AIIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

Inches

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

ASSESSMENT OF TECHNOLOGIES FOR HAZARDOUS WASTE SITE REMEDIATION: NON-TREATMENT TECHNOLOGIES AND PILOT SCALE FACILITY IMPEMENTATION--EXCAVATION--STORAGE TECHNOLOGY--SAFETY ANALYSIS AND REVIEW STATEMENT

Final Report

Work Performed Under Contract
No.: DE-FC21-92MC29467

For
Raymond J. Lovett, Principal Investigator
Environmental Technology Division
West Virginia University
National Research Center For Coal And Energy
PO Box 6064
Morgantown, WV 26506-6064

And
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Harry R. Johnson, Project Manager
William K. Overbey, Jr.
George J. Koperna, Jr.
BDM Federal, Inc.
1199 Van Voorhis Road, Suite 4
Morgantown, WV 26505

FEBRUARY 1994

ASSESSMENT OF TECHNOLOGIES FOR HAZARDOUS WASTE SITE REMEDIATION: NON-TREATMENT TECHNOLOGIES AND PILOT SCALE FACILITY IMPLEMENTATION -- EXCAVATION TECHNOLOGY

Final Report

**Work Performed Under Contract
No.: DE-FC21-92MC29467**

For
Raymond J. Lovett, Principal Investigator
Environmental Technology Division
West Virginia University
National Research Center For Coal Annd Energy
P.O. Box 6084
Morgantown, West Virgimia 26506

And
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginis

By
Harry R. Johnson, Project Manager
William K. Overbey Jr.
George J. Koperna Jr.
BDM Federal Inc.
1199 Van Voorhis Rd. Suite 4
Morgantown, West virginia 26505

FEBRUARY 1994

DISCLAIMER

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF ILLUSTRATIONS

1.0 EXECUTIVE SUMMARY

A copy of the Core of Engineers Characterization and Cost Evaluation Report for the Winfield site was obtained and examined in detail. A technical approach was determined whereby a functional analysis was prepared to determine the functions to be conducted during the excavation phase of the remediation operations. a literature search was conducted using the key words generated as a results of the functional analysis. A number of excavation technologies were identified from the literature. A set of screening criteria was developed that would examine the utility and ranking of the technologies with respect to the operations that needed to be conducted at the Winfield site. These criteria were performance, reliability, implementability, environmental safety, public health, and legal and regulatory compliance.

The Loose Bulk excavation technology was ranked as the best technology applicable to the Winfield site. This technology is ordinarily applied with a drag line, but because of the location along a river with steep banks, a long-boomed backhoe would appear to be the equipment of choice. The long-boomed backhoe can be placed so that it may not have to be moved but one or twice while removing the dioxin contaminated soils, thus reducing the amount of movement and fugitive dust generation.

The literature was also examined to determine the success of various methods of controlling fugitive dust. The foams that have been tested were not very successful because they were not tailor made for the solid and other materials found at the excavation sites. Foams as a method of suppression of dust need more R & D work perhaps in an attempt to relate to formulations that will work on specific soil types or mixtures. Soil samples from the Winfield site should be collected and formulations for dust suppression tested before excavation operations begin.

Depending upon any changes in the results of chemical analyses, or prior remediation of the VOC's from the vadose zone, consideration should be given to testing a new "Pneumatic Excavator" which removes the VOC's liberated during the excavation process as they outgas from the soil. This equipment however would not be needed on locations with low levels of VOC emissions.

2.0 INTRODUCTION

2.1 Purpose and Scope

The purpose of this study is to assess the state-of-the-art of excavation technology as related to environmental remediation applications. A further purpose is to determine which of the excavation technologies reviewed could be used by the U.S. Corp of Engineers in remediating contaminated soil to be excavated in the near future for construction of a new Lock and Dam at Winfield, WV. The study is designed to identify excavation methodologies and equipment which can be used at any environmental remediation site but more specifically at the Winfield site on the Kanawha River in Putnam County, West Virginia.

2.2 Background

Proposing to construct a new lock and dam at Winfield, the U.S. Army Corps of Engineers (COE) filed a Declaration of Taking in U.S. District Court on December 8, 1989. The Declaration of Taking was for a 21.81-acre track of land located directly upstream from the existing locks and dam along the Kanawha River. This property was formerly owned by the American Car and Foundry Industries, Inc. (ACF) and is located 20 miles northwest of Charleston, WV, near the communities of Eleanor and Red House (see Figure 2.1). The ACF facility's main functions were to repair and service both tank and hopper covered railcars which were leased to chemical companies for transportation purposes.

The 28.81-acre tract of land is geologically located upon a Kanawha River flood plain. Two groundwater zones exist under the site. The first is a perched water zone, found at a depth of 30 feet, which has been sealed from downward water flow. The second zone is a water table aquifer consisting of 30 feet of sandstone. It is this second aquifer which is recharged by the Kanawha River and serves as a water source for the town of Eleanor one mile away.

The COE took possession of this property on May 1, 1990 following a limited site remediation project undertaken by ACF. The remediation operations included excavation of 9,151 cubic yards of toxic soil for disposal at the Envirosafe chemical landfill in Toledo, Ohio. The nontoxic soils were disposed of at the Wetzel County, WV special waste landfill. Also, about 100 empty containers (most 55 gallon drums) were excavated, crushed, and sent to the Envirosafe chemical landfill.

After a May 27-28, 1990 rainstorm, COE personnel discovered discolored water seeping from the newly excavated pit walls. This liquid exhibited a phenolic odor and it was noticed that the soil was also discolored in this area. Immediately, sampling activities were begun to attempt to determine the bounds and nature of the suspected contamination. The tests of the discolored water revealed the presence of volatile organic compounds (VOCs) and acid/base neutral extractables, among others.

In a separate incident, occurring on August 17, 1990, a COE construction contractor came into contact with a skin irritant while removing pavement with a backhoe from the ACF site. Irritation of the worker's throat and skin was evident. It was this incident which accelerated site characterization studies.

In September of 1990, the COE instituted a total site characterization plan through soil gas surveys, soil sampling, and groundwater monitoring. All sampling procedures followed the appropriate EPA SW-846 methods which utilize a quality assurance and quality control program. By using this method, the COE was attempting to gather legally defensible test results.

The results of the soil gas surveys and the soil sampling indicated the presence of VOCs and semi-volatile organic (SVOC) contaminants over a large portion of the site. Soil sampling also detected pesticides, polychlorinated biphenyls (PCBs), and dioxins. Due to the presence of dioxin, it was necessary to obtain additional soil samples in order to characterize the extent of the contamination. It was determined that over 50% of the samples contained levels of Tetrachlorodibenzodioxin (TCDD) contamination greater than one part per billion (ppb).

Groundwater monitoring activities included installing four monitoring wells. Each of these wells was to be sampled as were the existing water supply wells for the town of Eleanor. Three of the four monitoring wells were installed into the bedrock to a depth of 60 feet while the other was halted in a shallow perched water zone at a depth of 15 feet. The shallow monitoring well detected low levels of VOC concentrations while no contaminants were detected in the deeper monitoring wells.

FIGURE 2.1

The COE final assessment for remediation of the ACF site was for excavation of 60,000 cubic yards of contaminated soil. The soil is then to be placed in a temporary storage facility to await further processing.

2.3 Study Technical Approach

The approach for this study was to review the site characterization studies that provided indications of the type of operations that will have to be conducted to comply with federal and state regulations during excavation. A functional analysis was prepared to reveal the types of technologies that could be utilized for generic sites and for the Winfield site. Once the technologies were identified, key word descriptors were identified to support a literature search to review the state-of-the-art for the selected technology. A detailed analysis was then conducted to determine the advantages and disadvantages for the selected technologies. A list of potential problems that have not been resolved relative to the technology was also prepared for consideration for future research projects.

2.3.1 Winfield Characterization Studies

The COE have already quantified and characterized the chemicals present at the Winfield site by conducting soil sampling and soil gas surveys. Chemicals present at the Winfield site include VOCs, SVOCs, PCBs, pesticides, and dioxins (COE Report 1992). Besides remediation of the chemicals, railroad tracks and a small building must be demolished and remediated.

The site's geology and hydrology have been carefully screened through the use of four groundwater monitoring wells. The well drilled to 15 feet intersected the perched water zone while the other three wells were drilled into the bedrock top at a depth of 60 feet. The shallow well showed traces of VOC concentrations. No contaminants were detected in the 60 foot wells which intersect the water aquifer for the town of Eleanor.

2.3.2 Literature Review

A literature review was initiated in order to compile a technology base for state-of-the-art excavation technologies. Literature reviewed included open literature, which consists of books and periodicals, federal government projects, and patents. Besides excavation technologies, information was also sought concerning dust suppression and atmospheric dust and gas monitoring.

In order to begin the literature search, a key word hierarchy was constructed. This enabled the search to zoom in on the necessary literature. Figure 2.2 contains a breakdown of the hierarchy used.

2.3.2.1 Open Literature

The West Virginia University Library System (WVULS) was utilized for an open literature search. This search included technical journals, magazines, and books. Through the use of a CD ROM software package, which allows searching through periodical key words and topics from 1983 to present, a list of available articles was generated. See appendix A in section 9.1 for the article lists.

FIGURE 2.2

Although the generated search lists were quite involved in order to limit the search to specific relevant articles, most of the gathered articles were found to be rather general.

The WVULS' card catalog was searched, both manually and by computer, for topics relating to excavation and hazardous waste excavation. No books were found relating to hazardous waste excavation. However, there were a few books which dealt with general excavation technologies. The list of references contain these particular books.

2.3.2.2 Federal Government Projects Literature

In order to obtain government reports relating to hazardous waste excavation, a government document search was conducted. The Department of Energy's Morgantown Energy Technology Center (METC) library was utilized for this search.

Again, a CD ROM computer software package was utilized to gather government document titles and abstracts covering the past ten years. Once the results were viewed, it was determined that only a small number of government project documents existed that were not merely government "records of decisions". Relevant technical documents were obtained and reviewed. The topic list is contained in appendix B in section 9.2.

2.3.2.3 Patent Literature

The WVULS was utilized to search for patent information on excavation, but only a few patents were found. Of these, only one patent was determined to be an excavation method of hazardous waste. This patent relates to pneumatic excavation. The search results are in section 9.3 - appendix C.

2.3.2.4 Atmosphere Monitoring for Fugitive Dust and Waste Gases

Literature was gathered and reviewed concerning the monitoring of atmospheric emissions of hazardous waste gases (such as VOCs) and fugitive dusts. Open literature, as well as government project documents, government regulations, state regulations, and patents were investigated. The search results are contained within the open literature, patent, and government projects appendices.

2.3.3 Excavation Technologies

Through the use of published materials relating to excavation of hazardous and toxic materials from a site, it was determined how well various excavation technologies handle the removal of hazardous and toxic materials. More specific was the technology's ability to safely excavate soils containing dioxins and volatile materials. Thus, each technology's advantages and shortcomings could be compared when related to the Winfield site.

Eight basic technologies for excavation of materials have been identified (Carson 1961). Following, is a summary of each of these basic types of excavation and the key pieces of excavation equipment used.

2.3.3.1 Bulk-Pit Excavation

Bulk-pit excavation is primarily an excavation of considerable depth and of considerable material. It is used when site limitations such as buildings or streets cause excavating in a vertical manner and when the pit that is to be created will result in a large quantity of earth removal. The most efficient piece of equipment for bulk-pit excavation is the power shovel.

2.3.3.2 Bulk Wide-Area Excavation

Creating a pit that is much shallower than it is wide, bulk wide-area excavation is mainly a leveling process. It may be used for highway construction, airfield grading, removal of overlying earth layers (i.e., strip mining or quarrying), or moving high ground to lower areas. Also, bulk wide-area excavation may be of a large total bulk volume and of a considerable depth. The scraper plays a major role during bulk wide-area excavation.

2.3.3.3 Loose Bulk Excavation

Loose bulk excavation involves excavation of loose unconsolidated soils. These processes might include excavation of channels, canals, trenches, underwater soils, and overburden. Since no equipment may operate from the loose uncontrolled earth, it follows that excavation would be conducted from adjacent solid ground. The most effective piece of excavating equipment is the dragline. However, a long-boomed backhoe may also be used for this type of excavation.

2.3.3.4 Limited-Area, Vertical Excavation

During limited-area, vertical excavation, the spoil must be lifted vertically out of the pit. This is due to the material being of a loose, wet, or unconsolidated nature which results in the pit walls needing shoring or sheathing. The equipment best suited for this type of excavation is the clamshell. Also, hand excavation using picks and shovels as well as rotary drilling can be classified as limited-area, vertical excavation.

2.3.3.5 Trench Excavation

The main concern in trench excavation is linear footage dug via a series of interconnected vertically dug holes. This is rather contrary to conventional excavation, where the main concern is cubic yardage dug. After placing a conduit into the trench, the trench is then backfilled. Backhoes and trenchers are the key pieces of equipment used in digging trenches. Trenches may be excavated for exploratory purposes.

2.3.3.6 Tunnel Excavation

Tunnel excavation, as discussed here, is an underground process where the width and depth the tunnel may reach as excavation continues is limited. Tunnel Boring Machines or the various microtunneling devices may allow for the needed diameter of the tunnel. Tunnel excavation is usually associated with utility operations such as sewers, water lines, telephone cables, etc.

2.3.3.7 Dredging

Considered a variant of loose bulk excavation, dredging is concerned with the excavation and transportation of underwater soils. To accomplish the excavation and transportation of these soils, an excavating rig is mounted upon a barge. Then, the barge moves to the spot of excavation where the excavating equipment is used to dig the soils out of the water and to deposit them onto the barge. The barge is then used as the transport medium to final deposition site.

2.3.3.8 Longwall Mining

Usually applied in consolidated mineral environments, longwall mining is the preferred technique for underground coal mining throughout the world. A longwall mining system utilizes a roof support which will allow the material to be removed via some mechanical device, such as a plow or shearer. Longwall mining could also be used to remove unconsolidated soils for placement of a solid barrier material to contain contaminated materials. It would generally be considered for excavation at depths of several hundred feet below the surface.

2.3.4 Unknowns/Uncertainties

As with any study, there remains some questions relating to the Winfield site remedial operations which need to be answered. They are:

- Will excavation of the contaminated materials release contaminants from the perched water zone?

- Because testing was limited, is the dioxin contamination localized or spread out over a significant area?

- Does the soil's VOC content require prior removal and/or treatment on the excavation site?

- Does the project schedule impact the storage and/or remediation technology selected for the site?

2.3.5 Assumptions

In order to review and rank each excavation technology, some basic assumptions must be made and held constant during the ranking process. It was assumed that VOCs, leachate, and dust emissions would be controlled during soil removal operations. Also, it was assumed that worker health and safety would be maintained. Further, there was a need to conduct excavation operations at a reasonably fast pace. These assumptions enabled the selection of the basic excavation technology required for the Winfield site.

3.0 EXCAVATION TECHNOLOGY-REVIEW

Each basic excavation technology summary has been further summarized below. The technologies are those that are applicable to the Winfield Site.

3.1 Loose Bulk Excavation

Loose bulk excavation involves excavation of loose unconsolidated soils. These processes might include excavation of channels, canals, trenches, underwater soils, and overburden.

Because this process involves the removal of wet clays and silts in unconsolidated formations, it is obvious that neither a power shovel nor or a scraper would be of use because these pieces of equipment operate over the surface in question. In this situation, the most effective pieces of excavating equipment are the dragline and the long boomed backhoe. Since no equipment may operate from the loose uncontrolled earth, it follows that excavation would be conducted from adjacent solid ground.

The optimum placement for dragline equipment is such that the drag bucket may be dragged straight up any slope. The drag bucket has but its own weight to prevent deflections from the true course, and if excavation is done diagonally up or down a slope, the bucket will have a tendency, because of its weight, to slide sideways down the slope.

However superior the dragline is in excavating loose soils, it has limitations in its disposal operations. The loading of hauling trucks is the major disadvantage because of the difficulty in controlling the loosely suspended bucket. Considerable amounts of soil may spill when lading the hauling trucks from the drag bucket.

The long-boomed backhoe has been used for loose bulk excavations when the use of a dragline is not practical. These long-reach excavators provide more control over loading the haul trucks than the dragline and a longer reach to enable large quantities of excavation to be accomplished before the equipment needs to be moved.

The backhoe may be placed in a manner that would allow large quantities of toxic material to be excavated before the backhoe needs to be moved. Thus, the backhoe would need to be decontaminated fewer times which would be time and cost conserving.

3.2 Bulk-Pit Excavation

Bulk-pit excavation is an excavation of considerable depth and of considerable material. Primarily, bulk-pit excavation is used when site limitations such as buildings or streets cause excavating in a vertical manner and when the pit that is to be created will result in a large quantity of earth removal. The equipment is operated against the earth bank's face (called the digging face) leaving vertical or nearly vertical faces. The excavant is then loaded into and hauled away by dump trucks.

During bulk-pit excavation, the rate of spoil production is the only function of cost. That is, as the pit yardage increases, the cost of moving equipment onto and off the site will decrease. Therefore, the piece of equipment chosen for the excavation is critical.

If the soil can sustain standing banks and the quantity of earth to be moved is large, the power shovel is the most efficient piece of equipment that can be used. The power shovel will excavate materials such as cemented gravels and other hard compacted materials that other equipment will not move. Also, the loading of the dump trucks can be carried out faster and more accurately than by using any other piece of excavating equipment.

However, if the soil is noncohesive and will not sustain banks, the power shovel will not be satisfactory for excavation. This is due to the fact the shovel must operate from the bottom of these banks and will be besieged by the sliding material. Materials with good drainage characteristics, such as wet soils which lie below the ground-water table, may be sufficiently dried up to meet banking requirements, but, wet, fine grained soils may not.

The two basic cuts the power shovel will make are the parallel approach and the frontal approach. The parallel approach allows for cutting across and parallel to the digging face. It is considerably helpful in creating highway cuts where continuous straight line loading is required. The frontal approach excavates in a series of overlapping circles and allows for the full width of the digging face to be utilized.

The frontal approach has several advantages over the parallel approach. (1) Two or more power shovels may be operated simultaneously with no confusion over the dump trucks, (2) two positions for haul units exist so that one may be entering its position while another is being loaded, (3) the average angle of swing is shorter, and (4) the shovel stands farther back from the bank reducing the risk of engulfment during sliding.

