RD); (2) Brewster Wellfield, Putnam County, NY (RD and RA); and (3) Vestal Well 1-1, Broome County, NY.

The Bog Creek Farm Site (RD) entailed an on-site incineration of organic and semi-organic contaminated material. In addition, due to the nature and amount of surface and subsurface water on-site, a sophisticated aqueous waste treatment system was designed and installed to treat all contaminated liquids generated during site activities. Later, this system was evaluated and upgraded to remain on-site for the second operable unit, the Groundwater Management System. Ebasco was also responsible for the engineering support to USACE/EPA during construction activities.

The Brewster Wellfield Site (RD/RA) consisted of the engineering, design and installation of a groundwater treatment system to control the migration of contaminant plume and restore the groundwater quality in the area. The second Operable Unit addressed removal of the source and off-site incineration and disposal of the source's contaminated materials. Both operable units are located within a busy business district of the Brewster Village and required constant public relations activities.

The Vestal Well 1-1 remediation involved the engineering and construction of a volatile organic compound (VOC) treatment system to remove contaminants from the groundwater. The treated groundwater will augment the existing municipal water supply system.

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Title: FORECASTING STAFFING REQUIREMENTS FOR HAZARDOUS WASTE CLEANUP

Authors: Robert W. Salthouse

The effort to clean up past hazardous waste sites faces a problem of constrained resources. One of the most important of those constraints is the relatively short supply of suitably trained workers. The first step in addressing that constraint is to find a reliable means for estimating the staffing required to carry out various phases of restoration work.

This paper discusses the methods we have developed to enable the U.S. Army Corps of Engineers to forecast the staffing that they will need to help restore both military and civilian hazardous waste sites. Those forecasting methods are incorporated in two computer staffing models: the Defense Environmental Restoration Program (DERP) staffing model, and the Superfund staffing model. The first model estimates requirements for military restoration work, while the second estimates the staffing needed to support Superfund work by the Civil Works side of the Corps.

Those two models are direct descendants of the Corps' standard military staffing model: the Corps of Engineers Resource and Military Manpower System (CERAMMS), which was also developed by the Logistics Management Institute. CERAMMS is now the established method for forecasting and allocating annual Corps staffing requirements for military design and construction.

CERAMMS and the environmental restoration staffing models are all based on statistical analysis of historic workload data. The models assume that the size and complexity of future programs will be related to the size and complexity of past programs. While a wide variety of factors affect staffing levels, we have found that the two most important factors are total dollars and project type or complexity. By dividing the Corps' programs into different types of work, dollars spent can be reliably related to hours worked. For estimating purposes, the Corps' restoration programs are divided into planning, technical assistance, remedial design, and remedial construction activities.

We use historical data to determine the relationship between dollars expended and hours worked for various types of work, the distribution of project sizes, durations, and start dates, and the functional relationship between time spent and work accomplished. Those functional relationships and distributions are embodied in a computer program that takes multiyear program dollars as its primary input, and produces multiyear forecasts of staffing levels and costs as its primary output.

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Previously, Mr. Salthouse worked for Exxon International Company, where he helped forecast worldwide raw material requirements and movements. Mr. Salthouse earned a bachelor's degree in chemistry and a master's in mideast studies from the University of Pennsylvania. In addition, he holds a master's degree in Industrial Administration, with honors, from Carnegie Mellon University.

Title: SUMMARY OF U. S. ENVIRONMENTAL PROTECTION AGENCY/OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE/ENVIRONMENTAL RESPONSE TEAM'S HEALTH AND SAFETY CERTIFICATION SYSTEM

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The Environmental Response Team (ERT) is the U.S. Environmental Protection Agency's focal point for technical assistance to the Regions and program offices during single or multimedia emergency episodes involving toxic and hazardous materials. When activated by EPA Headquarters, regional offices, or Federal/State departments outside EPA, the ERT will provide assistance concerning prevention, safety, assessment, containment, control cleanup, restoration, removal, and disposal of oil and hazardous substances spills. Response activities include providing advice and consultation, as well as conceiving, implementing, and coordinating novel and advanced technical approaches for solving problems associated with multimedia environmental emergencies such as chemical spills.

On December 19, 1986, the Department of Labor Occupational Safety and Health Administration (OSHA) published an interim standard for the health and safety of workers on hazardous waste sites and emergency response activities in the Federal Register. The standard specifies different training requirements and medical monitoring requirements for the various workers at hazardous waste cleanup sites. These requirements are on-going, that is, each worker must maintain a specified level of training and follow the medical monitoring requirements set forth in the standard. ERT has developed an automated tracking system whereby we can monitor each individual's training and medical monitoring status in accordance with the OSHA standard. This paper summarizes the system, and explains its use for workers involved in hazardous waste site work and therefore subject to the requirements set forth in 29 CFR 1910.120.