3.3 Bulk Wide-Area Excavation

Bulk wide-area excavation may be defined as an excavation method that creates a pit that is much shallower than it is wide. This is because the method is a leveling process. It may be used for highway construction, airfield grading, removal of overlying earth layers (i.e., strip mining or quarrying), or moving high ground to lower areas. Also, bulk wide-area excavation may also be of a large total bulk volume and of a considerable depth.

Bulk wide-area excavation differs from bulk-pit excavation in two ways. First, bulk wide-area excavation allows for access to the site from several sides whereas bulk-pit excavation allows for limited access to the site. Second, bulk wide-area excavation is more concerned with the excavant and does not allow for depth as the most important factor as does bulk-pit excavation. So bulk wide-area excavation is usually shallower in depth than bulk-pit excavation but larger in area.

Generally, bulk wide-area excavation handles far fewer classes of earth than other types of excavation. Here, materials that may be suitably compacted are of primary interest. This is because bulk wide-area excavation is concerned with the fill material that it is excavating.

The excavating equipment used for this operation is a scraper. Its designed function is to load a thin strip of earth and to unload it in the same manner. The scraper may be either tractor-drawn or self-propelled. When used to excavate loose, dry sands and rock or wet, sticky clays, the scraper may also exhibit difficulties in loading or unloading, respectively. Another major limitation of the scraper deals with its traction. Traction problems may be overcome by using a crawler tractor to push the self-propelled scraper during material loading. Scraper loading may be accomplished, in the direction of the loading, using three methods.

Back-track loading can be used if the loading area is short and wide. After each push through the loading zone, the tractor makes a wide, time consuming, 180 degree turn.

Chain loading is to be used if the loading area is long and narrow and may be worked from end to end. Multiple scrapers may be loaded before the tractor needs to return to the starting point. The tractor turns which are involved here are small 90 degree turns.

Shuttle loading can be used if the loading area is limited or short and wide. Because turning scrapers in the loading area takes up space, access is required from the loading area from two directions. In all loading scenarios, the material is transported by the scraper to the unloading area.

3.4 Trench Excavation

Unlike conventional excavation, where the main concern is cubic yardage dug, trench excavation is concerned with linear footage dug via a series of interconnected vertically dug holes. Backhoes and trenchers are the key pieces of equipment used in digging trenches. Also, the key difference between trenches and ditches lies in the fact that ditches are slots cut in the earth and trenches are temporary scars in the earth into which a conduit is placed and then buried.

A key method in determining which piece of equipment to use is to limit the width of the trench in relation to the conduit diameter. Most trenches are dug with sloped back banks to control sliding and caving. Then, the trench width only has to be limited immediately above the conduit. Other considerations to be made in choosing trenching equipment and attachments include, the type of conduit to be used, the depth of the trench, the soil conditions, and the surface conditions.

3.5 Limited-Area, Vertical Excavation

During limited-area, vertical excavation, the excavant must be vertically lifted out of the pit. This is due to the material being of a loose, wet, or unconsolidated nature which results in the pit walls needing shoring or sheathing.

The equipment best suited for this type of excavation is the clamshell. Requiring close supervision, the clamshell may be used during any of the previously mentioned excavation operations as a secondary unit. That is, the clamshell could be used to remove the ramp used in bulk-pit excavation, or to clean up the rock and other debris generated during bulk wide-area excavation. As a primary piece of equipment, the clamshell could operate in restricted areas such as city streets with underlying utilities present. It is also used for excavating foundations, trenches, footings, and cellars.

With both halves of the clamshell bucket in the open position, the clamshell is operated by dropping it from the boom of a crane onto the material to be excavated. The bucket is then closed and the material is enclosed within the bucket. The clamshell may then deposit the material into the hauling truck.

The clamshell may operate (digging or dumping) at above or below its working area. However, its working range is limited to a small circle directly under the boom-point sheave pin. Also, the clamshell operates at a higher boom angle than that of the dragline to maximize the holding line's lifting power.

Since limited area excavating relates to confined areas where very little mechanical operating equipment may be used, it is necessary to include hand labor as a form of useful operating equipment. These procedures would include the use of shovels, and picks. The use of rotary drilling also falls within limited area excavating.

4.0 FUNCTIONAL ANALYSIS

Functional analysis criteria were created to aid in selecting an excavation remediation technology. Several concerns were addressed during the creation of the functional analysis criteria. Among the key criteria were performance, reliability, environmental safety, and legal and regulatory compliance. The review of the technologies was conducted by grading and ranking the removal processes. Also, the pertinent regulatory requirements were discerned as well as the issues and concerns, interfaces, requirements, and unknowns/uncertainties.

Several operational requirements must be met while removal operations are being conducted upon the contaminated soils. The site workers health and safety must be protected as well as the plant and animal life. The nearby population must also be protected from all detrimental health hazards that may occur during excavation operations at the Winfield site. Finally, all federal, state, and local regulations must be complied with.

Based upon government regulations, the site remediation plan will consist of an excavation technology, a means for monitoring the site, a means of storing the material, and a site closure plan. Each of these technologies will somewhat overlap the other. During excavation and transportation operations, due care must be observed so as not to allow contamination of the air with VOCs, contamination of the groundwater or river with dioxin, or the compromising of the workforce's or the public's health and safety.

4.1 Evaluation Criteria for Excavation Technology

The following is a breakdown of the functional analysis selection criteria for excavation remediation technologies.

4.1.1 Performance

The performance of the excavating technology will play a major role in determining which technology to utilize. For the Winfield site, the excavation will be concerned with removing contaminated soils. As, these soils are removed VOC emissions will need to be controlled as will fugitive dust emissions. Also, liquid contaminants may be present within the spoil. Therefore, liquid contaminant loss during excavation and transportation will need to be controlled.

4.1.2 Reliability

The reliability will be based on past demonstrated performances of the technology. Operational and maintenance requirements, operational complexity, and monitoring requirements will also need to be considered. The excavation technology will need to have a certain degree of flexibility to enable it to accommodate variations between the design criteria and the field operations.

4.1.3 Implementability

Here, the ease of execution must be considered as an important factor. A difficult technology to impiement may cause difficulty in maintaining the project throughout. The time required after execution for the technology to meet the excavation objectives is important. The ability to deliver the excavant to a storage media was considered.

4.1.4 Environmental Safety

The potential risk to the environment in the event of system failure was considered. Also, the potential risk to the plants, animals, groundwater, surfaced waters, etc., during initial system construction and operation was weighed.

4.1.5 Public Health Considerations

Public health considerations such as noise, air, pollution, odor, use of natural resources, aesthetics, and interferences with public services of local businesses were considered important. The environmental risks may include acute or chronic toxic effects on plant or animal life, alteration of wildlife habitat, and threats to endangered species.

4.1.6 Legal and Regulatory Compliance

Several groups of regulations and codes must be adhered to prior to, during, and after excavation. These include air standards, water standards, noise standards, land use and zoning codes, and any federal, state, or local laws which may be pertinent. Therefore, the excavation plan, remediation plan, and closure plan should be adhered to as closely as possibly to alleviate any regulatory problems which might occur during operations.

Several federal regulatory guidelines which relate to the Winfield site have been discerned as follows:

- Resource Conservation Recovery Act (RECRA)
- Air Quality Standards (AQS)
- National Pollutant Discharge Elimination System (NPDES)
- Clean Water Act (CWA, Section 404)
- Safe Water Drinking Act (SWDA)
- Fish and Wildlife Conservation Act (FWCA)
- Nation Environmental Protection Act (NEPA)
- Executive Order #11988

The following are West Virginia regulatory requirements which relate to the Winfield site:

- Air Pollution Control Act
- Clean Water Act
- Toxic and Hazardous Materials Control Act

4.1.7 Cost

Cost must be considered to meet the budgetary constraints of the project. That is, there is no reason to select equipment which is much more expensive to operate for a job when there is existing equipment which performs the same function for a lesser cost. Installation, operation, and maintenance are included within the cost framework.

4.1.8 Interferences

Several interferences exist at the Winfield site such as buried containers and railroad tracks. These interferences might cause problems during excavation. Thus, it is important to look at the effects of surface structures, buried containers, and buried utility lines.

4.2 Analysis

It is important to note that this analysis was carried out for the Winfield site and is, therefore, site specific. With this in mind, three excavation technologies were eliminated from the analysis because they are impractical for use at the Winfield site. These technologies are tunneling, dredging, and longwall mining.

It is also important to note that each excavation remediation technique was ranked on the basis of total site use. That is, it was assumed that the technology would be the only one used at the Winfield site although it may be necessary to utilize other technologies in some isolated cases where the contamination may be considerably higher.

Each of the functional criteria were ranked on a high, medium, or low basis. A high ranking meant the functional criteria was highly important with regards to the choice of the excavation technology. A low score meant the functional criteria was less important with regards to the excavation technology.

Then, each of the remaining five excavation technologies were ranked against each of the eight functional analysis criteria and given a score of high, medium, or low. A high score implied total compliance with the criteria and, conversely, a low score implied little or no compliance with the functional criteria.

Finally, values were given to the high (9 points), medium (3 points), and low (1 point) technology review. These values were then multiplied by the functional analysis criteria. The scores were then summed for each technology to yield a ranking with respect to the functional analysis criteria.

4.2.1 Performance (Value = 9)

Each technology was rated on its expected performance at the Winfield site. Since bulk-pit, bulk wide-area, and loose bulk excavation could move large quantities of earth quickly, they received scores of nine. On the other hand, both trenching and limited-area, vertical excavation could not move large quantities of earth quickly and were given scores of three.

4.2.2 Reliability (Value = 9)

Bulk-pit excavation was given a score of nine because it met all requirements and the power shovel's history of reliability was exceptional. However, the 7other four pieces of excavating equipment, the scraper, clamshell, long-boomed backhoe, and trencher/backhoe, were determined to be not as reliable. These ability deficiencies included the past demonstrated reliability of each technology. Also, the scraper requires some maintenance and the clamshells needs constant monitoring. It was determined that limited-area, vertical excavation and trenching would be the least reliable excavation technologies.

4.2.3 Implementability (Value = 3)

One key point which was considered was ease and speed of execution. Bulk-pit, bulk wide-area, and loose bulk excavations were determined to possess the ability to complete the removal operations quickly. Limited-area, vertical excavation and trenching would take longer.

Scrapers would experience difficulty in moving the excavant from the scraper to a storage media (i.e., dumptruck or temporary storage shelter). Also, clamshells are very sloppy loaders. Thus, bulk-pit received a score of nine and loose bulk, received a score of three. Bulk wide-area, trenching, and limited-area, vertical excavation received scores of one due to their slow execution and sloppy unloading of materials.

4.2.4 Environmental Health Considerations (Value = 9)

The functional analysis criteria for environmental safety and public health considerations were found to grade out identically. Thus, they will be spoken of jointly.

Potential health risks to the public, plants, animal, and worker safety were shown to exist if the excavant was loaded messily or if they were transported sloppily. For example, clamshells have difficulty in unloading while scrapers are not designed to retain any liquid materials that may leach out during travel to a storage facility.

Because of its ability to control loading of materials and leachate, loose bulk excavation received a score of nine. For their limited abilities to control loading and leachate problems, bulk-pit, trenching, and limited-area, vertical excavation received scores of three. Since the scraper has significant troubles with leachate and unloading, bulk wide-area excavation was given a score of one

4.2.5 Legal and Regulatory Compliance (Value = 3)

For legal and regulatory compliance to be attained, the excavation technology should leave the excavated site in such a manner that no hazardous waste is present. Thus, how well the excavating equipment loads the hazardous spoil and any leachate will become a primary issue.

Because of the loading and unloading characteristics of the scraper and clamshell, bulk wide-area and limited-area, vertical excavation were given scores of three. This is due to the fact contaminants could be spread in this manner. All other technologies were thought to comply and were given scores of three.

4.2.6 Cost (Value = 1)

On the basis of earth moving capacity, no other piece of equipment is as cost effective as the power shovel. For this reason, bulk-pit excavation was given a score of nine. Scrapers (bulk wide-area) and long-boomed backhoes (loose bulk) were thought to be nearly as fast and given scores of three. Trenching and limited-area, vertical excavation were considered poor options for cost effectiveness and given scores of one.

4.2.7 Interferences (Value = 3)

Interferences such as surface structures and buried objects can pose problems during excavation. Since scrapers and clamshells have difficulty in controlling the precise point of excavation, buried interferences can be ruptured or broken releasing any contents. For these reasons, bulk wide-area and limited-area, vertical excavation were given scores of one. Trenching was determined to be outperformed by both bulk-pit excavation methods and loose bulk excavation because of ability of the equipment to tolerate interferences such as the buried containers on the site.

4.2.8 Results

When all the scores were converted to numbers, multiplied, and summed, loose bulk excavation received the highest score (336 points). In a close second, bulk-pit excavation received 306 points. Bulk wide-area, trenching, and limited-area, vertical excavation followed with 144, 130, and 106 points, respectively. The results are shown in figure 4.1.

5.0 SCREENING CRITERIA

The problems at the Winfield site are not one of a kind. There are many other hazardous waste sites that have nearly identical site characteristics when compared to the Winfield site. That is, the other sites may have soils contaminated with VOCs, dioxins, or PCBs. These characteristics include:

- The site is adjacent to a major river.
- The site is overlying a primary water aquifer.
- The site is contaminated with volatile organic compounds such as benzene, chlorobenzene, chloroform, dichloroethene, dichloroethane, ethylbenzene, toluene, tetrachloroethane, tetrachloroethene, trichloroethene, and methylene chloride.
- There is a potential for fugitive dust emissions during excavation.
- The site is contaminated with dioxins such as TCDD.
- The site is contaminated with PCBs.
- The site is contaminated with metals such as silver, mercury, lead, cadmium, manganese, barium, arsenic, selenium, iron, and chromium.

FIGURE 4.1

5.1 Health and Safety Concerns

The Winfield site contains several problem areas. Since the site is lying adjacent to the Kanawha River, the potential exists for the spread of contaminants into the river. Also, the primary water aquifer for the area lies sixty feet below the surface of the site. The primary health and safety concern is to protect the water supply during excavation/remediation operations. Other health and safety concerns include the potential for VOC liberation during excavation, dioxin liberation during excavation, and fugitive dust emissions during excavation. Workers will likely have to wear protective clothing during excavation operations.

5.2 Contaminant Issues

There are four primary families of contaminants located at the Winfield site. They are VOCs, PCBs, metals, and dioxins. These contaminants must be excavated taking care to avoid exposing workers, plant and animal life, and the residential public to the contaminants by either airborne emissions or by accidentally spreading the contaminants over the ground.

Because contaminants are mobilized by water, care will have to be taken to control all liquids encountered during excavation operations. Water should be collected and stored on a temporary basis until analysis results are obtained. Then, disposal can be planned.

6.0 IDENTIFICATION OF PROBLEMS FOR FUTURE R&D

Future research and development in the field of hazardous waste excavation technologies will center on one of three items. These are new excavation equipment, fugitive dust suppression, and liberated gas suppression.

In the field of new excavation equipment, breakthroughs have been made. There exists the potential to operate basic excavation equipment by means of remote control. This would allow hazardous waste excavation to occur up to 2000 feet away from equipment operation thereby taking site workers away from potential exposure sites.

A pneumatic excavation system also exists whereby excavant is entrained in a gas and moved through an enclosed system to a temporary storage medium. This method reduces VOC and fugitive dust emissions from the site. The pneumatic excavation system can be coupled with a pneumatic transport system to a processing/temporary storage area where health and safety issues are more manageable.

Temporary shelters have been designed and used during excavation. Excavation is conducted within the temporary shelter and the shelter may be equipped with an air purification system to treat the air before it is discharged into the atmosphere.

Various patents exist for fugitive dust suppression within the coal industry, some of which may be applicable to hazardous waste excavation.

6.1 Generic Problems

The following will attempt to summarize the aforementioned technologies which BDM believes should be the focus of future research and development in the field of environmental remediation technology. If available, the first test site is included.

6.1.1 Pneumatic Excavation System

U.S. Patent 5,120,165 describes a pneumatic excavator, where fragmented excavated material is entrained in a gas and is pneumatically conveyed to a remote site (which may be a truck and trailer) for separation of material from the gas. The enclosed flow path will consist of a series of separation points which may include a separator with HEPA filtering apparatus for capturing toxic dust and toxic gases during toxic cleanup. Therefore the excavant is trapped within the system preventing the discharge of dust into the air, the spread of excavated fragments, and the runoff of toxic liquid.

6.1.2 Teleoperated Equipment

Two separate pieces of remote controlled excavation equipment were found in the literature. The first was developed jointly by DOE and the US Army for the purposes of excavating wastes using remotely operated equipment and remote retrieval of unexploded ordnance, the Small Emplacement Excavator (SEE) is an existing US Army backhoe converted to teleoperated control (Noakes, Richardson, Burks, and Sandness 1992). The SEE will (1) increase safety by removing on-site personnel from hazardous areas, (2) remotely acquire real-time data from multiple sensors, (3) increase cost-effectiveness and productivity by partial automation of the data collection process and by gathering and evaluating data from multiple sensors in real time, and (4) reduce costs for other waste-related development programs through joint development efforts and reusable standardized subsystems.

The second piece of equipment was created by Spar Aerospace Limited (SPAR 1992). It is a Hitachi model EX200LC backhoe which has been converted for remote controlled operation. This allows the excavation of hazardous or radioactive wastes, using a joystick with four degrees of freedom, from as far away as 2000 feet via a telemetry cable or radio frequency link. Movement in the three spatial directions as well as bucket rotation may be controlled remotely. Within the cab of the excavator, the operating levers have been replaced with the same joystick. Besides a conventional bucket, the excavator may use various other attachments that can also be operated remotely. These include shears, grapples, and jackhammers.

These technologies are currently available but should be considered for sites with extremely hazardous chemicals.

6.1.3 Excavation Within a Temporary Shelter

A trial excavation of 137 cubic yards was conducted by a track hoe at the McColl site in Fullerton, CA in October of 1992 (EPA 1992). The trial excavation was conducted within a temporary enclosure from which air was exhausted through a wet scrubber and an activated carbon-bed absorber to reduce toxic emissions (sulfur dioxide and VOCs) from the excavation operation. Also, vapor suppressing foam was used to attempt to reduce emissions from the raw waste being excavated. The operation appears to have been successful and could possibly be utilized at Winfield.

6.1.4 Fugitive Dust Suppression

Since the potential for creating airborne dusts is high during earth moving operations, fugitive dusts are an important factor which must be considered during excavation operations. There are many ways to suppress dust during excavation.

Water has probably been used most frequently. However, there are several new methods becoming available for fugitive dust suppression.

Several patents have been located describing dust suppression through the use of water based Newtonian non-viscous fluids, aqueous foamed solutions, and mixtures of polyacrylic acids. Therefore, the ability to choose the best dust suppression system for each site is available. It does require matching the contaminant chemistry with soil chemistry and dust suppressant chemistry.

6.2 Winfield Site

New technologies that are applicable for the Winfield site include nearly all the aforementioned excavation techniques. Excavation under a temporary shelter with an air treatment system to enable the VOCs to be treated as they are liberated figures to be a technology of use. Also, fugitive dust suppression techniques and robotic equipment figure to be applicable to the site.

7.0 SUMMARY AND ANALYSIS

By generating a functional analysis criteria, BDM was able to target eight basic excavation techniques and review each technology for its applicability to the Winfield site. It was determined that loose bulk excavation using a long-boomed backhoe was only a slightly better option than bulk-pit excavation with a power shovel. The other six technologies lagged far behind in their applicability to the site. In fact, dredging, tunneling, and longwall mining were not even graded during the functional analysis review because they were not considered applicable to the Winfield site.

Several new target areas have been identified for future research and development in environmental remedial excavation. These are fugitive dust suppression, liberated gas cleansing, and new and improved pieces of excavation equipment.

8.0 REFERENCES

1. U.S. Army Corps of Engineer's Report. May 5, 1992. *Engineering Evaluation/Cost Analysis For Removal and Treatment of Contaminated Soil at the Former ACF Industry Site, Red House, WV.* Nashville, TN.

2. Carson, A. Brinton. 1961. *General Excavation Methods.* McGraw-Hill.

3. Noakes, M. W., Richardson, B. S., Burks, B. L., Sandness, G. R., *Development of Robotics Technology for Remote Characterization and Remediation of Buried Waste.* presented at the Institute of Nuclear Materials Management Annual Meeting, July 19-22, 1992, Orlando, FL.

4. Spar Aerospace Limited Data Sheet. August 1993. *Remote Excavator.* Avon, CN.

5. U.S. Environmental Protection Agency's Applications Analysis Report. October 1992. *Demonstration of a Trial Excavation at the McColl Superfund Site.* Washington, D.C.: GPO.

9.0 APPENDICES

9.1 Appendix A - Open Literature Search

The following is a list of all open literature (technical journals, magazines, and books) compiled from the WVULS. Relevant books which were found are listed by the WVULS call number and its title. The book titles that were reviewed contain an asterisk after the call number.

The results of the periodical search are grouped by the key word search topics which are in alphabetical order, bolded, and centered.

9.1.1 Book Titles

Call No.	Title
TA730.C3*	General Excavation Methods
TD878.D72	The Soil Chemistry of Hazardous Chemicals
TD883.H65	Countermeasures to Airborne Hazardous Chemicals
TD196.C4568	How to Respond to Hazardous Chemical Spills
HE131.T73	Transportation of Hazardous Materials
TD1066.P64G85	Guidance on Remedial Actions for Superfund Sites With PCB Contamination
TD1032.S73	Standard Handbook of Hazardous Waste Treatment and Disposal
TD1040.D67*	Materials-Handling Technologies Used at Hazardous Waste Sites
TD1045.E85I57*	International Technologies for Hazardous Waste Site Cleanup
TD196.C5D553	Dioxin-Containing Wastes: Treatment Technologies
TD1030.C66*	Control of Fugitive and Hazardous Dusts
TD1050.T43F67*	1989 Forum on Innovative Hazardous Waste Treatment Technologies Domestic and International
TD1050.T43F67*	1990 Forum on Innovative Hazardous Waste Treatment Technologies Domestic and International
TD1050.T43F67*	1991 Forum on Innovative Hazardous Waste Treatment Technologies Domestic and International
TD1040.B56	Bioremediation of Hazardous Wastes
TD811.5.M39	Treatment of Hazardous Waste Leachate: Unit Operations and Cost
TD811.5.I52	Incinerating Hazardous Wastes

TD1040.H69	How to Select Hazardous Waste Treatment Technologies for Soils and Sludges: Alternative, Innovative, and Emerging Technologies
TD795.7.R47	Requirements for Hazardous Waste Landfill Design, Construction, and Closure
TD811.5.E94*	Vadose Zone Monitoring for Hazardous Waste Sites
TD1040.H37*	Technical Resource Document: Design, Construction, and Operation of Hazardous and Non-Hazardous Waste Impoundments
TD793.T48*	Test Methods for Evaluating Solid Waste: Physical/Chemical Methods
TD1040.S73	Stabilization/Solidification of CERCLA and RCRA Wastes: Physical Tests, Chemical Testing Procedures, Technology Screening, and Field Activities
TD1062.O82*	Quality Assurance/Quality Control Procedures for Hazardous Waste Management
TD878.H35	Handbook: Remediation of Contaminated Sediments

9.1.2 Periodical Titles

The following is a complete listing of all periodical titles found under each key word phrase. First, the list of keyword phrases, the number of articles found and the page within this section the keyword phrase topic may be found is listed.

Topic (No. Articles) **Page**

CLEAN AIR REGULATIONS

1 AST

AUTHOR: Bryant, Christopher R.
TITLE: EPA issues hazardous organic NESHAP
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p49-51 March 1 '93

SUBJECTS COVERED:
Air pollution control equipment
Hazardous air pollutants/Laws and regulations
Clean Air Act

2 AST

AUTHOR: Bergeson, Lynn L.
TITLE: Labeling of ozone-depleting chemicals approaches
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p49-52 January 15 '93

SUBJECTS COVERED:
Environmental labeling/Laws and regulations
Chlorofluorocarbons/Laws and regulations
Clean Air Act

3 AST

AUTHOR: Chironna, R. J.
TITLE: Dry/wet scrubbers for clean air compliance
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p56-8 November 1 '92

SUBJECTS COVERED:
Scrubbers/Design
Hazardous air pollutants/Laws and regulations

4 AST

AUTHOR: Adams, Paul:Jr.
TITLE: Innovative handling of reclaimed refrigerants

SOURCE: Heating/Piping/Air Conditioning (ISSN 0017-940X) v64 p61-4 October '92

SUBJECTS COVERED:
Supermarkets/Heating, cooling, etc.
Chlorofluorocarbons/Laws and regulations
Clean Air Act

5 AST
AUTHOR: Smith, Jeffrey C.
TITLE: ICAC cites air rule job benefits
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1286 October '92

SUBJECTS COVERED:
Pollution control industry/Laws and regulations
Clean Air Act

6 AST
AUTHOR: Blickley, George J.
TITLE: Improved gas analyzers meet government regulations
SOURCE: Control Engineering (ISSN 0010-8049) v39 p49-51 July '92

SUBJECTS COVERED:
Flue gas/Analysis
Gas analysis/Apparatus
Clean Air Act

7 AST
TITLE: Industry awaits EPA guidelines on CFCs (July 1 prohibition now in effect)
SOURCE: ASHRAE Journal (ISSN 0001-2491) v34 p8-9 July '92

SUBJECTS COVERED:
Chlorofluorocarbons/Laws and regulations
Clean Air Act

8 AST
AUTHOR: Gerstle, Richard W.
TITLE: Finding a solution to your air pollution
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p44-8 June 1 '92

SUBJECTS COVERED:
Air sampling
Hazardous air pollutants/Laws and regulations
Clean Air Act

9 AST
AUTHOR: Cox, J. E.; Miro, Charles R.

TITLE: Refrigerant recovery program takes shape: EPA plans grandfather clause for equipment already purchased or in service
SOURCE: ASHRAE Journal (ISSN 0001-2491) v34 p14 May '92

SUBJECTS COVERED:
Refrigerants/Recycling
Chlorofluorocarbons/Laws and regulations
Clean Air Act

10 AST
AUTHOR: Viswanathan, Shekar; Dixon, David
TITLE: Staying ahead of new air pollution regulations SOURCE: I&CS (ISSN 0746-2395) v65 p65-6+ May '92

SUBJECTS COVERED:
Air pollution control equipment
Clean Air Act

11 AST
TITLE: 1992 guide to state volatile organic compound control regulations (fold-out chart)
SOURCE: Modern Paint and Coatings (ISSN 0098-7786) v82 p17-34 April '92

SUBJECTS COVERED:
Volatile organic compounds
Paint industry/Environmental aspects
Clean Air Act

12 AST
AUTHOR: Bryant, Christopher R.
TITLE: EPA releases draft hazardous organic NESHAP SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p25-6 March 15 '92

SUBJECTS COVERED:
Air pollution/Laws and regulations
Air pollution control equipment
Clean Air Act

13 AST
AUTHOR: Maibodi, Mehdi
TITLE: Implications of the Clean Air Act acid rain title on industrial boilers
SOURCE: Environmental Progress (ISSN 0278-4491) v10 p307-13 November '91

SUBJECTS COVERED:
Flue gas/Desulfurization
Acid rain/Laws and regulations
Clean Air Act

14 AST

TITLE: Clean air rules mean engine changes
SOURCE: Modern Materials Handling (ISSN 0026-8038) v46 p13+ November '91

SUBJECTS COVERED:
Lift trucks
Air pollution/Laws and regulations
Truck engines/Exhaust

15 AST

TITLE: Kentucky's Wilkinson pushes for acid rain moratorium
SOURCE: Coal (ISSN 1040-7820) v96 p22-3 October '91

SUBJECTS COVERED:
Coal industry/Kentucky
Acid rain/Laws and regulations
Clean Air Act

16 AST

AUTHOR: Blickley, George J.
TITLE: Valves and actuators changing to meet standards and regulations
SOURCE: Control Engineering (ISSN 0010-8049) v38 p111-13+ October '91

SUBJECTS COVERED:
Valves/Standards
Valve actuators/Standards
Clean Air Act

17 AST

AUTHOR: Novello, David P.
TITLE: The new Clean Air Act operating permit program: EPA's proposed regulations
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1038-44 August '91 Discussion. 41:1430 N '91

SUBJECTS COVERED:
Pollution permits
State governments/Federal relations
Clean Air Act

18 AST

AUTHOR: Colyer, Richard S.; Meyer, Jan
TITLE: Understanding the regulations governing equipment leaks
SOURCE: Chemical Engineering Progress (ISSN 0360-7275) v87 p22-30 August '91

SUBJECTS COVERED:
Leakage
Chemical plants/Equipment

Clean Air Act

19 AST
TITLE: Clean air regulations hit midwestern states
SOURCE: Coal (ISSN 1040-7820) v96 p9 July '91

SUBJECTS COVERED:
Coal industry/Middle Western States
Clean Air Act

20 AST
AUTHOR: Andersen, Stephen O.
TITLE: Global impact of the CFC phaseout
SOURCE: Journal of the IES (ISSN 1052-2883) v34 p17-22 May/June '91

SUBJECTS COVERED:
Chlorofluorocarbons/Laws and regulations
Ozone layer depletion
Clean Air Act

21 AST
AUTHOR: Hawthorn, Gary
TITLE: Transportation provisions in the Clean Air Act Amendments of 1990
SOURCE: ITE Journal (ISSN 0162-8178) v61 p17-24 April '91

SUBJECTS COVERED:
Transportation/Laws and regulations
Clean Air Act

22 AST
TITLE: Clean Air Act of 1990: effect on the coatings industry
SOURCE: Modern Paint and Coatings (ISSN 0098-7786) v81 p64-6+ April '91

SUBJECTS COVERED:
Paint industry/Laws and regulations
Clean Air Act

23 AST
AUTHOR: Gilkey, Herbert T.
TITLE: The coming refrigerant shortage
SOURCE: Heating/Piping/Air Conditioning (ISSN 0017-940X) v63 p41-6 April '91CONTAINS: illustration(s)

SUBJECTS COVERED:
Chlorofluorocarbons/Laws and regulations
Chlorofluorocarbon substitutes

Clean Air Act

24 AST
TITLE: EPA is rushing to enact new air regulations
SOURCE: ENR (ISSN 0891-9526) v226 p11-12 February 4 '91

SUBJECTS COVERED:
Clean Air Act

25 AST

AUTHOR: Chow, Winston; Miller, Michael J.; Fortune, James
TITLE: Managing air toxics under the new Clean Air Act Amendment
SOURCE: Power Engineering (ISSN 0032-5961) v95 p30-4 January '91

SUBJECTS COVERED:
Power plants/Environmental aspects
Hazardous air pollutants/Laws and regulations

26 AST
AUTHOR: Leone, Marie
TITLE: Cleaning the air the market-based way
SOURCE: Power (New York, N.Y.) (ISSN 0032-5929) v134 p9-10 December '90

SUBJECTS COVERED:
Acid rain/Laws and regulations
Power plants/Environmental aspects

27 AST
AUTHOR: Henry, Paul B.
TITLE: Duplicate regulations create new problems, not solutions
SOURCE: American Mining Congress Journal (ISSN 0277-8688) v76 p23 August '90

SUBJECTS COVERED:
Indoor air pollution/Laws and regulations
Clean Air Act

28 AST
AUTHOR: Doyle, J. AndrewTITLE: Clean air: opportunity still knocking
SOURCE: Industrial Finishing (ISSN 0019-8323) v66 p64 July '90

SUBJECTS COVERED:
Volatile organic compounds
Paint industry/Laws and regulations
Clean Air Act

29 AST
AUTHOR: Arkush, DanTITLE: Clean Air Act questions abound

SOURCE: Wood & Wood Products (ISSN 0043-7662) v95 p10+ May '90

SUBJECTS COVERED:
Furniture industry/Laws and regulations
Clean Air Act

30 AST
AUTHOR: Smith, Douglas J.
TITLE: IPPs seek exemption from Clean Air Act
SOURCE: Power Engineering (ISSN 0032-5961) v94 p14 May '90

SUBJECTS COVERED:
Independent power industry/Laws and regulations
Clean Air Act

31 AST
AUTHOR: Vaughan, Chris
TITLE: Congress moves to clean up America's air
SOURCE: New Scientist (ISSN 0262-4079) v126 p21 April 14 '90

SUBJECTS COVERED:
Air pollution/Laws and regulations

32 AST
AUTHOR: Zacharias, Ken; Eastman, Robin
TITLE: Clean air regulations dominate issues facing the paint industry
SOURCE: Modern Paint and Coatings (ISSN 0098-7786) v80 p30+ April '90

SUBJECTS COVERED:
Paint industry/Laws and regulations
Clean Air Act

33 AST
AUTHOR: Parkinson, Gerald
TITLE: Petroleum refiners clean up their act
SOURCE: Chemical Engineering (ISSN 0009-2460) v97 p30-1+ January '90

SUBJECTS COVERED:
Automotive fuel/Testing
Fuel research
Air pollution/Laws and regulations

34 AST
AUTHOR: McInnes, Robert G.
TITLE: Changes in clean air regulations will affect industry in the 1990s
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p20-1 December '89

SUBJECTS COVERED:
Air pollution control equipment/Costs
Clean Air Act

35 AST

AUTHOR: Ward, Ann F.
TITLE: Clean air rewrite gains momentum
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v61 p542+ May '89

SUBJECTS COVERED:
Acid rain
Hazardous substances/Laws and regulations
Clean Air Act

36 AST

AUTHOR: Ward, Ann F.
TITLE: Clean air, federal facilities top congressional agenda
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v61 p274+ March '89

SUBJECTS COVERED:
Industrial waste disposal/Cleanup
Hazardous waste management industry/Laws and regulations
Clean Air Act

37 AST

TITLE: 7th World Clean Air Congress, Sydney, Australia, Aug. 25-29, 1986
SOURCE: JAPCA (ISSN 0894-0630) v37 p24-6 January '87

SUBJECTS COVERED:
Air pollution/Laws and regulations

38 AST

Book Review
AUTHOR: Melnick, R. Shep:
1951-TITLE: Regulation and the courts: the case of the Clean Air Act
REVIEWED BY: Ward, Morris A.
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v62 p69-70 July 23 '84

EXCAVATING MACHINERY/ELECTRONIC EQUIPMENT

1 AST

TITLE: Earthmovers get dash displays, self-diagnostics
SOURCE: Automotive Engineering (ISSN 0098-2571) v93 p37-43 April '85

SUBJECTS COVERED:

Excavating machinery/Electronic equipment

EXCAVATING MACHINERY/HYDRAULIC EQUIPMENT

1 AST

AUTHOR: Popp, Dee
TITLE: Attachments for hydraulic excavators
SOURCE: Highway & Heavy Construction Products (ISSN 1062-5194) v135 p18-23 October '92

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Construction equipment industry/Directories

2 AST

TITLE: Hitachi introduces upgraded line of hydraulic excavators (Super EX 1100 and Super EX 1800)
SOURCE: Mining Engineering (ISSN 0026-5187) v44 p531-2 June '92

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment

3 AST

TITLE: Fluid power in action: mobile equipment
SOURCE: Hydraulics & Pneumatics (ISSN 0018-814X) v44 p31-4 August '91

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Electrohydraulic control

4 AST

TITLE: Shovels and excavators (with list of manufacturers and their products)
SOURCE: Engineering and Mining Journal (ISSN 0095-8948) v191 p30-1 October '90

SUBJECTS COVERED:
Shoveling machines
Excavating machinery/Hydraulic equipment

5 AST

AUTHOR: Klemens, Thomas L.
TITLE: Long-boomed backhoe digs $6M toxic cleanup
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p46-7 October '90

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Hazardous waste incineration

6 AST

TITLE: Hydraulic attachments reduce risk in hazardous materials cleanup
SOURCE: Public Works (ISSN 0033-3840) v121 p94 August '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Excavating machinery/Hydraulic equipment

7 AST

AUTHOR: Murray, Charles J.
TITLE: Forged part improves cylinder quality
SOURCE: Design News (ISSN 0011-9407) v46 p84-5 August 20 '90

SUBJECTS COVERED:
Forgings
Excavating machinery/Hydraulic equipment
Cylinders (Engines, etc.)/Manufacture

8 AST

AUTHOR: Tarricone, Paul
TITLE: Less bang for the buck (hydraulic hammers)
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v60 p64-6 March '90

SUBJECTS COVERED:
Hydraulic accumulators
Excavating machinery/Hydraulic equipment