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Title: SUMMARY OF U. S. ENVIRONMENTAL PROTECTION AGENCY/OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE ENVIRONMENTAL RESPONSE TEAM'S GENERIC SITE HEALTH AND SAFETY PLAN

Authors: V. L. Santoro
R. D. Turpin
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M. J. O'Neill

The Environmental Response Team (ERT) is the United States Environmental Protection Agency's focal point for technical assistance to the Regions and program offices during single or multimedia emergency episodes involving toxic and hazardous materials. When activated by EPA Headquarters, Regional offices, or Federal/State departments outside EPA, the ERT will provide assistance concerning prevention, safety, assessment, containment, control cleanup, restoration, removal, and disposal of oil and hazardous substances spills. Response activities include providing advice and consultation as well as conceiving, implementing, and coordinating novel and advanced environmental emergencies such as chemical spills.

On December 19, 1986 the Department of Labor Occupational Safety and Health Administration (OSHA) published an interim standard for the health and safety of workers on hazardous waste sites and emergency response activities in the Federal Register. One of the requirements of this standard is for the generation of a site safety plan prior to the commencement of site activities. The requirements for the site safety plan are extensive. ERT has developed a generic plan for site safety at hazardous waste sites that we believe will help hazardous waste workers in the preparation of their site-specific plans in accordance with the OSHA standard. This paper will present the generic plan, an automated system for its preparation, and the use of the plan.

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Title: WORKER PROTECTION STANDARD (29 CFR 1910.120) VS. OTHER REQUIREMENTS

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The U.S. Environmental Protection Agency's Environmental Response Team (ERT), was established in October 1978 to provide technical assistance to Federal On Scene Coordinators (OSCs), Regional Response Teams (RRTs), National Response Team (NRT), EPA Headquarters/Regional Offices, and other Federal/State government agencies, as well as foreign governments, in the area of environmental emergency issues, such as chemical spills and hazardous waste spills, and hazardous waste sites.

There are many different standards with overlapping requirements; some are mandatory, while others are not. This paper briefly describes other related requirements, such as 40 CFR 311, SARA TITLE III, HAZARDOUS COMMUNICATION, 29 CFR 1910/1926, NFPA 471/472, and identifies their relationship to Hazardous Waste Worker Protection Standard.

In addition, this paper addresses the nine emergency response planning elements of Section 303, SARA Title III and relates this to paragraph (q) - Emergency Response to Hazardous Substance Releases of 29 CFR 1910.120. Last, but not least, the paper addresses the legal federal requirements of NFPA 471/472 and discusses specific elements which are more restrictive than 29 CFR 1910.120.

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Title: POLICY FOR RD/RA ACTIVITIES: THE EFFECTS OF THE DAVIS-BACON ACT ON THE LaSALLE ELECTRICAL UTILITIES PHASE I REMEDIAL ACTION

Author: David P. Seely
Karen Yeates

THE SITE: LaSalle Electrical Utilities (LEU) Superfund Site is a former manufacturer of electrical equipment which utilized polychlorinated biphenyls (PCBs) in the production of capacitors. The Remedial Investigation (RI) documented PCB-contaminated soil above the 5 ppm cleanup level in the yards of 27 residences. A Record of Decision (ROD) was issued in August, 1986 which included the following basic components: (1) Excavation of the contaminated off-site soils, (2) incineration of contaminated soils with an on-site thermal destruction unit, and (3) Industrial cleaning of all structures where excavation occurs. The subsequent remedial action was initiated by the State of Illinois under a cooperative agreement in January, 1988.

THE ACT: The Davis-Bacon Act is a federal labor regulation which establishes minimum wage rates and fringe benefits for workers on federally assisted construction projects in excess of $2,000. These minimum rates and benefits are established on a regional basis by the U.S. Department of Labor (U.S. DOL).

THE PROBLEM: Upon reviewing the cost for the first change in scope of the remedial action, there was a question regarding the appropriate wage rates for the contractor's workers. The bid specifications clearly stated that the contractor was responsible to comply with all federal and state wage regulations. The specifications also continually referenced "construction" activities, and included established Davis-Bacon wage rates, yet no Davis-Bacon wages were being paid. A dispute developed between the contractor and the State over the applicability of the Davis-Bacon Act. The main issue was that the contractor considered the contract to be covered under the Service Contract Act since 75% of the total contract was incineration related cost. The contractor considered incineration a service and not a construction activity. However, the Service Contract Act was never considered by the State since it relates solely to direct Federal procurement. This resulted in many discussions between the U.S. EPA, the State, and U.S. DOL. During the two years since the issue was first brought to light, the three main points heavily argued by all parties were: 1) Did Davis-Bacon apply? 2) Does Davis-Bacon apply to incineration related cost? If so, what wages were to be paid when no wage classifications have been established? and 3) If Davis-Bacon applied, who is responsible for the financial liability for compliance?