9 AST

AUTHOR: Cosgrove, Tom
TITLE: Hydraulic excavators excelling
SOURCE: ENR (ISSN 0891-9526) v224 p42-58 February 1 '90

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment

10 AST

AUTHOR: Yeaple, Frank
TITLE: Hybrid hose lowers loader's cost
SOURCE: Design News (ISSN 0011-9407) v45 p32 November 6 '89

SUBJECTS COVERED:
Hose
Excavating machinery/Hydraulic equipment

11 AST

TITLE: Moving the earth
SOURCE: Machine Design (ISSN 0024-9114) v61 pF24-6+ October 26 '89

SUBJECTS COVERED:
Electrohydraulic control
Excavating machinery/Hydraulic equipment
Sawmills/Control equipment

12 AST
AUTHOR: Stewart, Larry
TITLE: Maintenance notebook (hydraulic systems)
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p77-9 July '89

SUBJECTS COVERED:
Hydraulic machinery/Maintenance and repair
Hydraulic fluids
Excavating machinery/Hydraulic equipment

13 AST
AUTHOR: Munn, Walter D.
TITLE: Big shovel/backhoe stars in early dam work
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p28-30 May '89

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Dams/Construction

14 AST
AUTHOR: Stricker, P.
TITLE: COV's 4000-psi hydraulics adapt to multiple functions (army Counter Obstacle Vehicle)
SOURCE: Hydraulics & Pneumatics (ISSN 0018-814X) v41 p37-9 July '88

SUBJECTS COVERED:
Motor vehicles, Military
Tracked vehicles
Excavating machinery/Hydraulic equipment

15 AST
TITLE: Infrared-controlled hydraulics
SOURCE: Design News (ISSN 0011-9407) v44 p50+ March 7 '88

SUBJECTS COVERED:
Remote control
Excavating machinery/Hydraulic equipment
Infrared detectors

16 AST
TITLE: Trenching methods solve rock, water problems

SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p30-1 December '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Sewer pipes, Plastic
Pipe laying

17 AST
AUTHOR: Hall, R. L.
TITLE: Unique concentric pumps power crawler excavator's hydraulics
SOURCE: Hydraulics & Pneumatics (ISSN 0018-814X) v40 p48-9 November '87

SUBJECTS COVERED:
Tracked vehicles
Excavating machinery/Hydraulic equipment

18 AST
AUTHOR: Brookhart, R. V.
TITLE: Backhoe loader's load-sensing system conserves energy, increases productivity
SOURCE: Hydraulics & Pneumatics (ISSN 0018-814X) v40 p45-6 November '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Loaders (Machines)

19 AST
AUTHOR: Rukavina, Mitchell
TITLE: Can seismic velocity determine performance of hydraulic excavators?
SOURCE: Rock Products (ISSN 0035-7464) v90 p18 November '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Seismic waves/Velocity

20 AST
AUTHOR: Mills, David
TITLE: Using hydraulic excavators as cranes
SOURCE: Civil Engineering (London, England) (ISSN 0305-6473) p20-1 September '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Building sites/Safety measures
Cranes, derricks, etc.

21 AST

TITLE: Excavators scoop scrapers as markets change
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p58-60 September '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Haulage
Dump trucks

22 AST

TITLE: Excavator hydraulics 'flow' with 'go'
SOURCE: Design News (ISSN 0011-9407) v43 p26+ June 8 '87

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment

23 AST

AUTHOR: Hogan, Brian J.
TITLE: Pump transfers fluid between articulated loader's circuits
SOURCE: Design News (ISSN 0011-9407) v42 p96-7 October 20 '86

SUBJECTS COVERED:
Loaders (Machines)
Excavating machinery/Hydraulic equipment

24 AST

AUTHOR: Bertinshaw, Ross G.
TITLE: Using hydraulic excavators to mine variably dipping coal seams
SOURCE: CIM Bulletin (ISSN 0317-0926) v78 p48-51 October '85

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Coal mines and mining/Stripping operations

25 AST

TITLE: Long-armed excavator carves deep clay trench under water
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v128 p68-9 October '85

SUBJECTS COVERED:
Trenching machinery/Control
Pipe laying, Subaqueous
Excavating machinery/Hydraulic equipment

26 AST

TITLE: Power summation improves versatility of hydraulic system
SOURCE: Hydraulics & Pneumatics (ISSN 0018-814X) v38 p64-6 September '85

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Hydraulic transmission

27 AST
TITLE: Hydrostatic drive improves dozer action
SOURCE: Coal Age (ISSN 0009-9910) v89 p87 November '84

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment

28 AST
AUTHOR: Stefanides, E. J.
TITLE: Hydraulic system improves tractor loader backhoes SOURCE:
Design News (ISSN 0011-9407) v40 p104-5+ October 8 '84

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Hydraulic control

29 AST
TITLE: Hydraulic excavators (tables)
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p35-9 June '84

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment

30 AST
TITLE: 15 ways to cut hydraulic excavator downtime
SOURCE: Pipe Line Industry (ISSN 0032-0145) v60 p25 February '84

SUBJECTS COVERED:
Excavating machinery/Hydraulic equipment
Excavating machinery/Maintenance and repair

EXCAVATING MACHINERY/MINIATURIZATION

1 AST
AUTHOR: Klemens, Thomas L.
TITLE: Simplifying excavation in tight quarters
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p76 September '90

SUBJECTS COVERED:
Excavating machinery/Miniaturization

EXCAVATING MACHINERY/PERFORMANCE

1 AST

AUTHOR: Hendricks, C.; Peck, J.; Scoble, M. J.
TITLE: Machine performance monitoring in surface mines (1991 Stefanko Award)
SOURCE: Mining Engineering (ISSN 0026-5187) v44 p243-50 March '92

SUBJECTS COVERED:
Rock drills/Performance
Microcomputers/Mining engineering use
Excavating machinery/Performance

2 AST

AUTHOR: Goodman, Gerrit V. R.; Page, Steven J.
TITLE: Dragline productivity
SOURCE: Engineering and Mining Journal (ISSN 0095-8948) v191 p16G+ October '90

SUBJECTS COVERED:
Excavating machinery/Performance
Buckets/Design
Coal miners/Training

3 AST

AUTHOR: Munn, Walter D.
TITLE: 100 million gallons of water lubricate 400-ft. rock fill SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p62-4 June '89

SUBJECTS COVERED:
Excavating machinery/Performance
Fill (Earthwork)
Soils/Consolidation

4 AST

TITLE: Mini-excavators help excavating contractors fill market niche
SOURCE: Concrete Construction (ISSN 0010-5333) v34 p392-3 April '89

SUBJECTS COVERED:
Excavating machinery/Performance

5 AST

AUTHOR: Chironis, Nicholas P.
TITLE: With dozers, bigger is better (Caterpillar D11N tractor) SOURCE: Coal Age (ISSN 0009-9910) v91 p56-8 July '86

SUBJECTS COVERED:
Excavating machinery/Performance
Coal mines and mining/Costs

6 AST

AUTHOR: Manatakis, Emmanuel K.
TITLE: Stochastic model for productivity estimating
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v112 p554-63 May '86

SUBJECTS COVERED:
Stochastic processes
Excavating machinery/Performance

EXCAVATING MACHINERY/SPECIFICATIONS

1 AST

AUTHOR: Chironis, Nicholas P.
TITLE: Utilization factors help estimate diggability of excavators
SOURCE: Coal (ISSN 1040-7820) v95 p58-9 October '90

SUBJECTS COVERED:
Excavating machinery/Specifications

2 AST

AUTHOR: Chironis, Nicholas P.
TITLE: Competition reigns at modern mines
SOURCE: Coal (ISSN 1040-7820) v96[95] p61-5 July '90

SUBJECTS COVERED:
Excavating machinery/Specifications

3 AST

AUTHOR: Popp, Dee
TITLE: Wheel loaders
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p56-60 March '90

SUBJECTS COVERED:
Excavating machinery/Specifications

4 AST

AUTHOR: Popp, Dee
TITLE: Spotlight--backhoe-loaders
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p71-2 June '89

SUBJECTS COVERED:
Loaders (Machines)
Excavating machinery/Specifications

5 AST

AUTHOR: Smith, Marilyn
TITLE: Spotlight, mini-excavators (tables)

SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p126-9 September '87

SUBJECTS COVERED:
Excavating machinery/Specifications
Equipment industry/Directories

6 AST
TITLE: Considerations for selecting the right size crawler dozer
SOURCE: Pipe Line Industry (ISSN 0032-0145) v65 p56+ September '86

SUBJECTS COVERED:
Tracked vehicles
Excavating machinery/Specifications

7 AST
TITLE: What to look for when choosing a crawler dozer
SOURCE: American City & County (ISSN 0149-337X) v101 p74 June '86

SUBJECTS COVERED:
Purchasing
Tracked vehicles
Excavating machinery/Specifications

8 AST
TITLE: Selecting the right-sized dozer
SOURCE: Coal Age (ISSN 0009-9910) v91 p85-6 April '86

SUBJECTS COVERED:
Excavating machinery/Specifications
Coal mines and mining/Stripping operations

9 AST
AUTHOR: Chironis, Nicholas P.
TITLE: Bucket wheel excavators of compact design growing popular (with specifications)
SOURCE: Coal Age (ISSN 0009-9910) v89 p84-91 October '84

SUBJECTS COVERED:
Coal mines and mining/Stripping operations
Excavating machinery/Specifications
Buckets

10 AST
AUTHOR: Chironis, Nicholas P.
TITLE: Cross-pit spreader selected by computer for new surface mine
SOURCE: Coal Age (ISSN 0009-9910) v89 p84-7 September '84

SUBJECTS COVERED:
Excavating machinery/Specifications
Coal mines and mining/Stripping operations
Electronic data processing/Coal industry

EXCAVATING MACHINERY/TRANSMISSION

1 AST

AUTHOR: Hogan, Brian J.
TITLE: Cartridge hydraulics replace loader's pneumatic transmission controls
SOURCE: Design News (ISSN 0011-9407) v41 p122-4 May 6 '85

SUBJECTS COVERED:
Hydraulic transmission
Excavating machinery/Transmission

2 AST

AUTHOR: Chamberlain, Gary
TITLE: Hi-tech controls give earthmovers competitive edge SOURCE: Design News (ISSN 0011-9407) v40 p58-60+ May 7 '84

SUBJECTS COVERED:
Electronic control
Excavating machinery/Transmission

EXCAVATION

1 AST

AUTHOR: Poohkay, P. A.; Smetaniuk, Blain M.
TITLE: Thawing frozen ground enhances gas operations
SOURCE: Pipeline & Gas Journal (ISSN 0032-0188) v219 p30+ December '92

SUBJECTS COVERED:
Frozen ground
Thawing
Excavation

2 AST

AUTHOR: Gould, James P.; Tamaro, George; Powers, J. P.
TITLE: Taming the urban underground
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p60-2 February '93

SUBJECTS COVERED:
Storm sewers
Excavation

3 AST

AUTHOR: Whittle, Andrew J.; Hashash, Youssef M. A.; Whitman, Robert V.
TITLE: Analysis of deep excavation in Boston
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v119 p69-90 January '93

SUBJECTS COVERED:
Underground construction
Excavation
Soil mechanics/Mathematical models

4 AST
AUTHOR: Rubin, Robert A.; Molina, Jeannette L.
TITLE: In too deep (urban excavation)
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p67-9 December '92

SUBJECTS COVERED:
Environmental impact analysis
Hazardous waste management industry/Laws and regulations
Excavation

5 AST
TITLE: Soil nailing shown seismically stable
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p24 December '92

SUBJECTS COVERED:
Soil stabilization
Excavation
Earthquake resistant design

6 AST
AUTHOR: Chen, Chun-Sung; Lin, Hung-Cheng
TITLE: Estimating excavation volume using new formulas
SOURCE: Surveying and Land Information Systems (ISSN 1052-2905) v52 p104-11 June '92

SUBJECTS COVERED:
Excavation
Volume/Mathematical models

7 AST
TITLE: Huge freshwater diversion project rescues Louisiana wetlands
SOURCE: Public Works (ISSN 0033-3840) v123 p44-5 March '92

SUBJECTS COVERED:
Wetlands/Louisiana
Excavation
Waterways

8 AST

AUTHOR: Linehan, P. W.; Longinow, A.; Dowding, C. H.
TITLE: Pipe response to pile driving and adjacent excavation
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v118 p300-16 February '92

SUBJECTS COVERED:
Natural gas pipe lines/Location
Excavation
Bridges/Foundations and piers

9 AST

AUTHOR: Bischoff, John A.; Klein, Stephen J.; Lang, Thomas A.
TITLE: Designing reinforced rock
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p64-7 January '92

SUBJECTS COVERED:
Mountain roads
Excavation
Vehicular tunnels

10 AST

AUTHOR: Finno, Richard J.; Harahap, Indra S.
TITLE: Finite element analyses of HDR-4 excavation
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v117 p1590-609 October '91

SUBJECTS COVERED:
Structural engineering/Finite element method
Excavation
Deformation (Mechanics)/Finite element method

11 AST

AUTHOR: Cosgrove, Tom
TITLE: Firms digging for work in new market areas; top 600
SOURCE: ENR (ISSN 0891-9526) v227 p49 September 23 '91

SUBJECTS COVERED:
Excavation

12 AST

AUTHOR: Krukowski, John
TITLE: Scraping muck from borrow pits
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v134 p41 September '91

SUBJECTS COVERED:
Road construction
Excavation

13 AST

AUTHOR: Klemens, Thomas L.; Hodson, Cathryn
TITLE: Alternative to blasting breaks new ground (non-explosive rock excavation)
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v134 p30-1 September '91

SUBJECTS COVERED:
Impact
Excavation
Rock mechanics

14 AST

AUTHOR: Korman, Richard
TITLE: OSHA sees weakness in cave-in
SOURCE: ENR (ISSN 0891-9526) v227 p8-9 August 5 '91

SUBJECTS COVERED:
Beams and girders, Steel/Load
Excavation
Building accidents

15 AST

AUTHOR: Finno, Richard J.; Lawrence, Samir A.; Allawh, Nabil F.
TITLE: Analysis of performance of pile groups adjacent to deep excavation
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v117 p934-55 June '91 Discussion. 118:1481-2 S '92

SUBJECTS COVERED:
Excavation
Piles
Bending moment

16 AST

AUTHOR: McManamy, Rob
TITLE: Cut-ups slice rock under arch (beneath Gateway Arch, St. Louis)
SOURCE: ENR (ISSN 0891-9526) v226 p39 June 10 '91

SUBJECTS COVERED:
Jet cutting
Excavation
Motion picture theaters

17 AST

TITLE: Cameras monitor caisson excavations
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p22 June '91

SUBJECTS COVERED:
Excavation
Television cameras

18 AST
AUTHOR: Chen, Chun-Sung; Lin, Hung-Cheng
TITLE: Estimating pit-excavation volume using cubic spline volume formula
SOURCE: Journal of Surveying Engineering (ISSN 0733-9453) v117 p51-66 May '91 Discussion. 118:66-7 My '92

SUBJECTS COVERED:
Excavation
Volume/Mathematical models
Spline functions

19 AST
TITLE: Foundation excavation collapse ties up D.C.
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p14 January '91

SUBJECTS COVERED:
Building accidents
Foundations
Excavation

20 AST
TITLE: Failure cause a mystery
SOURCE: ENR (ISSN 0891-9526) v225 p11 December 3 '90

SUBJECTS COVERED:
Excavation
Foundations/Failure
Building accidents

21 AST
AUTHOR: Cosgrove, Tom
TITLE: Diversity is foundation for this year's leaders; top 600
SOURCE: ENR (ISSN 0891-9526) v225 p52 August 30 '90

SUBJECTS COVERED:
Foundations
Excavation

22 AST
AUTHOR: Garrett, Rodney
TITLE: Scrapers vs. haulers on long, slippery routes

SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p28-9 July '90

SUBJECTS COVERED:
Scrapers
Locks (Hydraulic engineering)
Excavation

23 AST
AUTHOR: Gretsky, Paul; Barbour, Richard; Asimenios, George S.
TITLE: Geophysics, pit surveys reduce uncertainty
SOURCE: Pollution Engineering (ISSN 0032-3640) v22 p102-8 June '90

SUBJECTS COVERED:
Excavation
Hazardous waste disposal/Location
Geophysical prospecting

24 AST
AUTHOR: Borja, Ronaldo I.
TITLE: Analysis of incremental excavation based on critical state theory
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v116 p964-85 June '90

SUBJECTS COVERED:
Excavation
Soil mechanics/Mathematical models

25 AST
AUTHOR: Wittchen, V. C.; Croxall, J. E.; Yu, T. R.
TITLE: Roadheader excavation in consolidated rockfill at Kidd Creek Mines
SOURCE: CIM Bulletin (ISSN 0317-0926) v83 p41-5 May '90

SUBJECTS COVERED:
Tunneling machines
Mine fill
Excavation

26 AST
AUTHOR: Chambers, Daniel W.
TITLE: Estimating pit excavation volume using unequal intervals
SOURCE: Journal of Surveying Engineering (ISSN 0733-9453) v115 p390-401 November '89

SUBJECTS COVERED:
Excavation
Volume/Mathematical models

27 AST
AUTHOR: McManamy, Rob
TITLE: Firms dig in for slump after revenues pile up (top 600 specialty contractors)
SOURCE: ENR (ISSN 0891-9526) v223 p70 August 24 '89

SUBJECTS COVERED:
Excavation
Foundations

28 AST
TITLE: Giant earthmovers see a good year shaping up (giants/earthmoving & rock excavation)
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p55-7 August '89

SUBJECTS COVERED:
Excavation
Earthwork

29 AST
AUTHOR: Downey, Ray
TITLE: Buried victims
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p16-17+ August '89 142:16+ S '89

SUBJECTS COVERED:
Rescue work
Excavation

30 AST
AUTHOR: Finno, Richard J.; Nerby, Steven M.
TITLE: Saturated clay response during braced cut construction
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p1065-84 August '89

SUBJECTS COVERED:
Soils, Clay
Excavation
Bracing

31 AST
AUTHOR: Finno, Richard J.; Atmatzidis, Dimitrios K.; Perkins, Scott B.
TITLE: Observed performance of a deep excavation in clay
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p1045-64 August '89

SUBJECTS COVERED:
Excavation
Soils, Clay

32 AST

AUTHOR: Wong, Kai S.; Broms, Bengt B.
TITLE: Lateral wall deflections of braced excavations in clay
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p853-70 June '89