During this process, it became clear that the applicability of Davis-Bacon to federally assisted Remedial Actions is not well defined. A settlement on all issues was finally reached for this site, however, the applicability to all remedial actions remains in question. At the present time, U.S. EPA defers to U.S. DOL on site-specific determinations. However, new Superfund procurement regulations have only added to the confusion. Clear guidelines need to be established for how and when the Davis-Bacon Act applies to federally assisted Superfund Remedial Actions so that it will not be a continuing problem for other Superfund sites.

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Mr. Seely's college education included one year of experience in industry as a co-op for Olin Chemicals. During this time, he worked in research and development and operated bench scale pilot plants to simulate plant processes. After graduation he worked as an operator for eight months for PPG Industries. During his time with U.S. EPA, Mr. Seely has been a RPM for Superfund sites which include: 1) Federal Lead Remedial Investigation/Feasibility Study (RI/FS), 2) State Lead RI/FS, 3) Federal Facility RI/FS, and 4) State Lead Remedial Design/Remedial Action (RD/RA). Mr. Seely has been involved with the LaSalle Site for approximately 2-1/2 years overseeing two RD/RA operable units involving on-site incineration.

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Title: BIOREMEDIATION OF TOXIC CHARACTERISTIC SLUDGES WITH BIOLOGICAL LIQUID/SOLIDS SLURRY TREATMENT

Authors: Donald F. Sherman

The remediation of over 50,000 cubic yards of toxic characteristic (TC) sludges was completed with the implementation of liquid/solids slurry treatment (LST) and land treatment at a petrochemical plant. The primary targeted compound was benzene, which was treated in-place in the liquid phase with strict control of volatile emissions during operations. This full-scale remediation action was implemented as a result of the newly promulgated toxicity characteristic regulations.

The LST technology is an adaptation of conventional activated sludge treatment, conducted at significantly higher solids loading, thus impacting the mixing and aeration horsepower requirements and materials handling processes. The slurry environment is capable of enhancing the biodegradation of organic contaminants as a result of improved nutrient, oxygen and substrate mass transfer rates.

The 50,000 cubic yards of sludge were remediated in a three-month period. To control volatile emissions, specifically benzene, treatment was conducted in a phased approach. Initially denitrifying conditions were enhanced, followed by a period of high oxygenation with minimal surface disruption. The final stage of aerobic treatment included maximum aeration and solids suspension to achieve final reduction of residual volatile organics, and solids reduction. Residual solids and soils were remediated via in-place land treatment.

Benzene levels were reduced to below TC regulatory levels in all impoundments within 3 months. Greater than 25% volume reduction of sludges was observed during this period. All impoundments were verified to e non-hazardous based on TCLP analysis, following the SW-846 sampling protocol. The project success represented significant savings relative to the cost of operating or closing a potential RCRA facility.

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Title: STATE OVERSIGHT AT TWO URANIUM MILL SUPERFUND SITES IN COLORADO

Authors: Don Simpson
Phil Stoffey

The State of Colorado has had the unique opportunity to act as lead oversight of cleanup actions at two uranium mill tailings sites which are also designated Superfund sites. The two sites are the Uravan Project located in southwestern Colorado near the Colorado-Utah border and the Lincoln Park Project located near Canon City, Colorado, approximately 96 miles south of Denver.

Both sites have a long and complex history of industrial development. Groundwater, including bedrock aquifers, have been affected at both sites. Extensive information existed at both sites prior to the development of Remedial Action Plans (RAPs). However, even with a large amount of existing information and site evaluation, changes have been required in the RAPs based on field experience at each site during implementation of the remedial action plan.

The State of Colorado's strategy on these two sites has been to assign On-Site Coordinators (OSCs) who spend significant time at each site. By spending much of their time on site, the OSCs are aware of current progress, are better able to understand the site conditions and are available to help analyze and solve problems that develop in the field. Experience in colorado has shown that no matter how comprehensive the preliminary investigations and studies are, unanticipated conditions are encountered once implementation of the remedial action plan begins. Examples are given of field changes that were made based upon unanticipated conditions such as geohydrology and constructability. The OSCs are empowered to authorize changes in the field to accomplish the objectives of the RAPs. This has enabled both projects to proceed in a timely manner but has also required that OSCs fully understand the purpose and intent of each project component. The time spent on-site observing the construction activities provides three important benefits:

1. The site conditions and situation are well understood;
2. Additional quality assurance is provided; and
3. Project delays and costs are minimized.

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Mr. Simpson received his B.S. degree in Geology at the University of Massachusetts, and his M.S. degree at Colorado State University.

His experience includes 13 years working for government agencies and consulting firms as a hydrologist and geologist.

Mr. Simpson's experience includes work on Environmental Impact Statements, environmental characterizations for coal mines, writing of water quality permits for mining sites, technical coordination to support CERCLA lawsuit, evaluation of final reclamation plans for uranium mill tailings sites and oversight of the final reclamation plan at Uravan Uranium Mill.

His last six years were primarily spent on planning, design, review and implementation of reclamation plans for CERCLA sites and for uranium mill tailings sites.

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Mr. Stoffey has had 15 years experience working for consulting engineering firms as an engineering geologist, soils specialist and concrete and materials engineer. Field work included minor and major construction sites throughout the world including soil and rock investigations, dam rehabilitation, foundation construction through completion of concrete dams and skyscrapers.

Mr. Stoffey worked three years on Superfund sites in Colorado, including oversight of field investigations for RI/FS and CERCLA litigation. He worked the past three years as on-site coordinator overseeing clean-up of Cotter Uranium Mill and Lincoln Park, a community contaminated by the mill.

Title: LESSONS LEARNED FROM REMEDIAL DESIGN OF HELEN KRAMER LANDFILL SUPERFUND SITE

Authors: V. Singh
J. Lanzo

The Helen Kramer Landfill Superfund Site is currently undergoing remedial action. The remedial design was developed by URS Consultants, Inc., under a contract to the U.S. Army Corps of Engineers. The construction is being carried out by IT/Davy, a joint venture of International Technical Corporation (IT) and Davy McKee Corporation (Davy). As part of Title II services, URS is providing engineering services during construction.

The site was ranked fourth on the USEPA's National Priorities List. It includes a 66-acre refuse area and an 11-acre stressed area adjacent to a perennial stream, tributary to the Delaware River. The remedial action contract, in the amount of $55.7 million, represents the second largest single contract awarded to date under the Superfund program.

Initially a sand and gravel quarry, the site became an operating landfill and received municipal, chemical, and hospital wastes from 1963 to 1981. The waste was dumped indiscriminately and resulted in contamination of surface water and shallow groundwater. The remedial action includes an active gas collection and treatment system, a multilayer clay cap, a soil-bentonite slurry wall around the entire site, a leachate/groundwater collection system, and an on-site, 120-gpm pretreatment facility. The remedial action is expected to provide effective mitigation of any potential dangers posed by the site.

The design of the Helen Kramer Landfill Superfund Site remedial action can be instructive for future remedial designs on complex sites. It comprises almost all those elements of remedial action that apply to containment and isolation of uncontrolled site. It includes elements that are normally used to protect important potable water aquifers and surface water streams. The design was benefitted by a comprehensive value engineering study, the first Superfund remedial design to use that approach. In all aspects, it was a very thorough and complete design and resulted in complete and clear construction bid documents. The process, however, was not totally free of difficulties. It is those difficult aspects of the design process which, when combined with the success story, can be instructive and beneficial on future projects. This paper presents an overview of the remedial design process on this large Superfund project.

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Mr. Singh has both his BS and MS degrees in Civil Engineering, and is a Professional Engineer in New York, New Jersey, Illinois, and California.

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Mr. Lanzo is a Senior Project Manager with URS Consultants. He has over 15 years of management and technical experience in the fields of hazardous and industrial waste management, and chemical engineering design. He has completed engineering design and specifications for wastewater treatment storage and disposal facilities, as well as designs for full and partial treatment systems for hazardous waste sites for a variety of private, municipal, state, and federal clients. He had been the Task Manager for all water treatment issues for the Helen Kramer Landfill Project since 1986. Since that time he has provided designs and specifications pertaining to the treatment of groundwater and leachage, and provided support to the client in negotiating with the local POTW.

Title: THE PRE-DESIGN TECHNICAL SUMMARY

Authors: Kenneth R. Skahn

The Pre-Design Technical Summary (PDTS) is a compilation of available site information prepared by the remedial project manager (RPM) to provide the designer with a clear understanding of the technical objectives of the remedial action. Guidance is being developed by the Design and Construction Branch on preparation of the PDTS. This paper will provide a summary of that guidance.

The objective of developing a PDTS is to provide a smooth transition from the Record of Decision (ROD) into the design process. The preparation and use of the PDTS should ensure that the designer will understand the technical objectives of the design as well as provide the designer with an up-to-date inventory of all available information that may be pertinent to the design. The PDTS will serve the RPM as the initial building block for developing a comprehensive statement of work for the remedial design.

At a minimum the PDTS should accomplish the following:

- define initial site conditions;
- describe the selected remedy;
- identify applicable regulatory requirements;
- summarize available data and identify possible additional data needs; and
- state all known unresolved issues.

The Remedial Investigation/Feasibility Study (RI/FS) and ROD will be the sources for most of the information to be summarized or referenced in the PDTS. However, the guidance will identify a great deal of additional site-specific information that may be known to the RPM and is not included in the RI/FS or ROD.