SUBJECTS COVERED:
Excavation
Retaining walls, Concrete
Soils, Clay

33 AST

AUTHOR: Ulrich, Edward J.:Jr.
TITLE: Tieback supported cuts in overconsolidated soils
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p521-45 April '89 Discussion. 117:832-6 My '91

SUBJECTS COVERED:
Excavation
Bracing
Earth pressure

34 AST

AUTHOR: Ulrich, Edward J.:Jr.
TITLE: Internally braced cuts in overconsolidated soils
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p504-20 April '89 Discussion. 117:829-32 My '91

SUBJECTS COVERED:
Excavation
Earth pressure
Bracing

35 AST

AUTHOR: Yancheski, Tad B.
TITLE: Suburban Superfund (tree branches buried in trenches)
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p48-9 April '89

SUBJECTS COVERED:
Soils, Gases in
Excavation
Landfills/Gas production

36 AST

AUTHOR: Boscardin, Marco D.; Cording, Edward J.
TITLE: Building response to excavation-induced settlement

SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v115 p1-21 January '89 Discussion. 117:1276-8 Ag '91; 118:636-7 Ap '92

SUBJECTS COVERED:
Excavation
Subsidences (Earth movements)
Brick construction

37 AST
TITLE: Clearing the way in a Missouri landfill
SOURCE: The Management of World Wastes (ISSN 0745-6921) v31 p24-5 December 30 '88

SUBJECTS COVERED:
Sewage disposal plants/Location Sewerage/Springfield (Mo.)
Excavation

38 AST
AUTHOR: Usui, Naoaki
TITLE: Stockpile complex buried safely
SOURCE: ENR (ISSN 0891-9526) v222 p26-7 January 12 '89

SUBJECTS COVERED:
Excavation
Strategic materials
Oil tanks

39 AST
AUTHOR: Lawson, Michael
TITLE: Utility locator rules coming
SOURCE: ENR (ISSN 0891-9526) v221 p14 December 15 '88

SUBJECTS COVERED:
Underground electric lines
Pipe lines/Location
Excavation

40 AST
AUTHOR: Ralston, Margaret
TITLE: Three-dimensional plans pay off (Bonneville Dam)
SOURCE: ENR (ISSN 0891-9526) v221 p45-6 November 10 '88

SUBJECTS COVERED:
Excavation
Blasting
Locks (Hydraulic engineering)

41 AST

AUTHOR: Easa, Said M.
TITLE: Estimating pit excavation volume using nonlinear ground profile
SOURCE: Journal of Surveying Engineering (ISSN 0733-9453) v114 p71-83 May '88

SUBJECTS COVERED:
Excavation
Surveying/Mathematical models

42 AST
AUTHOR: Munn, Walter D.
TITLE: Pre-wet soils compacted for impervious core (Stacy Dam)
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v131 p42-5 September '88

SUBJECTS COVERED:
Excavation
Soil moisture
Dams/Foundations

43 AST
TITLE: Span keeps city talking (Philadelphia)
SOURCE: ENR (ISSN 0891-9526) v221 p11 September 1 '88

SUBJECTS COVERED:
Garages, Underground
Excavation
Telephone cables/Installation

44 AST
AUTHOR: Munn, Walter D.
TITLE: Ripping replaces blasting on rock project
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v131 p44-6 April '88

SUBJECTS COVERED:
Excavation
Road construction
Earthwork

45 AST
TITLE: Back-up operators help to beat deadline
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p36-7 December '87

SUBJECTS COVERED:
Rest periods
Excavation
Building/Rapid construction

46 AST
AUTHOR: Dolby, Bob
TITLE: Trenching & shoring
SOURCE: Civil Engineering (London, England) (ISSN 0305-6473) p55 May '87

SUBJECTS COVERED:
Building accidents
Excavation

47 AST
AUTHOR: Tuchman, Janice L.
TITLE: Nailing down a new method
SOURCE: ENR (ISSN 0891-9526) v218 p38 June 18 '87 Discussion. 219:18-20 S 17 '87

SUBJECTS COVERED:
Soil stabilization
Polymer concrete
Excavation

48 AST
TITLE: Rock excavated differently on adjacent highway sections
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p50-3 June '87

SUBJECTS COVERED:
Road construction
Marshes
Excavation

49 AST
TITLE: Material sources are the key to Florida earthmoving work
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v130 p50-1 April '87

SUBJECTS COVERED:
Lakes, Artificial
Excavation
Fill (Earthwork)

50 AST
AUTHOR: Chappell, Brian A.
TITLE: Deformational control in excavating unstable slopes
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v113 p299-319 April '87

SUBJECTS COVERED:
Mine roof bolting
Excavation

Deformation (Mechanics)/Finite element method

51 AST
TITLE: Long Beach replacement work
SOURCE: Pipeline & Gas Journal (ISSN 0032-0188) v213 p30-1 December '86

SUBJECTS COVERED:
Pipe laying
Gas distribution
Excavation

52 AST
AUTHOR: Nicholson, Peter J.
TITLE: Soil nailing a wall
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v56 p37-9 December '86

SUBJECTS COVERED:
Excavation
Retaining walls, Concrete
Soil stabilization

53 AST
AUTHOR: Schroeder, W. L.; Rybel, Vincent W.; Cochran, Larry
TITLE: Dewatering for Opal Springs powerhouse excavation
SOURCE: Journal of Construction Engineering and Management (ISSN 0733-9364) v112 p440-51 September '86

SUBJECTS COVERED:
Excavation
Drainage
Hydroelectric plants/Construction

54 AST
TITLE: Rotary drills, twice a day shots keep rock excavation on track
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v129 p42 September '86

SUBJECTS COVERED:
Drilling and boring (Earth and rocks)
Excavation

55 AST
TITLE: Slurry wall only choice (Milwaukee theater district)
SOURCE: Engineering News-Record (ISSN 0013-807X) v217 p17 July 17 '86

SUBJECTS COVERED:

Cities and towns/Development work
Excavation

56 AST
AUTHOR: Green, Peter
TITLE: Law library burrows underground
SOURCE: Engineering News-Record (ISSN 0013-807X) v216 p24-5 June 12 '86

SUBJECTS COVERED:
College buildings
Excavation
Underground construction

57 AST
AUTHOR: Shields, F. Douglas:Jr.; Sanders, Thomas G.
TITLE: Water quality effects of excavation and diversion
SOURCE: Journal of Environmental Engineering (ISSN 0733-9372) v112 p211-28 April '86

SUBJECTS COVERED:
Waterways
Excavation
Water pollution

58 AST
TITLE: Huge submarine school challenges men and machines
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v128 p44-5 March '85

SUBJECTS COVERED:
Excavation
Concrete construction

59 AST
TITLE: Small firm digs big contract
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v128 p41-3 March '85

SUBJECTS COVERED:
Excavation

60 AST
AUTHOR: Braun, Bernd; Nash, William R.
TITLE: Ground freezing for construction
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v55 p54-6 January '85

SUBJECTS COVERED:

Frozen ground
Excavation

61 AST
TITLE: Hard rock excavation tests points and buckets
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p61 October '84

SUBJECTS COVERED:
Excavation

62 AST
TITLE: Rock excavation made easier by new blasting agents
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p49-51 August '84

SUBJECTS COVERED:
Excavation
Explosives
Blasting

63 AST
TITLE: Contractor tackles unexpected material
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p92 May '84

SUBJECTS COVERED:
Excavation

64 AST
TITLE: California contractor digs artificial bay
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p54-5 April '84

SUBJECTS COVERED:
Excavation

65 AST
AUTHOR: Desai, C. S.; Sargand, S.
TITLE: Hybrid FE procedure for soil-structure interaction
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v110 p473-86 April '84 Discussion. 111:1057-60 Ag '85

SUBJECTS COVERED:
Soil-structure interaction/Finite element method
Excavation

66 AST

TITLE: Backhoe cleanup revitalizes aging California canal
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p76 February '84

SUBJECTS COVERED:
Excavation
Canals/California

67 AST
TITLE: Big saw carves rock walls
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p50 January '84

SUBJECTS COVERED:
Excavation

68 AST
AUTHOR: Garbis, Dennis J.
TITLE: Excavations stabilized using rock revetments (discussion of 109:424-39 Mr '83)
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v110 p307-10 February '84

SUBJECTS COVERED:
Excavation
Retaining walls

69 AST
TITLE: Ditch cut through solid rock for 407-mile line
SOURCE: Pipe Line Industry (ISSN 0032-0145) v59 p30 December '83

SUBJECTS COVERED:
Excavation
Sewer pipes

70 AST
TITLE: Excavation geared to long disposal hauls
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v126 p32-3 December '83

SUBJECTS COVERED:
Fill (Earthwork)
Excavation

71 AST
AUTHOR: Schwartz, Charles W.; Azzouz, Amr S.; Einstein, Herbert H.
TITLE: Example cost of 3-D FEM for underground openings (discussion of Am Soc C E Proc 108 [GT 9 no17301]:1186-91 S '82)

SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v109 p1496-500 November '83

SUBJECTS COVERED:
Excavation
Finite element method
Soil mechanics

72 AST
AUTHOR: Anderson, William ; Hanna, Thomas H.; Abdel-Malek, Magued N.
TITLE: Overall stability of anchored retaining walls
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v109 p1416-33 November '83 Discussion. 110:1817-18 D '84

SUBJECTS COVERED:
Earth pressure
Excavation
Retaining walls

73 AST
AUTHOR: Norman, Renny S.
TITLE: What's new in gas utility excavation technology (status of Gas Research Institute R&D)
SOURCE: Pipe Line Industry (ISSN 0032-0145) v59 p19-21 September '83

SUBJECTS COVERED:
Excavation
Pipe laying
Gas pipes/Maintenance and repair

EXCAVATION/COSTS

1 AST
TITLE: Drydock removal costs less
SOURCE: ENR (ISSN 0891-9526) v225 p28 December 17 '90

SUBJECTS COVERED:
Wrecking
Excavation/Costs
Foundations

2 AST
TITLE: Earthmoving revenues up 34 percent to $1.8 billion
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p41-3 August '90

SUBJECTS COVERED:
Earthwork
Excavation/Costs

3 AST

AUTHOR: Munn, Walter D.
TITLE: Excess channel excavation becomes urban job's profit
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v132 p72-3 November '89

SUBJECTS COVERED:
Fill (Earthwork)
Channels
Excavation/Costs

4 AST

TITLE: Price tags sought for excavating the moon
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p15+ November '89

SUBJECTS COVERED:
Lunar bases
Excavation/Costs
Lunar geology

5 AST

TITLE: Hydraulic excavators help save contractor $500 a day
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v127 p70 February '84

SUBJECTS COVERED:
Excavating machinery
Excavation/Costs

EXCAVATION/SAFETY MEASURES

1 AST

AUTHOR: Lehr, Ray C.
TITLE: OSHA--our savior has arrived
SOURCE: American Water Works Association Journal (ISSN 0003-150X) v84 p22+ June '92

SUBJECTS COVERED:
Occupational health/Laws and regulations
Excavation/Safety measures
Waterworks/Employees

2 AST

AUTHOR: Breiland, Donald J.; Fraser, Lola
TITLE: Self-paced training; excavation safety and the "competent person"
SOURCE: Professional Safety (ISSN 0099-0027) v36 p28-31 September '91

SUBJECTS COVERED:
Excavation/Safety measures
Construction workers/Training

Occupational health/Laws and regulations

3 AST

AUTHOR: O'Reilly, Joe
TITLE: Safety and maintenance tips for mini-excavators
SOURCE: Concrete Construction (ISSN 0010-5333) v34 p397 April '89

SUBJECTS COVERED:
Excavation/Safety measures
Construction equipment/Maintenance and repair

4 AST

AUTHOR: Leshchinsky, Dov; Mullett, Teresa L.
TITLE: Design charts for vertical cuts
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v114 p337-44 March '88

SUBJECTS COVERED:
Factor of safety
Excavation/Safety measures

5 AST

AUTHOR: Stanevich, Ronald L.; Middleton, Dannie C.
TITLE: An exploratory analysis of excavation cave-in fatalities SOURCE: Professional Safety (ISSN 0099-0027) v33 p24-8 February '88

SUBJECTS COVERED:
Excavation/Safety measures
Building accidents
Trenching

6 AST

AUTHOR: Heinly, David R.
TITLE: OSHA targets professional engineers for building safety measures
SOURCE: Consulting-Specifying Engineer (ISSN 0892-5046) v1 p32 June '87

SUBJECTS COVERED:
Excavation/Safety measures
Safety standards

7 AST

AUTHOR: Bradford, Hazel
TITLE: OSHA airs new excavation rules
SOURCE: ENR (ISSN 0891-9526) v218 p50 April 30 '87

SUBJECTS COVERED:
Excavation/Safety measures

Building accidents

8 AST

AUTHOR: McMahon, Donald R.; Abrams, Donald B.
TITLE: Monitoring saves a site
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v55 p59-61 May '85

SUBJECTS COVERED:
Rapid transit/Buffalo (N.Y.)
Excavation/Safety measures
Soils/Testing

9 AST

AUTHOR: Nicholson, Peter L.; Boley, Dennis L.
TITLE: Soil nailing supports excavation (of Pittsburgh's PPG headquarters)
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v55 p44-7 April '85

SUBJECTS COVERED:
Excavation/Safety measures
Soil stabilization

10 AST

AUTHOR: Yokel, Felix Y.; Chung, Riley M.
TITLE: Proposed standards for construction practice in excavation
SOURCE: Professional Safety (ISSN 0099-0027) v28 p34-9 September '83

SUBJECTS COVERED:
Safety standards
Excavation/Safety measures

EXCAVATION/SUBAQUEOUS

1 AST

AUTHOR: orja, Ronaldo I.
TITLE: Free boundary, fluid flow, and seepage forces in excavations
SOURCE: ournal of Geotechnical Engineering (ISSN 0733-9410) v118 p125-46 January '92

SUBJECTS COVERED:
Nonlinear systems
Fluids flow/Mathematical models
Excavation, Subaqueous

2 AST

AUTHOR: Suttill, Keith R.
TITLE: Digging deeper is the answer
SOURCE: Rock Products (ISSN 0035-7464) v94 p81-4 June '91

SUBJECTS COVERED:
Dredges/Design
Aggregates
Excavation, Subaqueous

3 AST

AUTHOR: Brown, Daniel C.
TITLE: Underwater rock blasting, removal deepens channel
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v133 p42-4 October '90

SUBJECTS COVERED:
Mississippi River
Blasting
Excavation, Subaqueous

4 AST

AUTHOR: Sills, Nick V.
TITLE: Remote underwater excavation
SOURCE: Pipeline & Gas Journal (ISSN 0032-0188) v216 p23-6 July '89

SUBJECTS COVERED:
Pipe lines, Subaqueous/Maintenance and repair
Excavation, Subaqueous

5 AST

TITLE: Vacuums the seabed (Toyo pump)
SOURCE: Civil Engineering (London, England) (ISSN 0305-6473) p36 March '86

SUBJECTS COVERED:
Excavation, Subaqueous
Vacuum pumps
Sewage disposal/Ocean outfalls

6 AST

TITLE: New depth gauge attachment boosts excavator's production
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v128 p46-7 July '85

SUBJECTS COVERED:
Excavation, Subaqueous
Trenching
Pipe laying, Subaqueous

7 AST

AUTHOR: Robertson, Joseph L.
TITLE: Scrapers prove a versatile tool (Santa Clara Sand & Gravel)
SOURCE: Rock Products (ISSN 0035-7464) v88 p24-7 February '85

SUBJECTS COVERED:
Scrapers
Sand and gravel plants/Equipment
Excavation, Subaqueous

FUGITIVE DUSTS

1 AST

AUTHOR: Nudo, Lori
TITLE: Bag change-outs sans fugitive dust
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p18+ April 15 '93

SUBJECTS COVERED:
Dust collectors/Design

2 AST

AUTHOR: Stunder, B. J. Billman; Arya, S. P. S.
TITLE: Windbreak effectiveness for storage pile fugitive dust control: a wind tunnel study
SOURCE: JAPCA (ISSN 0894-0630) v38 p135-43 February '88

SUBJECTS COVERED:
Wind tunnels
Atmospheric boundary layer
Dust prevention

3 AST

AUTHOR: Kestner, Mark O.
TITLE: How to control fugitive dust emissions from coal-fired plants
SOURCE: Power (New York, N.Y.) (ISSN 0032-5929) v131 p43-4+ June '87

SUBJECTS COVERED:
Coal handling
Dust prevention
Fossil fuel power plants/Environmental aspects

4 AST

AUTHOR: Termine, Frank; Favilla, John R.
TITLE: Chemical methods reduce fugitive dust
SOURCE: Power Engineering (ISSN 0032-5961) v91 p26-9 January '87

SUBJECTS COVERED:
Coal dust
Fly ash
Dust prevention

5 AST

TITLE: Fugitive dust rules could limit the size of surface mines

SOURCE: Coal Age (ISSN 0009-9910) v90 p40 January '85

SUBJECTS COVERED:
Coal mines and mining/Stripping operations
Coal dust
Air pollution/Laws and regulations

6 AST

TITLE: Coal-handling system keeps fuel dry, eliminates fugitive dust
SOURCE: Power (New York, N.Y.) (ISSN 0032-5929) v127 p154 September '83

SUBJECTS COVERED:
Coal handling
Coal storage

HAZARDOUS WASTE/ANALYSIS

1 AST

AUTHOR: Sedman, Richard M.; Reynolds, Stephen D.; Hadley, Paul W.
TITLE: Why did you take that sample?
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1420-3 November '92

SUBJECTS COVERED:
Hazardous waste/Analysis
Soil sampling

2 AST

TITLE: Annual Waste Testing and Quality Assurance Symposium, 8th [Crystal City, Va.] July 13-17, 1992 [program]
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v26 p1289-93 July '92

SUBJECTS COVERED:
Environmental laboratories
Hazardous waste/Analysis

3 AST

AUTHOR: Behmanesh, Nasrin; Allen, David T.; Warren, John L.
TITLE: Flow rates and compositions of incinerated waste streams in the United States
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p437-42 April '92

SUBJECTS COVERED:
Hazardous waste/Analysis
Hazardous waste incineration/Environmental aspects
Environmental databases