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Mr. Skahn is a licensed Professional Engineer and Structural Engineer in the State of Illinois. He has received two of EPA's bronze medals for his work in the hazardous waste program.

Title: SURETY BONDS — SUPERFUND PROJECTS

Authors: August V. Spallo

BACKGROUND: Surety performance bonds are required by Federal law for any Federal Government construction contract over $25,000. A surety bond may also be required for services contracts if necessary to project the Government's interest. Surety bonds are designed to guarantee that the Government will receive a completed project. Contractors performing work under the Superfund law have complained that they are finding it increasingly difficult to obtain surety bonds. Contractors report that surety firms are reluctant to provide such bonds due to their concern that their liability will be extended beyond that traditionally covered by performance bonds to tort claims as well.

ANALYSIS AND FINDINGS: The bids for Superfund projects were reviewed to determine whether there has been a reduction in competition among contractors for Superfund work. The number of bids has decreased. In addition, the number of bids tend to decrease as the size of the project increases. However, the decrease in the number of bids received was not significant. There are no instances in which there has been a lack of competition for Superfund contracts.

CONCLUSIONS: If contractors are having a problem obtaining surety bonds, the problem has not had a significant impact on bidding for Superfund projects. Bidders have been able to obtain surety bonds for Superfund contracts. It may be that part of the problem that contractors may experience in obtaining surety bonds is due to their inability to meet criteria for financial capability and experience which surety firms require for issuance of a surety bond.

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Title: RPM/OSC SUMMARY GUIDE – REMEDIAL/REMOVAL INCINERATION PROJECTS

Authors: Laurel J. Staley

The Superfund On Scene Coordinator (OSC) and/or Remedial Project Manager (RPM) must access a wide variety of information when supervising removal/remedial activity at a Superfund site where incineration is to be used. In order to make that information more readily available to the OSC/RPM, the OSC/RPM Summary Guide for Remedial Removal Incineration Projects was prepared. The Guide was not intended to be an all-inclusive reference on incineration. The body of hazardous waste incineration knowledge changes too rapidly for such a guide to be useful for very long. Rather, it was intended to guide the OSC/RPM to experts within and outside of the EPA who have the most current knowledge of incineration. Background information on Incinerator Design and Operation, Incinerator Manufacturers and Operators, Incineration Regulations, and Cost is presented concisely and largely in tabular form. Extensive references are provided for more detailed information on the topics discussed in the Guide. Together with the lists of incineration experts, the Guide should provide the OSC/RPM with enough information to more effectively monitor and direct incineration related activities at Superfund sites. This presentation discusses the contents of the Summary Guide and some of the issues raised during its review.

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Title: THE SIKES DISPOSAL PITS SUPERFUND SITE — A STUDY IN BID SOLICITATION —

Authors: James R. Steed
Earl G. Hendrick

- o Site Background
- o 1st Solicitation of Bids
- o Recognize Bidder Difficulties with Bonding
- o Resolution of Difficulties:
    1) Allow other Security Instruments
    2) Reduce Security Amount
    3) Phase Work So That the Handling of Hazardous Material is in Separate Agreement
    4) Define/Limit Purpose of Bond
    5) Cap Retainage
    6) Define Surety Company Options
    7) Make Indemnification Available to Sureties
- o Rebid and Results
- o Update and Status of Project

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Title: MOBILIZING FOR REMEDIAL CONSTRUCTION PROJECTS

Authors: R. Gary Stillman, P.E., C.C.E.

If a remedial construction project does not mobilize correctly with all required activities completed, both time and monies can be lost trying to correct the situation. This period is key for an on-time project. The successful start is dependent on completion of activities prior to and during the mobilization period. Some of these activities are similar to that of general construction, yet others are unique to this field. Knowledge of construction and the requirements of remediation is required for meeting the start date of work. The paper will examine the items and activities that must be completed in order to successfully mobilize.

The procurement of equipment and materials that are required for the project have to be accomplished. The levels of safety have to be set for the correct health and safety equipment. Construction equipment requirements have to be determined for the actual work.

The establishment of the contamination and clean zones for the work areas must be based on experience and the site layout. The types of facilities and locations are dependent on the safety requirements.

Permits must be obtained from a number of local and national agencies. Receipt of some permits may take extended periods with reviews from several agencies. Time and budget has to be allocated for this work.

Reports and procedures have to be written and established for the project. The site health and safety plan is one example of the procedures.

This paper will serve as a checklist for mobilizing a remedial construction project. A particular project may have some different requirements, but most will incorporate the items presented.

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He has over seventeen years of experience in both general and remedial construction. His recent projects include site remediation, tank management, incineration, and environmental construction. Past projects consist of power generation facilities, industrial and pharmaceutical plants construction and retrofits.

His current position of Manager of Construction Services at Weston Services, Inc. includes estimating, project controls and procurement management. Prior to this position, he was the Manager of Estimating and Cost Engineering at United Engineers & Constructors.