4 AST

AUTHOR: Burkhard, Lawrence; Durhan, Elizabeth J.; Lukasewycz, Marta T.
TITLE: Identification of nonpolar toxicants in effluents using toxicity-based fractionation with gas chromatography/mass spectrometry
SOURCE: Analytical Chemistry (ISSN 0003-2700) v63 p277-83 February 1 '91

SUBJECTS COVERED:
Hazardous waste/Analysis
Fish poisons/Analysis
Separation

5 AST

AUTHOR: Ho, James S.; Bellar, Thomas A.; Eichelberger, James W.
TITLE: Distinguishing diphenylamine and N-nitrosodiphenylamine in hazardous waste samples by using high-performance liquid chromatography/thermospray/mass spectrometry
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v24 p1748-51 November '90

SUBJECTS COVERED:
Diphenylamine/Analysis
Hazardous waste/Analysis

6 AST

AUTHOR: Versteeg, Donald J.; Woltering, Daniel M.
TITLE: A laboratory-scale model for evaluating effluent toxicity in activated sludge wastewater treatment plants
SOURCE: Water Research (ISSN 0043-1354) v24 p717-23 June '90

SUBJECTS COVERED:
Detergents/Manufacture
Industrial waste disposal/Mixing with sewage
Hazardous waste/Analysis

7 AST

AUTHOR: Burkhard, Lawrence P.; Ankley, Gerald T.
TITLE: Identifying toxicants: NETAC's toxicity-based approach SOURCE: Environmental Science & Technology (ISSN 0013-936X) v23 p1438-43 December '89

SUBJECTS COVERED:
Hazardous waste/Analysis
Water laws and regulations

8 AST

TITLE: [Annual Waste Testing and Quality Assurance Symposium, 5th, Washington, D.C., July 1989]
SOURCE: Analytical Chemistry (ISSN 0003-2700) v61 p1048A-9A September 15 '89

SUBJECTS COVERED:
Hazardous waste/Analysis
Environmental pollution/Testing

HAZARDOUS WASTE/CLEANUP

1 AST

AUTHOR: Powers, Mary B.
TITLE: Cutting gridlock on cleanup sites
SOURCE: ENR (ISSN 0891-9526) v230 p43 March 29 '93

SUBJECTS COVERED:
Hazardous substances/Cleanup
Cooperation

2 AST

AUTHOR: Powers, Mary B.; Ichniowski, Tom; Rubin, Debra K.
TITLE: Base closings mean pain and gain
SOURCE: ENR (ISSN 0891-9526) v230 p6-7 March 22 '93

SUBJECTS COVERED:
Military bases/Waste
Hazardous substances/Cleanup
Economic conversion

3 AST

TITLE: Unique dredging technique rids bay of toxic sediments
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p48 March 15 '93

SUBJECTS COVERED:
Dredging
Hazardous substances/Cleanup

4 AST

AUTHOR: Balasundaram, V.; Shashidhara, N.
TITLE: Data validation practices and risk assessment
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p60-1 March '93

SUBJECTS COVERED:
Health risk assessment
Environmental databases
Hazardous substances/Cleanup

5 AST

TITLE: Rocky Flats cleanup lacks detail, says state
SOURCE: ENR (ISSN 0891-9526) v230 p18 February 22 '93

SUBJECTS COVERED:
Nuclear weapons plants/Waste

Radioactive decontamination
Hazardous substances/Cleanup

6 AST

AUTHOR: Radtke, Larry
TITLE: Haz-mat notebook
SOURCE: Fire Engineering (ISSN 0015-2587) v146 p10+ February '93

SUBJECTS COVERED:
Volunteer fire departments/Ground command
Hazardous substances/Cleanup

7 AST

AUTHOR: Heath, Jenifer S.
TITLE: Development of state regulations should include participation of affected parties
SOURCE: Water Environment & Technology (ISSN 1044-9493) v5 p13 February '93

SUBJECTS COVERED:
Environmental law/United States
Hazardous substances/Cleanup
State laws

8 AST

TITLE: Trench boxes help get to the bottom of this
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p20-1 February '93

SUBJECTS COVERED:
Hazardous substances/Cleanup
Trenching

9 AST

AUTHOR: DiGiulio, Dominic C.
TITLE: Evaluation of soil venting application
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v32 p279-91 December '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Soil vapor extraction
Soil permeability

10 AST

AUTHOR: Krukowski, John
TITLE: No more enforcement double standard
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p9-10 January 1 '93

SUBJECTS COVERED:
Military bases/Waste
United States/Environmental policy
Hazardous substances/Cleanup

11 AST
AUTHOR: Carpenter, William L.; Brooks, James R.
TITLE: Small becomes big (environmental advice)
SOURCE: Water Environment & Technology (ISSN 1044-9493) v5 p56-9 January '93

SUBJECTS COVERED:
Consultants and consulting services
Hazardous substances/Cleanup
Industrial waste disposal/Costs

12 AST
AUTHOR: Brown, Jack
TITLE: Wichita accepts cleanup responsibility--avoids Superfund
SOURCE: Water Environment & Technology (ISSN 1044-9493) v5 p26-7 January '93

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup

13 AST
AUTHOR: Wu, Yo-Ping G.; Dong, Jong-In; Bozzelli, Joseph W.
TITLE: Mass transfer of hazardous organic compounds in soil matrices experiment and model
SOURCE: Combustion Science and Technology (ISSN 0010-2202) v85 no1-6 p151-63 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Organic soil pollutants
Hazardous waste incineration

14 AST
TITLE: New software speeds site cleanup decisions (ReOpt)
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1555-6 December '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental engineering software

15 AST
AUTHOR: Mansdorf, S. Z.

TITLE: Personal protective equipment; hazardous materials spill response
SOURCE: Professional Safety (ISSN 0099-0027) v37 p16-23 December '92

SUBJECTS COVERED:
Clothing, Protective
Respiratory apparatus
Hazardous substances/Cleanup

16 AST
TITLE: The military's newest battlefront
SOURCE: ENR (ISSN 0891-9526) v229 p26-36 November 30 '92

SUBJECTS COVERED:
Military bases/Waste
Hazardous substances/Cleanup

17 AST
AUTHOR: Filho, Paulo Pinho
TITLE: Guanabara Bay recovers
SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p50-4 December '92

SUBJECTS COVERED:
Bays
Water quality
Hazardous substances/Cleanup

18 AST
TITLE: Case worries cleanup firms
SOURCE: ENR (ISSN 0891-9526) v229 p12 November 23 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Pollution liability
Hazardous waste/Transportation

19 AST
TITLE: Court ruling may broaden liability nationwide
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p27-8 November '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Industrial waste disposal/Laws and regulations

20 AST
AUTHOR: Sbrolla, James
TITLE: Environmental clean-up & decommissioning

SOURCE: Water & Pollution Control (ISSN 0820-4446) v130 p13-14 October '92

SUBJECTS COVERED:
Chemical plants/Environmental aspects
Hazardous substances/Cleanup
Phosphorus/Manufacture

21 AST
AUTHOR: Acar, Yalcin B.; Li, Heyi; Gale, Robert J.
TITLE: Phenol removal from kaolinite by electrokinetics
SOURCE: Journal of Geotechnical Engineering (ISSN 0733-9410) v118 p1837-52 November '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Kaolinite
Electrokinetic effects

22 AST
TITLE: Governors map out cleanup strategies
SOURCE: ENR (ISSN 0891-9526) v229 p13-14 October 19 '92

SUBJECTS COVERED:
Environmental pollution/Western States
Hazardous substances/Cleanup

23 AST
AUTHOR: Acar, Yalcin B.
TITLE: Electrokinetic cleanups
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p58-60 October '92

SUBJECTS COVERED:
Soil pollution
Electrokinetic effects
Hazardous substances/Cleanup

24 AST
TITLE: Bridge cleanup requires environmental sensitivity
SOURCE: Public Works (ISSN 0033-3840) v123 p76 October '92

SUBJECTS COVERED:
Bridge painting
Hazardous substances/Cleanup

25 AST
TITLE: New database links technology with remediation needs

SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p25-6 October '92

SUBJECTS COVERED:
Environmental databases
Hazardous substances/Cleanup

26 AST
AUTHOR: Whelan, Gene; Sims, Ronald C.
TITLE: Oxidation of recalcitrant organics in subsurface systems
SOURCE: Hazardous Waste & Hazardous Materials (ISSN 0882-5696) v9 p245-65 Fall '92

SUBJECTS COVERED:
Organic soil pollutants/Oxidation
Hazardous substances/Cleanup
Copolymerization

27 AST
AUTHOR: Krukowski, John
TITLE: Mickey Mouse, McDonald's and now Superfund?
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p114 October 1 '92

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup
Environmental law/Western Europe

28 AST
TITLE: Removing arsenic
SOURCE: Public Works (ISSN 0033-3840) v123 p78+ September '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Water supply/Arsenic content
Sewage disposal/Lime treatment

29 AST
TITLE: AGWSE Educational Program, "Aquifer Restoration: Pump-and-Treat and the Alternatives" [Las Vegas, Nev., Sept. 30-Oct. 2, 1992; with abstracts of papers]
SOURCE: Ground Water (ISSN 0017-467X) v30 p781-800 September/October '92

SUBJECTS COVERED:
Pumping
Hazardous substances/Cleanup
Groundwater pollution

30 AST
TITLE: Military toxics in hot water
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p30 September '92

SUBJECTS COVERED:
Water purification
Supercritical processes
Hazardous substances/Cleanup

31 AST
TITLE: Mammoth cleanup for Kuwait's contaminated soil
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p22+ September '92

SUBJECTS COVERED:
Soil pollution
Hazardous substances/Cleanup

32 AST
AUTHOR: Krukowski, John
TITLE: Reconsidering Superfund
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p9-10 September 1 '92

SUBJECTS COVERED:
Superfund sites
Pollution liability
Hazardous substances/Cleanup

33 AST
AUTHOR: Ngo, Chien D.; Carlton, Gary M.; Mitchell, Philip J.
TITLE: Dual-system cleanup
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p45-7 August '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Pollution control equipment
Water purification/Aeration

34 AST
AUTHOR: Robertson, S. B.
TITLE: Groundwater issues relating to an Alaskan methanol spill
SOURCE: Journal of Petroleum Technology (ISSN 0149-2136) v44 p936-40 August '92

SUBJECTS COVERED:
Methanol
Groundwater pollution/Alaska

Hazardous substances/Cleanup

35 AST

TITLE: Document conversion key element of decontamination procedures

SOURCE: Mechanical Engineering (ISSN 0025-6501) v114 p12+ July '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Document imaging systems

36 AST

AUTHOR: Wallace, William A.; Yates, Michael K.

TITLE: Hazardous waste engineering: the state of the practice

SOURCE: ENR (ISSN 0891-9526) v228 pE47 June 22 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental engineering

37 AST

AUTHOR: Pinkstaff, Jay

TITLE: OSHA regulations require increased pipeline training

SOURCE: Pipeline & Gas Journal (ISSN 0032-0188) v219 p34-5 June '92

SUBJECTS COVERED:
Occupational health/Laws and regulations
Employees, Training of
Hazardous substances/Cleanup

38 AST

AUTHOR: LaGoy, Peter K.; Bohrer, Richard L.; Halvorsen, Fred H.

TITLE: The development of cleanup criteria for an acutely toxic pesticide at a contaminated industrial facility

SOURCE: American Industrial Hygiene Association Journal (ISSN 0002-8894) v53 p298-302 May '92

SUBJECTS COVERED:
Steel works
Pesticides/Residues
Hazardous substances/Cleanup

39 AST

AUTHOR: Krukowski, John

TITLE: Emerging technologies; haz waste treatment

SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p50-4 April 15 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup

Soil pollution
Groundwater pollution

40 AST

AUTHOR: Reeves, Theodore S.; Bacon, Patti A.
TITLE: Preventing and responding to UST system leaks
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p52-5 April 1 '92

SUBJECTS COVERED:
Tanks, Underground/Leakage
Soil pollution
Hazardous substances/Cleanup

41 AST

AUTHOR: Aquino, John T.
TITLE: Hazardous waste profile: AWD Technologies Inc.
SOURCE: Waste Age (ISSN 0043-1001) v23 p175-6 April '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Hazardous waste management industry
Soil vapor extraction

42 AST

AUTHOR: Windgasse, G.; Dauerman, L.
TITLE: Microwave treatment of hazardous wastes: removal of volatile and semi-volatile organic contaminants from soil
SOURCE: Journal of Microwave Power & Electromagnetic Energy (ISSN 0832-7823) v27 no1 p23-32 '92

SUBJECTS COVERED:
Microwaves/Industrial applications
Soil pollution
Hazardous substances/Cleanup

43 AST

AUTHOR: Schmidtke, K.; McBean, E.; Rovers, F.
TITLE: Evaluation of collection-well parameters for DNAPL
SOURCE: Journal of Environmental Engineering (ISSN 0733-9372) v118 p183-95 March/April '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Wells
Soil infiltration

44 AST

AUTHOR: Hillger, Robert
TITLE: Database offers useful information

SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p28 April '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental databases

45 AST
AUTHOR: Gilmartin, Patricia A.
TITLE: Defense companies press Congress to ease liability on cleanup contracts
SOURCE: Aviation Week & Space Technology (ISSN 0005-2175) v136 p52+ April 6 '92

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup

46 AST
AUTHOR: Bond, David F.
TITLE: Fernald contract may set pattern for Energy Dept. cleanup management
SOURCE: Aviation Week & Space Technology (ISSN 0005-2175) v136 p48-9 April 6 '92

SUBJECTS COVERED:
Nuclear weapons plants/Environmental aspects
Hazardous substances/Cleanup
United States/Dept. of Energy/Appropriations and expenditures

47 AST
AUTHOR: Smith, Bruce A.
TITLE: Contractors pursue potential $200-billion cleanup market
SOURCE: Aviation Week & Space Technology (ISSN 0005-2175) v136 p44-5+ April 6 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Nuclear weapons plants/Environmental aspects

48 AST
TITLE: European Community addresses tainted soil
SOURCE: ENR (ISSN 0891-9526) v228 p15-16 February 24 '92

SUBJECTS COVERED:
Soil pollution
Hazardous substances/Cleanup
Environmental law/Western Europe

49 AST

TITLE: Big dioxin cleanup job is awarded
SOURCE: ENR (ISSN 0891-9526) v228 p14 February 10 '92

SUBJECTS COVERED:
Soil pollution
Dioxin
Hazardous substances/Cleanup

50 AST

AUTHOR: McKinley, W. Scott; Pratt, Randy C.; McPhillips, Loren C.
TITLE: Cleaning up chromium
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p69-71 March '92

SUBJECTS COVERED:
Chromium
Hazardous substances/Cleanup

51 AST

TITLE: Cleanup efforts continue at Oakland fire site
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p14 February '92

SUBJECTS COVERED:
Wildfires
Fire losses
Hazardous substances/Cleanup

52 AST

TITLE: Site remediation group to provide guidance for characterizing, remediating, and monitoring contaminated waste sites
SOURCE: ASTM Standardization News (ISSN 0090-1210) v20 p12 January '92

SUBJECTS COVERED:
Hazardous substances/Cleanup

53 AST

TITLE: Lead paint abatement is growing, but risky
SOURCE: ENR (ISSN 0891-9526) v228 p37 January 20 '92

SUBJECTS COVERED:
Lead based paint
Hazardous substances/Cleanup

54 AST

AUTHOR: Phipps, Leigh
TITLE: Dredging up old wastes

SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p28 January '92

SUBJECTS COVERED:
Hazardous substances/Cleanup
Dredging

55 AST

AUTHOR: Anderson, Mary Rose
TITLE: Ecological robots
SOURCE: Technology Review (ISSN 0040-1692) v95 p22-3 January '92

SUBJECTS COVERED:
Robots
Hazardous substances/Cleanup

56 AST

AUTHOR: Tokle, Gary O.; Henry, Martin F.
TITLE: Where do we stand on haz-mat response?
SOURCE: NFPA Journal (ISSN 1054-8793) v86 p36-40+ January/February '92

SUBJECTS COVERED:
Clothing, Protective
Hazardous substances/Cleanup
Firefighters/Training

57 AST

AUTHOR: Kearl, Peter M.; Korte, Nic E.; Gleason, T. A.
TITLE Vapor extraction experiments with laboratory soil columns: implications for field programs
SOURCE: Waste Management (ISSN 0956-053X) v11 no4 p231-9 '91

SUBJECTS COVERED:
Soil vapor extraction
Hazardous substances/Cleanup

58 AST

AUTHOR: Mott, J. Gregory; Romanow, Stephen
TITLE: Sludge characterization. removal, and dewatering
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p127-40 December '91

SUBJECTS COVERED:
Volatile organic compounds
Industrial sludge dewatering
Hazardous landfills
Hazardous substances/Cleanup

59 AST

AUTHOR: Arands, Rolf; Kuczykowski, David; Kosson, David
TITLE: Process development for remediation of phenolic waste lagoons
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p97-125 December '91

SUBJECTS COVERED:
Industrial waste disposal/Lagoons
Phenols
Industrial waste disposal/Biological treatment
Hazardous substances/Cleanup
Plastics plants/Waste

60 AST

AUTHOR: Makdisi, Richard S.
TITLE: Tannery wastes definition, risk assessment and cleanup options, Berkeley, California
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p79-96 December '91

SUBJECTS COVERED:
Tanneries/Waste
Health risk assessment
Solidification (Hazardous waste)
Hazardous substances/Cleanup

61 AST

AUTHOR: Sturges, Stan G.:Jr.; McBeth, Paul:Jr.; Pratt, Randy C.
TITLE: Performance of soil flushing and groundwater extraction at the United Chrome Superfund site
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p59-78 December '91

SUBJECTS COVERED:
Plating shops/Waste
Soil vapor extraction
Hazardous substances/Cleanup

62 AST

AUTHOR: Breitstein, Leonard; Forrest, Andrew; Frew, Ronald L.
TITLE: Groundwater recovery and treatment for chlorinated organic compounds
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p43-58 December '91

SUBJECTS COVERED:
Chlorocarbons
Electronics plants/Waste
Industrial waste disposal/Aeration
Hazardous substances/Cleanup

63 AST

AUTHOR: Adams, William D.; Golden, James E.
TITLE: Comparison of the effects of geologic environment on volatile organic plume development
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p17-41 December '91

SUBJECTS COVERED:
Gasoline tanks/Leakage
Hydrogeology
Soils, Sandy
Hazardous substances/Cleanup