Title: MANAGEMENT OF CHANGE ORDER CONDITIONS: A SUPERFUND CASE HISTORY

Authors: Myron S. Temchin

Although much literature has been written about change order controls during superfund remediation, few articles if any have dealt with the two-way street that must exist between the EPA, the USACOE and the contractor.

This article presents an actual case history of the impact of changes on a major superfund clean-up and attempts to define this unwritten cooperative relationship that must exist in order to successfully complete the project in the face of significant changed conditions.

The article will present a short history of the interim action of Basin F hazardous waste clean-up at the Rocky Mountain Arsenal. It will establish the basis for technical concerns during remediation and the contract environment which existed to deal with these concerns. The paper will then discuss the USACE change control process as it existed and will focus on the logistics of the cooperative relationship between the USACOE and the contractor which allowed the project to proceed to a successful completion. Finally the paper presents lessons learned on change order control and presents some food for thought for the EPA, the USACOE and remedial action contractors involved on Federally-funded Superfund projects.

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Title: CONSTRUCTION DISPUTES ON HAZARDOUS WASTE PROJECTS

Authors: Theodore J. Trauner, Jr., P.E., P.P.

This paper will address the problem of construction disputes and claims as related to hazardous waste sites. Common causes specific to these projects will be addresses such as: differing site conditions, design changes, impossibility of performance, etc. Once causes have been explained, ideas and suggestions on preventing these problems will be discussed. These would include items such as "if and where directed" clauses, independent design reviews, phased construction, etc.

Incorporated in the body of the paper will be a discussion of constructive changes. Since these occur frequently on hazardous waste projects and often result in claims, an understanding of constructive changes is essential.

The paper will also address construction delays and inefficiencies since these comprise the largest dollar value type of claims asserted on hazardous waste projects.

In summary, the paper will address causes of claims, contractual considerations, changes (directed and constructive), and consideration for reducing the incidence of changes and claims.

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Title: THE EVOLUTION AND OVERVIEW OF HAZARDOUS WASTE HEALTH AND SAFETY REQUIREMENTS

Authors: Rodney D. Turpin
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This paper will construct the evolution of current health and safety requirements beginning with the 1970 Occupational Safety and Health Act progressing to the current 29 CFR 1910.120 Hazardous Waste Worker Protection standard. Areas of reference which will be highlighted will include key elements of the EPA Order 1440 Occupational Health and Safety Manual such as requirements for health and safety plans, training and medical monitoring as well as the requirements for providing written plans focused on certain issues such as respiratory protection. Specifics of the Office of Solid Waste and Emergency Response Integrated Health and Safety Policy governing field personnel who are either actively or potentially involved in various hazardous substance field activity will be cited. An overview of the sections of the 29 CFR 1910.120 and EPA 40 CFR 311 equivalent standard applicable to hazardous waste, RCRA, emergency response and oil spill activities will be explored. The paper will conclude with brief highlights of reoccurring current health and safety issues.

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Title: REMEDIAL DESIGN SCHEDULE MANAGEMENT

Authors: C. F. Wall, P.E.
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Successful management of a remedial design depends on the performance of responsible and qualified architectural or engineering (A/E) firms, the maintenance of schedules and budgets, and the rapid resolution of problems. Techniques for establishing good design management include requirements that a schedule be agreed to between the contracting party and the designer, that the schedule be reviewed and up-dated monthly, and that enforcement of the schedule by the contracting party be maintained. Of course, the schedule must be reasonable, must establish obtainable goals, must contain sufficient detail to permit task control, and must be based upon a complete scope of work.

The purpose of this paper is to discuss the development of generic Remedial Design Schedules. The schedules are to be used as tools to assist all parties involved in the development of Remedial Design (RD) Schedules.

Initially, a schedule methodology and computer software packages were selected that were appropriate to Remedial Design scheduling. The critical-path-method (CPM) of scheduling was selected because of the ability to track and display the numerous interrelated activities which comprise the Remedial Design.

Using the draft Standard Remedial Design tasks, an activity list was developed in sufficient detail to estimate activity durations and define activity interrelationships. Then, using the computer software, a single, time-phased logic was produced which served as a template for the development of the remedy-specific generic RD schedules.

In parallel with the development of the template, data and other information were reviewed to determine the universe of technologies being considered for remediation of NPL (National Priority List) sites. Further brainstorming resulted in the selection of nine remediation categories which encompass the universe of technologies and which were used to develop the remedy-specific RD schedules.

A remedy-specific generic RD schedule was developed for each of the nine categories by using a team of experts to estimate the individual activity durations and their interrelationships.

The remedy-specific schedules are generic in nature and have been developed with the objective of demonstrating management approaches to reducing the over-all remedial design duration. They present reasonable approximations of the interrelationships of those activities required to successfully complete a remedial design. The schedules and level of effort (LOE) estimates are intended for training purposes only and should not be used to develop site-specific schedules. The schedules and LOE estimates used by the party contracting for design must reflect their own experience with similar projects.

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Title: REMEDIATING TCE-CONTAMINATED SOILS: A CASE STUDY OF A FOCUSED RI/FS AND VACUUM EXTRACTION TREATABILITY STUDY

Authors: W. Winslow Westervelt
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A focused remedial investigation/feasibility study (RI/FS) was conducted for EPA Region III to determine the extent of trichloroethene (TCE) contamination in soils at a former sanitary landfill site and to evaluate alternatives for soil remediation. The investigation revealed high concentrations of TCE (up to 330,000 μg/kg) trapped in a 50-foot-deep vadose zone, and high concentrations of TCE and acetone (up to 840,000 μg/kg) in the saturated soils above bedrock. The overburden soils in the vicinity of the spill areas are between 40 to more than 100 feet deep and were classified as predominately silt. Due to the depth of contamination and potential problems of controlling volatile organic compound (VOC) emissions, treatment alternatives that required excavation of the soil were ruled out. A combination of capping and *in situ* vacuum extraction was considered to be the most promising alternative for this site.

To evaluate the effectiveness, implementability, and cost of vacuum extraction, a pilot-scale treatability study was performed at the site. Physical and chemical data were collected over a two-week period that allowed for a determination of the radius of influence of vacuum pressure in various soil units, an evaluation of the effects of key operating parameters and system designs on performance, and an estimation of the time required to remediate the contaminated soils. Subsurface air flow and contaminant removal models were calibrated to the pilot-scale data and used to predict the performance of various full-scale system configurations that included nested vacuum extraction wells, surface capping, and air injection wells. Preliminary costs and designs for full-scale remediation systems were developed.

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Title: THE REMEDIAL MANAGEMENT STRATEGY

Authors: Thomas A. Whalen, P.E.

The Remedial Management Strategy (RMS) is a transitional tool between the Record of Decision (ROD) and the Remedial Design (RD) for expediting the project. It contains an analysis of the major management considerations required to achieve the goals of the ROD in a timely manner. Preparation of the RMS is essential for the smooth progression of a project through RD and Remedial Action (RA).

The RMS is prepared by the Remedial Project Manager (RPM) in the predesign phase of a project, when the ROD and supporting documents are to be converted to a scope of work for RD and RA by expressing EPA's technical and managerial requirements. When linked with the Preliminary Design Technical Summary (PDTS), complete project definition is formulated, including realistic objectives in a clearly stated format.

Certain managerial requirements should be addressed in the RMS, and will be discussed in additional detail in the paper, including: 1) a plan for communications and coordination of all parties involved in RD/RA; 2) a program for meeting the regulatory and environmental requirements; 3) contracting strategy(ies) to be pursued for the RD and RA; 4) a reasonable estimate of the resources needed for, and duration of, the project, with schedule and budget projections; 5) assurances for project quality, including plans for reviews of documents and oversight needs; 6) discussion of risk and labor management, including bonding, insurance, labor rates, etc.; 7) providing for a detailed statement of work for the RD, including discussion of the type of plans required; 8) use of value engineering during RD; and 9) type of engineering support anticipated during the RA.

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Title: ACQUISITION OF PERMITS AND "PERMIT EQUIVALENCIES" FOR THE IMPLEMENTATION OF SUPERFUND REMEDIAL ACTIONS

Authors: Mark S. Wheeler, B.S.
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BACKGROUND: The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) leaves open the question of permit requirements for Superfund remedial actions. Being a Federally run environmental program, remedial actions were frequently executed with little or no regard to permit requirements. The Superfund Amendments and Reauthorization Act (SARA) specifically exempted remedial activities within a Superfund site from Federal, State, and Local permits yet required that these remedial actions comply with the Applicable, Relevant, and Appropriate Requirements (ARARs). Since the passage of SARA, State environmental agencies have gained strength and authority and the provisions of SARA have provided these agencies with a mechanism to enforce the requirements of permits, although without actually issuing such permits. What has resulted from this new involvement of the State agencies is termed "permit equivalency."

ANALYSIS: Current Superfund remedial construction contracts notify the contractor that Federal, State, and Local permits are not required for work within the project site, but require that documentation which would normally be required to support applications for such permits be provided to the Contracting Officer for approval. The documentation provided by the Contractor is generally forwarded to the regulatory bodies which normally issue the permits involved for determination as to whether or not the ARARs are being complied with and issuance of a "permit equivalency." Frequently, as a result of Pre-SARA practices, the design process has failed to properly address the technical requirements of those permit equivalencies. In addition, much of the information required for submission is comprised of field investigation data and design calculations with which the construction contractor generally is unfamiliar or which has not been made available to him.