64 AST

AUTHOR: Siegrist, Robert L.
TITLE: Volatile organic compounds in contaminated soils: the nature and validity of the measurement process
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p3-15 December '91

SUBJECTS COVERED:
Volatile organic compounds
Soil pollution
Hazardous substances/Cleanup

65 AST

TITLE: Characterization and cleanup of chemical waste sites (based on Symposium of the American Chemical Society's 200th National Meeting, Washington, D.C., Aug. 29, 1990)
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v29 p3-140 December '91

SUBJECTS COVERED:
Hazardous substances/Cleanup

66 AST

TITLE: How Clean is Clean? [Boston, Mass., Nov. 7-9, 1990]
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1446-9 November '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Soil pollution
Groundwater pollution

67 AST

TITLE: Sunlight cleans polluted water
SOURCE: Journal of Environmental Health (ISSN 0022-0892) v54 p45-6 November/December '91

SUBJECTS COVERED:
Sunlight
Hazardous substances/Cleanup
Photocatalysis

68 AST

TITLE: To clean up hazwastes, let the sun shine in
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p10+ November '91

SUBJECTS COVERED:
Water purification
Sunlight
Hazardous substances/Cleanup

69 AST

AUTHOR: Hasbach, Ann Chestnut
TITLE: Automated control monitors cleanup at loading terminal
SOURCE: Pollution Engineering (ISSN 0032-3640) v23 p95-7 October '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Truck terminals/Control equipment

70 AST

AUTHOR: Janz, James R.; Arnold, James R.; Mays, Richard H.
TITLE: Development and redevelopment of contaminated property
SOURCE: Journal of Urban Planning and Development (ISSN 0733-9488) v117 p108-20 September '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental property assessment

71 AST

TITLE: Soil cleaning
SOURCE: Public Works (ISSN 0033-3840) v122 p154+ August '91

SUBJECTS COVERED:
Soil pollution
Hazardous substances/Cleanup

72 AST

TITLE: Hazardous waste
SOURCE: Public Works (ISSN 0033-3840) v122 p80 August '91

SUBJECTS COVERED:
Hazardous substances/Cleanup

73 AST
AUTHOR: Kemezis, Paul
TITLE: Mill tailings cleanup progresses
SOURCE: ENR (ISSN 0891-9526) v227 p23 July 29 '91

SUBJECTS COVERED:
Uranium works/Waste
Tailings
Hazardous substances/Cleanup

74 AST
TITLE: Old process used anew to clean German site
SOURCE: ENR (ISSN 0891-9526) v227 p13 July 29 '91

SUBJECTS COVERED:
Foundation soils
Hazardous substances/Cleanup
Hydraulic jets

75 AST
AUTHOR: Koustas, Richard N.
TITLE: Control of incidental asbestos exposure at hazardous waste sites
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1004-9 July '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Health risk assessment
Asbestos/Laws and regulations

76 AST
AUTHOR: Isman, Warren E.
TITLE: Hazardous materials and the environment
SOURCE: NFPA Journal (ISSN 1054-8793) v[85] p112-13 January/February '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Industrial waste disposal/Laws and regulations

77 AST
AUTHOR: Toro, Taryn
TITLE: How to close a uranium mine
SOURCE: New Scientist (ISSN 0262-4079) v130 p42-5 June 22 '91

SUBJECTS COVERED:
Uranium mines and mining/Germany
Hazardous substances/Cleanup
Miners

78 AST
AUTHOR: Gallant, Brian J.; Rodriquez, Gary M.
TITLE: Pilgrim managers become hazmat technicians
SOURCE: Electrical World (ISSN 0013-4457) v205 p12-14 May '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Employees, Training of

79 AST
AUTHOR: Toro, Taryn
TITLE: German playgrounds blighted by dioxin
SOURCE: New Scientist (ISSN 0262-4079) v130 p11 May 4 '91

SUBJECTS COVERED:
Dioxin
Playgrounds
Hazardous substances/Cleanup

80 AST
AUTHOR: Kunreuther, Howard; Patrick, Ruth
TITLE: Managing the risks of hazardous waste
SOURCE: Environment (ISSN 0013-9157) v33 p12-15+ April '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Hazardous waste management industry
Health risk assessment

81 AST
TITLE: Cleaned up sites leaking
SOURCE: ENR (ISSN 0891-9526) v226 p17 May 20 '91

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup

82 AST
AUTHOR: Taylor, Michael L.; Barkley, Naomi P.
TITLE: Development and demonstration of a pilot-scale debris washing system
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p488-96 April '91

SUBJECTS COVERED:
Washing
Cleaning compositions
Hazardous substances/Cleanup

83 AST

AUTHOR: Hagarty, Edward Patrick; Gruninger, Robert M.; Balog, George G.
TITLE: Chromium-contaminated site remediation for POTW expansion (Baltimore, Md.)
SOURCE: Water Environment & Technology (ISSN 1044-9493) v3 p53-7 April '91

SUBJECTS COVERED:
Chromium
Building sites
Hazardous substances/Cleanup

84 AST

AUTHOR: Nichols, Alan B.
TITLE: DOE cleanup plan marks start of long, costly program SOURCE: Water Environment & Technology (ISSN 1044-9493) v3 p28+ April '91

SUBJECTS COVERED:
Nuclear weapons plants/Waste
Hazardous substances/Cleanup

85 AST

AUTHOR: Splitstone, D. E.
TITLE: How clean is clean statistically?
SOURCE: Pollution Engineering (ISSN 0032-3640) v23 p90-2+ March '91

SUBJECTS COVERED:
Cleanliness/Standards
Hazardous substances/Cleanup
Industrial waste disposal/Cleanup
Statistical methods

86 AST

AUTHOR: Jacobson, C. Dale; Osborn, Craig G.
TITLE: Getting the lead out
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p60-2 April '91

SUBJECTS COVERED:
Lead waste
Hazardous substances/Cleanup
Soils/Lead content

87 AST

AUTHOR: Prendergast, John
TITLE: Fear of trying (new hazwaste remediation methods)
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p52-5 April '91

SUBJECTS COVERED:
Hazardous substances/Cleanup

88 AST

TITLE: Robotic excavator could play key role in waste cleanup (Haz-Trak)
SOURCE: Machine Design (ISSN 0024-9114) v63 p18 March 21 '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Excavating machinery
Industrial robots

89 AST

AUTHOR: Caldwell-Johnson, Teree; Cummings, Caroline
TITLE: Toxic cleanup for households
SOURCE: BioCycle (ISSN 0276-5055) v32 p54-5 March '91

SUBJECTS COVERED:
Hazardous substances/Cleanup

90 AST

TITLE: DOE awards environmental restoration contracts for defense and energy labs
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p258-9 March '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental research/Federal aid

91 AST

AUTHOR: Sachen, John B.
TITLE: Holy smoke, look at that cloud!
SOURCE: Fire Engineering (ISSN 0015-2587) v144 p43+ February '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Emergency planning

92 AST

AUTHOR: Gilges, Kent; Fouhy, Ken; Staller, Paul
TITLE: Days of reckoning (ecological destruction)
SOURCE: Chemical Engineering (ISSN 0009-2460) v98 p30-1+ February '91

SUBJECTS COVERED:
Hazardous substances/Cleanup
Eastern Europe/Industries and resources
Environmental pollution

93 AST

AUTHOR: Kosowatz, John J.
TITLE: DOE has money, but little to buy
SOURCE: ENR (ISSN 0891-9526) v226 p8-9 February 4 '91

SUBJECTS COVERED:
Nuclear weapons plants/Waste
Hazardous substances/Cleanup

94 AST

AUTHOR: Toro, Taryn
TITLE: Uranium mines leave heaps of trouble for Germany
SOURCE: New Scientist (ISSN 0262-4079) v129 p29 February 2 '91

SUBJECTS COVERED:
Uranium mines and mining/Germany
Soils, Radioactive substances in
Hazardous substances/Cleanup

95 AST

TITLE: Characterization and Cleanup of Chemical Waste Sites, based on papers given at Symposium of the American Chemical Society, 197th, National Meeting, Dallas, Tex., Apr. 10, 1989
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v25 pi-iii, 269-397 December '90

SUBJECTS COVERED:
Hazardous substances/Cleanup

96 AST

AUTHOR: Fischer, Kenneth E.
TITLE: Illegal drug labs pose cleanup problems
SOURCE: Pollution Engineering (ISSN 0032-3640) v22 p70-4 November '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Narcotics trade
Pharmaceutical laboratories

97 AST

AUTHOR: Yeo, Sang-Do; Akgerman, Aydin
TITLE: Supercritical extraction of organic mixtures from aqueous solutions
SOURCE: AIChE Journal (ISSN 0001-1541) v36 p1743-7 November '90

SUBJECTS COVERED:
Supercritical fluid extraction
Peng-Robinson equation
Hazardous substances/Cleanup

98 AST

AUTHOR: Kovalick, Walter W.:Jr.; Town, Jerri P.; Deardorff, Mary B.
TITLE: Assessment of needs for technical information in EPA's hazardous and solid waste programs
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p1478-85 November '90

SUBJECTS COVERED:
Technical information
Hazardous substances/Cleanup
Technology transfer

99 AST

AUTHOR: Toro, Taryn
TITLE: Unwholesome Hamburg unearths a poisonous past
SOURCE: New Scientist (ISSN 0262-4079) v128 p18 November 10 '90

SUBJECTS COVERED:
Hamburg (Germany)
Hazardous substances/Cleanup

100 AST

AUTHOR: Hirschhorn, Joel S.
TITLE: Cleaning up: the second decade
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v60 p66-8 October '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Health risk assessment

101 AST

AUTHOR: O'Sullivan, Kevin G.
TITLE: A soft-sided haz-mat unit
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p55-7 October '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Fire apparatus, Motor/Design
Decontamination

102 AST

TITLE: An inventory for haz-mat response (special advertising section)
SOURCE: Fire Command (ISSN 0746-9586) v57 p29-33 October '90

SUBJECTS COVERED:
Fire departments/Equipment
Hazardous substances/Cleanup

103 AST
AUTHOR: James, Stephen C.
TITLE: Guidance for the field demonstration of remediation technologies
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p801-6 May '90

SUBJECTS COVERED:
Hazardous substances/Cleanup

104 AST
AUTHOR: Kummler, Ralph H.; Witt, Cathrine A.; Powitz, Robert W.
TITLE: A comprehensive survey of graduate education and training in hazardous waste management
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p32-7 January '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental engineering/Study and teaching
Colleges and universities/Graduate work

105 AST
AUTHOR: Gaglierd, Anthony M.
TITLE: Training for radiation accident response
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p57-8+ September '90

SUBJECTS COVERED:
Firefighters/Training
Hazardous substances/Cleanup
Radioactive decontamination

106 AST
TITLE: Hydraulic attachments reduce risk in hazardous materials cleanup
SOURCE: Public Works (ISSN 0033-3840) v121 p94 August '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Excavating machinery/Hydraulic equipment

107 AST
AUTHOR: Kemezis, Paul
TITLE: New RCRA rules could be windfall
SOURCE: ENR (ISSN 0891-9526) v225 p8-9 July 19 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Resource Conservation and Recovery Act

108 AST

AUTHOR: Long, Janice
TITLE: Call to use defense know-how to save environment
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v68 p8 July 9 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Technology transfer

109 AST
AUTHOR: Kohn, Philip M.
TITLE: Cleaning up via materials research
SOURCE: Chemical Engineering (ISSN 0009-2460) v97 p32+ June '90

SUBJECTS COVERED:
Ash handling
Hazardous substances/Cleanup
Chitosan

110 AST
TITLE: Engineers see barriers to high-tech solutions
SOURCE: ENR (ISSN 0891-9526) v224 p12 June 14 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup

111 AST
AUTHOR: Bewley, Richard
TITLE: Setting standards for restoration of contaminated land
SOURCE: Chemistry and Industry (ISSN 0009-3068) vno11 p354-7 June 4 '90

SUBJECTS COVERED:
Reclamation of land
Soil pollution
Hazardous substances/Cleanup

112 AST
AUTHOR: Hermann, Stephen L.
TITLE: Writing an OSHA-required emergency response plan
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p109-10+ June '90

SUBJECTS COVERED:
Hazardous substances/Cleanup

113 AST
TITLE: Documenting emergency cleanup: a photographer's case study
SOURCE: Pollution Engineering (ISSN 0032-3640) v22 p36+ April '90

SUBJECTS COVERED:
Hazardous substances/Cleanup

Photography/Industrial applications

114 AST
AUTHOR: Rubin, Debra K.
TITLE: Air Force lets big contracts
SOURCE: ENR (ISSN 0891-9526) v224 p11-12 May 3 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Air bases/Waste

115 AST
AUTHOR: Hellmann, Margaret A.; Savage, Eldon P.; Cheatham, Richard A.
TITLE: Health risk assessment; a practical approach to reducing public misconceptions
SOURCE: Journal of Environmental Health (ISSN 0022-0892) v52 p352-3 May/June '90

SUBJECTS COVERED:
Health risk assessment
Hazardous substances/Cleanup

116 AST
AUTHOR: Sachen, John B.
TITLE: Make the call (to Chemtrec or the manufacturer of the chemical involved)
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p31+ May '90

SUBJECTS COVERED:
Telephone in business
Chemical industry/Public relations
Hazardous substances/Cleanup

117 AST
AUTHOR: Henry, Martin F.
TITLE: An initial response
SOURCE: Fire Command (ISSN 0746-9586) v57 p34-5 May '90

SUBJECTS COVERED:
Emergency medical care
Hazardous substances/Cleanup

118 AST
AUTHOR: Neuhard, Michael P.
TITLE: Decontamination: a system evolves
SOURCE: Fire Command (ISSN 0746-9586) v57 p28-32+ May '90

SUBJECTS COVERED:
Decontamination

Hazardous substances/Cleanup

119 AST
AUTHOR: Alexander, Glenn
TITLE: Regional teamwork
SOURCE: Fire Command (ISSN 0746-9586) v57 p20-3+ May '90

SUBJECTS COVERED:
Cooperation
Fire departments/Management
Hazardous substances/Cleanup

120 AST
AUTHOR: Carlson, Gene P.
TITLE: Haz mats: expect the unexpected
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p8+ April '90

SUBJECTS COVERED:
Fire departments/Ground command
Hazardous substances/Cleanup

121 AST
AUTHOR: Hermann, Stephen L.
TITLE: Haz-mat incidents: contrasting scenarios
SOURCE: Fire Command (ISSN 0746-9586) v57 p12-15 April '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Hazardous substances/Transportation
Chemical plants/Emergency problems

122 AST
AUTHOR: Tobey, Scott
TITLE: Haz-mat training, Michigan-style
SOURCE: Fire Engineering (ISSN 0015-2587) v143 p89-91 March '90

SUBJECTS COVERED:
Firefighters/Training
Hazardous substances/Cleanup

123 AST
AUTHOR: Keuzenkamp, Kees
TITLE: Dutch policy on clean-up of contaminated soil
SOURCE: Chemistry and Industry (ISSN 0009-3068) vno3 p63-4 February 5 '90

SUBJECTS COVERED:
Environmental law/Netherlands
Hazardous substances/Cleanup

Soil pollution

124 AST
TITLE: Progress in hazardous waste management
SOURCE: Engineering Digest (ISSN 0013-7901) v36 p37-8 February '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Vitrification

125 AST
AUTHOR: Vlatas, D. A.
TITLE: Trends and solutions in hazardous-waste cleanups SOURCE: Journal of Professional Issues in Engineering (ISSN 0733-9380) v116 p67-82 January '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Insurance, Liability

126 AST
AUTHOR: Miller, Carol J.
TITLE: Training municipal employees in hazardous-waste issues SOURCE: Journal of Professional Issues in Engineering (ISSN 0733-9380) v116 p61-6 January '90

SUBJECTS COVERED:
Municipal employees
Employees, Training of
Hazardous substances/Cleanup

127 AST
TITLE: Cleanup to cost $4 billion (Savannah River)
SOURCE: ENR (ISSN 0891-9526) v224 p25 February 8 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Nuclear weapons plants/Waste

128 AST
TITLE: Polluted U.S. harbors face more thorough cleansing
SOURCE: ENR (ISSN 0891-9526) v224 p13 February 8 '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Lake sediments
Marine sediments

129 AST
AUTHOR: Silensky, Philip
TITLE: Monsanto's "MERIT" team: partner with the public sector SOURCE: Fire Engineering (ISSN 0015-2587) v143 p51+ February '90

SUBJECTS COVERED:
Factory fire brigades
Hazardous substances/Cleanup
Chemical industry/Public relations

130 AST
AUTHOR: McGouldrick, Philip D.
TITLE: Acid leak spurs evacuation
SOURCE: Fire Command (ISSN 0746-9586) v57 p14-17 February '90

SUBJECTS COVERED:
Hazardous substances/Cleanup
Tank cars
Fire departments/Ground command

131 AST
AUTHOR: Cheremisinoff, Paul N.
TITLE: Spill and leak containment and emergency response
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p42-4+ December '89

SUBJECTS COVERED:
Emergency planning
Hazardous substances/Cleanup

132 AST
AUTHOR: Cadwallader, Mark W.
TITLE: Liners keep Superfund waste in its place
SOURCE: The Management of World Wastes (ISSN 0745-6921) v32 p32-3 December '89

SUBJECTS COVERED:
Hazardous landfills/Lining
Hazardous substances/Cleanup
Superfund sites

133 AST
AUTHOR: Rubin, Debra K.; Kosowatz, John J.
TITLE: Busy decade looms ahead for cleanup contractors (Forecast '90)
SOURCE: ENR (ISSN 0891-9526) v224 p54-7 January 25 '90

SUBJECTS COVERED:
Hazardous waste management industry
Hazardous substances/Cleanup

2 of 4

134 AST
TITLE: Dressing for successful haz-mat emergency response (special advertising section)
SOURCE: Fire Command (ISSN 0746-9586) v56 p36-41 December '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Clothing, Protective

135 AST
TITLE: Hazardous wastes become pure
SOURCE: American City & County (ISSN 0149-337X) v104 p76 November '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

136 AST
TITLE: PC support for hazardous spills
SOURCE: ENR (ISSN 0891-9526) v223 p45 December 21 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental engineering software

137 AST
AUTHOR: Melamed, Dennis
TITLE: Fixing Superfund
SOURCE: Chemical Engineering (ISSN 0009-2460) v96 p30-1+ November '89