FINDINGS: The current system of obtaining permit equivalencies is resulting in expensive delays and changes to remedial construction contracts. Inattentiveness to local regulations and inadequate participation by local regulatory agencies during the design process has resulted in contract requirements which are inadequate or actually conflict with the requirements of the ARARs. Unfamiliarity of the remedial construction contractor with the details of the design and lack of easy access to relevant information further complicate the acquisition of permit equivalencies for the remedial action. A change in the approach to these issues during design could avoid increased costs and delays and may actually reduce remedial costs by providing more definitive requirements to the construction contractors.

CONCLUSIONS: In the incipient stages of the design process, the designer must identify and contact those regulatory agencies responsible for permitting activities under the ARARs and, through them, determine the technical requirements of the ARARs for incorporation into the physical design and the submission requirements for obtaining permit equivalencies. The designer should then prepare supporting documentation for such permit equivalencies to the extent he is capable and identify, in the contract specifications, the additional specific information which will be required of the construction contractor. In addition, the designer should obtain those permit equivalencies for which all supporting documentation is available prior to contract award. By following such a procedure, obtaining permit equivalency can be expedited and considerable delays and costs associated with later changes can be avoided.

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Title: COMPARATIVE ROLES OF THE ENVIRONMENTAL PROTECTION AGENCY AND THE BUREAU OF RECLAMATION DURING CONSTRUCTION AND IMPLEMENTATION OF THE LIDGERWOOD, NORTH DAKOTA SUPERFUND PROJECT

Authors: L. O. Williams
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The Lidgerwood Project is one of three components of the Arsenic Trioxide Superfund Site which is located in North Dakota. The Arsenic Site is just south of Fargo and encompasses approximately 500 square miles of the southeastern corner of the state. Groundwater beneath the Site contains arsenic contamination resulting from widespread distribution of arsenic-laced grasshopper bait during the 1930's and 1940's. In February, 1988, the Lidgerwood Project was included as part of the selected remedy for the Site consisting of expansion of the existing systems, continued monitoring, and institutional controls. The Remedial Design (RD) for the Lidgerwood Project was approved in March, 1989 and the final construction conference is scheduled for January, 1991.

The U.S. Environmental Protection Agency (EPA) has been the lead agency throughout the RD and Remedial Action (RA) process. During this time the EPA Project Manager was responsible for coordination of all activities for the Lidgerwood Project. These included direct conduct of Community Relation activities; development and oversight of various interagency documents with the State of North Dakota, the City of Lidgerwood, and the Bureau of Reclamation; and related responsibilities concerning funding for the Project.

Through an Interagency Agreement, the U.S. Bureau of Reclamation (BOR) was "contracted" to perform direct procurement and construction oversight of RA activities on behalf of EPA. Due to the serious nature of the situation, an accelerated design and construction schedule was established. Through a cooperative team effort with EPA, Reclamation issued the specifications, awarded the contract, and completed the construction as scheduled.

While the opportunities for conflicts and problems were myriad, only those which were of major impact to the Lidgerwood community, construction completion, or funding are presented for discussion. Some of these include notification issues, reimbursement of EPA funds, cost overruns, and recycling concerns. Suggestions based on the practical "hands-on" knowledge gained from the Lidgerwood Project are offered for consideration by those initiating or conducting RA at other Superfund sites.

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Title: REMEDIAL DESIGN AND CONSTRUCTION AT THE CHARLES GEORGE LANDFILL SUPERFUND SITE

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The Charles George landfill is a 55 acre, mixed-waste landfill located north of Boston in Tyngsboro, MA. The landfill operated under a state hazardous waste license during the mid 1970's, and received hazardous wastes during this period and probably others. In 1983 the state ordered the landfill closed after local deep bedrock water well contamination was attributed to the site. The landfill was placed on the NPL in 1983. EPA performed emergency actions in 1983-1984 to cover exposed refuse, fence the site and upgrade a temporary waterline to nearby condominiums. Permanent water supply line installation was completed in 1988.

Fund financed construction of a high density polyethylene cap (HDPE) with systems for perimeter leachate collection, gas venting and surface water diversion was completed in 1990. Issues that arose during cap construction included, design specification interpretation, constructability, leachate management, value engineering, community concerns, site access for PRPs and coordination between three bureaucracies.

Because of the complexities and uncertainties at this site, remedial components selected in both the Record of Decision and Remedial Design stages continued to be changed and in some cases deleted during construction. In addition, ongoing cost recovery litigation has impacted the implementation of both remedial design and construction. Close coordination between the governments, the general contractor, the PRP contractors, and the local communities helped solve, but did not totally resolve, the many construction issues that arose.

Both fund-lead and PRP-lead design activities for the remaining leachate, groundwater and landfill gas treatment systems are currently underway. Issues that remain for remedial design include waste stream quantity and quality, pilot treatment plant studies and design details for lowering the water table within the refuse.

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