SUBJECTS COVERED:
Industrial waste disposal/Finance
Hazardous substances/Cleanup
Superfund Amendments and Reauthorization Act of 1986

138 AST
AUTHOR: Assennato, G.; Cannatelli, P.; Emmett, E.
TITLE: Medical monitoring of dioxin clean-up workers
SOURCE: American Industrial Hygiene Association Journal (ISSN 0002-8894) v50 p586-92 November '89

SUBJECTS COVERED:
Dioxin/Physiological effect
Hazardous substances/Cleanup
Occupational health
Hazardous substances handling

139 AST
AUTHOR: Lesak, David M.

TITLE: "GEDAPER" for haz mats--the final steps
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p56-60 November '89

SUBJECTS COVERED:
Fire departments/Ground command
Hazardous substances/Cleanup

140 AST
AUTHOR: Lesak, David M.
TITLE: Tactics for haz-mat incidents
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p89+ October '89

SUBJECTS COVERED:
Fire departments/Ground command
Hazardous substances/Cleanup

141 AST
TITLE: [International Conference on the Demonstration of Remedial Action Technologies for Contaminated Land and Groundwater, 2nd, Bilthoven, The Netherlands, Nov. 7-11, 1988]
SOURCE: JAPCA (ISSN 0894-0630) v39 p1178-84 September '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
International cooperation

142 AST
TITLE: Rockwell out at Rocky Flats
SOURCE: ENR (ISSN 0891-9526) v223 p13 September 28 '89

SUBJECTS COVERED:
Government contracts
Nuclear weapons plants/Waste
Hazardous substances/Cleanup

143 AST
AUTHOR: Lesak, David M.
TITLE: Strategic goals at haz-mat incidents
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p60-4 September '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Fire departments/Ground command

144 AST
AUTHOR: Rubin, Debra K.
TITLE: Unions attempting to capture lion's share of toxics market SOURCE: ENR (ISSN 0891-9526) v223 p13-14 August 24 '89

SUBJECTS COVERED:
Safety education
Hazardous substances/Cleanup
Collective labor agreements

145 AST
AUTHOR: Hopper, David R.
TITLE: Cleaning up contaminated waste sites
SOURCE: Chemical Engineering (ISSN 0009-2460) v96 p94-110 August '89
Discussion. 96:8 N '89

SUBJECTS COVERED:
Chemical plants/Waste
Hazardous waste management industry/Laws and regulations
Hazardous substances/Cleanup

146 AST
AUTHOR: Seltzer, Richard
TITLE: Great Lakes pollution remains severe
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v67 p5 August 28 '89

SUBJECTS COVERED:
Water pollution
Great Lakes
Hazardous substances/Cleanup

147 AST
AUTHOR: Brown, J. S.
TITLE: Training the waste watchers
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p69-71 August '89

SUBJECTS COVERED:
Civil engineering/Study and teaching
Hazardous substances/Cleanup

148 AST
AUTHOR: Lesak, David M.
TITLE: Incident estimation and strategic goals at haz-mat incidents
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p89-91+ August '89

SUBJECTS COVERED:
Fire departments/Ground command
Hazardous substances/Cleanup

149 AST
AUTHOR: Franklin, Steve G.
TITLE: Mandatory haz-mat emergency response training: OSHA's final rule

SOURCE: Fire Engineering (ISSN 0015-2587) v142 p31-4+ August '89

SUBJECTS COVERED:
Firefighters/Training
Hazardous substances/Cleanup
Occupational health/Laws and regulations
Hazardous substances handling

150 AST
TITLE: Newsmakers (interview with Thomas P. Grumbly, president of Clean Sites, Inc.)
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p16+ July '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental law/United States

151 AST
AUTHOR: Nadeau, Paul F.
TITLE: What's right with Superfund?
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p6 July '89

SUBJECTS COVERED:
Environmental engineering
Hazardous substances/Cleanup
Superfund Amendments and Reauthorization Act of 1986

152 AST
AUTHOR: Rubin, Debra K.; Kemezis, Paul; Kosowatz, John J.
TITLE: Toxics R&D: a brave new world
SOURCE: ENR (ISSN 0891-9526) v223 p30-4+ August 3 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

153 AST
AUTHOR: Long, Janice
TITLE: Federal nuclear waste cleanup plan proposed
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v67 p5-6 August 7 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Nuclear weapons plants/Waste
Radioactive waste disposal

154 AST
AUTHOR: Bates, E. R.; Herrmann, J. G.; Sanning, D. E.

TITLE: The U.S. Environmental Protection Agency's SITE Emerging Technology Program
SOURCE: JAPCA (ISSN 0894-0630) v39 p927-35 July '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental research/United States

155 AST
TITLE: Cleanup begins at Hanford
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v61 p1154-5 July '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

156 AST
AUTHOR: Lesak, David M.
TITLE: Data gathering at haz-mat incidents
SOURCE: Fire Engineering (ISSN 0015-2587) v142 p61-7 July '89

SUBJECTS COVERED:
Fire departments/Ground command
Hazardous substances/Cleanup

157 AST
TITLE: Court tells Allied-Signal to pay for site cleanup
SOURCE: ENR (ISSN 0891-9526) v223 p16 July 6 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Insurance, Liability
Allied-Signal Inc.

158 AST
TITLE: DOE agrees to fund Rocky Flats cleanup
SOURCE: ENR (ISSN 0891-9526) v222 p19 June 29 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Nuclear weapons plants/Waste

159 AST
AUTHOR: Ichniowski, Tom
TITLE: House appropriations measure would fund many new projects
SOURCE: ENR (ISSN 0891-9526) v222 p17-18 June 29 '89

SUBJECTS COVERED:
Public works/Federal aid

Hazardous substances/Cleanup
United States/Dept. of Energy/Appropriations and expenditures

160 AST
TITLE: Puget cleanup plan mapped
SOURCE: ENR (ISSN 0891-9526) v222 p16 June 22 '89

SUBJECTS COVERED:
Puget Sound (Wash.)
Hazardous substances/Cleanup

161 AST
AUTHOR: Hellmann, Margaret A.; Cheatham, Richard A.
TITLE: Data validation: its importance in health risk assessments
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v23 p638-40 June '89 Discussion. 23:1028 S '89

SUBJECTS COVERED:
Testing laboratories/Quality control
Health risk assessment
Hazardous substances/Cleanup

162 AST
TITLE: Newsmakers (interview with David J. Hayes, law firm of Hogan & Hartson, Washington, D.C.)
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p16+ May '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental law/United States

163 AST
AUTHOR: Kosowatz, John J.
TITLE: Cleaning up after the military
SOURCE: ENR (ISSN 0891-9526) v222 p82-4 May 25 '89

SUBJECTS COVERED:
Munition factories/Waste
Hazardous substances/Cleanup

164 AST
AUTHOR: Simes, Guy F.; Harrington, John S.
TITLE: Quality assurance for the SITE program demonstrations
SOURCE: JAPCA (ISSN 0894-0630) v39 p431-6 April '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Quality control
Performance standards

165 AST
AUTHOR: Carafano, Peter C. TITLE: Handle with care
SOURCE: Fire Command (ISSN 0746-9586) v56 p45-6 May '89
CONTAINS: illustration(s)

SUBJECTS COVERED:
Biological specimens/Transportation
Hazardous substances/Cleanup

166 AST
AUTHOR: Meyninger, Rita; Marlowe, Christopher:1564-1593
TITLE: The model cleanup
SOURCE:

Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p64-7 May '89 Discussion. 59:32 Jl '89

SUBJECTS COVERED:
Lead in the body
Hazardous substances/Cleanup
Health risk assessment

167 AST
AUTHOR: Kiely, Thomas
TITLE: Toxic training
SOURCE: Technology Review (ISSN 0040-1692) v92 p10+ May/June '89
CONTAINS: illustration(s)

SUBJECTS COVERED:
Safety education
Hazardous substances/Cleanup

168 AST
TITLE: Roundtable: groundwater contamination issues
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p92-105 April '89

SUBJECTS COVERED:
Groundwater pollution/Testing
Hazardous substances/Cleanup
Environmental engineering

169 AST
TITLE: Wellsite liability: cradle to grave, worker to shareholder
SOURCE: Offshore (Tulsa, Okla.) (ISSN 0030-0608) v49 p38 April '89

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup

170 AST
TITLE: New toxics markets emerge
SOURCE: ENR (ISSN 0891-9526) v222 p14 April 20 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

171 AST
TITLE: Decommissioning guidelines
SOURCE: Water & Pollution Control (ISSN 0820-4446) v127 p6 April '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Industrial waste disposal/Laws and regulations

172 AST
AUTHOR: Porter, J. Winston
TITLE: Hazardous waste cleanup programs: a critical review
SOURCE: Chemical Engineering Progress (ISSN 0360-7275) v85 p16-25 April '89

SUBJECTS COVERED:
Hazardous waste management industry/Laws and regulations
Hazardous substances/Cleanup
Industrial waste disposal/Finance

173 AST
AUTHOR: Barczy, Sharon
TITLE: CHMR's hands-on approach to hazmat training
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p90-2 March '89

SUBJECTS COVERED:
Employees, Training of
Hazardous substances/Cleanup
Safety education

174 AST
AUTHOR: Longest, Henry
TITLE: Building public confidence in Superfund
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v61 p298-303 March '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Hazardous waste management industry/Public relations
Superfund Amendments and Reauthorization Act of 1986

175 AST
TITLE: DOD cleanups build quietly

SOURCE: ENR (ISSN 0891-9526) v222 p24 March 23 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Military bases/Waste

176 AST
AUTHOR: Matyi, Robert; Rubin, Debra K.; Carr, F. Housley
TITLE: States want bigger say in cleanup of toxics
SOURCE: ENR (ISSN 0891-9526) v222 p13-14 March 23 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
State governments/Federal relations

177 AST
TITLE: Hazwaste cleanup put on fast track
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v59 p20+ April '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

178 AST
TITLE: Dirty business; the Department of Energy still thinks it can clean up its mess
SOURCE: Scientific American (ISSN 0036-8733) v260 p27-8 April '89

SUBJECTS COVERED:
Hazardous substances/Cleanup

179 AST
TITLE: Corps chief eyes DOE waste
SOURCE: ENR (ISSN 0891-9526) v222 p12 March 9 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
United States/Army/Corps of Engineers

180 AST
TITLE: Mobile lab provides on-the-spot testing
SOURCE: Chemical Engineering (ISSN 0009-2460) v96 p188 March '89

SUBJECTS COVERED:
Laboratories, Traveling
Hazardous substances/Cleanup

181 AST

TITLE: Newsmakers (Gary D. Vest, civilian assistant to the chief of the Air Force environmental division)
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p14-15+ February '89

SUBJECTS COVERED:
Military bases/Waste
Hazardous substances/Cleanup

182 AST

TITLE: State DOTs beefing up toxic waste controls
SOURCE: ENR (ISSN 0891-9526) v222 p27-8 February 23 '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Road construction

183 AST

TITLE: Buried toxic wastes trip up jail design
SOURCE: ENR (ISSN 0891-9526) v222 p20+ February 23 '89

SUBJECTS COVERED:
Building sites
Prisons
Hazardous substances/Cleanup

184 AST

AUTHOR: Burgher, Brian; Culpepper, Mike; Zieger, Werner TITLE: Remedial action costing procedures manual
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v21 p89-91 January '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental engineering/Handbooks, manuals, etc.
Cost accounting

185 AST

AUTHOR: Welch, S. H.; Kelly, B. A.; DeLozier, M. F. P.
TITLE: Planning for closures of hazardous waste land disposal units at the Oak Ridge Y-12 Plant
SOURCE: Nuclear and Chemical Waste Management (ISSN 0191-815X) v8 no4 p283-97 '88

SUBJECTS COVERED:
Hazardous landfills/Closure
Hazardous substances/Cleanup
Hazardous waste management industry/Laws and regulations

186 AST

AUTHOR: Anastos, G. J.; Noland, J. W.; Johnson, N. P.
TITLE: Innovative technologies for hazardous waste treatment
SOURCE: Nuclear and Chemical Waste Management (ISSN 0191-815X) v8 no4 p269-81 '88

SUBJECTS COVERED:
Environmental law/United States
Polychlorinated biphenyls
Hazardous substances/Cleanup

187 AST

AUTHOR: Long, Janice
TITLE: President urged to act on waste cleanup
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v67 p22 January 30 '89

SUBJECTS COVERED:
Environmental law/United States
Hazardous substances/Cleanup

188 AST

TITLE: States slow on toxics rules
SOURCE: ENR (ISSN 0891-9526) v222 p16 January 19 '89

SUBJECTS COVERED:
Pollution liability
Hazardous substances/Cleanup

189 AST

AUTHOR: Hanson, Kent E.; Babich, Adam
TITLE: Taking charge: local governments and hazardous substances
SOURCE: Journal of Environmental Health (ISSN 0022-0892) v51 p139+ January/February '89

SUBJECTS COVERED:
Hazardous substances/Cleanup
Local government

190 AST

AUTHOR: Stringfield, William H.
TITLE: Routine calls or hidden emergencies?
SOURCE: Fire Command (ISSN 0746-9586) v55 p36-7 October '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Firefighters/Health and safety

191 AST

AUTHOR: Altmann, Jon C.
TITLE: A regional response for the "Valley" (Phoenix, Ariz. metropolitan area)
SOURCE: Fire Command (ISSN 0746-9586) v55 p30-5 October '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Emergency planning
Firefighters/Training

192 AST
AUTHOR: Snell, Victor R.
TITLE: Response to a greenhouse effect (melted cylinder's fusible plug)
SOURCE: Fire Command (ISSN 0746-9586) v55 p19-21 October '88

SUBJECTS COVERED:
Chlorine
Gas leakage
Hazardous substances/Cleanup

193 AST
TITLE: Montreal PCB cleanup begins
SOURCE: ENR (ISSN 0891-9526) v221 p13-14 September 29 '88

SUBJECTS COVERED:
Polychlorinated biphenyls
Hazardous substances/Cleanup
Warehouses/Fires and fire protection

194 AST
AUTHOR: Cashman, John
TITLE: Emergency-response teams developed
SOURCE: American City & County (ISSN 0149-337X) v103 p98+ September '88

SUBJECTS COVERED:
Public works departments/Emergency problems Hazardous substances/Cleanup

195 AST
AUTHOR: Dybdahl, David J.
TITLE: Insurance for hazardous waste cleanup
SOURCE: Public Works (ISSN 0033-3840) v119 p206+ September '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Insurance, Liability

196 AST
TITLE: Hazwaste TTU regs undergo scrutiny (transportable treatment units)

SOURCE: The Management of World Wastes (ISSN 0745-6921) v31 p17 September '88

SUBJECTS COVERED:
Hazardous substances/Cleanup

197 AST
AUTHOR: Crawford, Mark
TITLE: Weapons legacy: a $110-billion mess?
SOURCE: Science (ISSN 0036-8075) v241 p155 July 8 '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Radioactive waste disposal/Environmental aspects

198 AST
AUTHOR: Merwin, Donald P.
TITLE: Toxic cleanup: no easy answers
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v131 p36-9 July '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Industrial waste disposal/Finance

199 AST
TITLE: EPA shifts duties to regional offices
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v58 p14 July '88

SUBJECTS COVERED:
Hazardous substances/Cleanup

200 AST
TITLE: Record cleanup pact set
SOURCE: ENR (ISSN 0891-9526) v220 p25 June 16 '88

SUBJECTS COVERED:
PCB disposal/Cleanup
Natural gas pipe lines
Hazardous substances/Cleanup

201 AST
AUTHOR: Skinner, John H.; Bassin, N. Jay
TITLE: The Environmental Protection Agency's hazardous waste research and development program
SOURCE: JAPCA (ISSN 0894-0630) v38 p377-87 April '88

SUBJECTS COVERED:
Hazardous substances/Cleanup

Environmental research/United States

202 AST
TITLE: Kesterson cleanup stalls
SOURCE: ENR (ISSN 0891-9526) v220 p27-8 May 12 '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Soils/Selenium content

203 AST
AUTHOR: Rees, John; Lyandres, Sol
TITLE: Mobile haz waste treatment technologies
SOURCE: Pollution Engineering (ISSN 0032-3640) v20 p72-6 April '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Sewage disposal plants, Portable

204 AST
AUTHOR: Meieran, Harvey B.
TITLE: How mobile robots have helped at Chernobyl and other accidents
SOURCE: Nuclear Engineering International (ISSN 0029-5507) v33 p21-3+ April '88

SUBJECTS COVERED:
Mobile robots/Remote control
Radiation/Protection
Hazardous substances/Cleanup

205 AST
TITLE: Firms told to clean up dump
SOURCE: ENR (ISSN 0891-9526) v220 p13 April 14 '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Environmental law/California

206 AST
TITLE: Wheels turn slowly for de minimis settlers
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v60 p434 April '88

SUBJECTS COVERED:
Hazardous substances/Cleanup
Industrial waste disposal/Finance

207 AST
AUTHOR: Hill, Ronald
TITLE: EPA: siting permanent solutions
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v58 p56-8 February '88

SUPERFUND SITES

6 AST
AUTHOR: Rosenbaum, David B.
TITLE: No spoil and less money
SOURCE: ENR (ISSN 0891-9526) v229 p20-1 August 3 '92

SUBJECTS COVERED:
Pile foundations
Grouting
Superfund sites

7 AST
TITLE: Developer to pay up in toxics damage pact
SOURCE: ENR (ISSN 0891-9526) v229 p24 July 13 '92

SUBJECTS COVERED:
Pollution liability
Superfund sites
Housing/Location

8 AST
TITLE: EPA is re-examining Superfund directive
SOURCE: Adhesives Age (ISSN 0001-821X) v35 p40-1 April '92

SUBJECTS COVERED:
Health risk assessment
Superfund sites

9 AST
TITLE: Clean Sites urges risk assessments at Superfund waste sites
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1560+ December '91

SUBJECTS COVERED:
Health risk assessment
Superfund sites

10 AST
AUTHOR: Morse, H. Newcomb
TITLE: The boundaries of an NPL site
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1413 October '91

SUBJECTS COVERED:
Superfund sites

11 AST

AUTHOR: Hanson, David
TITLE: New hazard ranking system called more accurate
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v69 p21 September 16 '91

SUBJECTS COVERED:
Risk
Ranking (Statistical methods)
Superfund sites

12 AST

TITLE: Interlocking mats provide access to Superfund site
SOURCE: Pollution Engineering (ISSN 0032-3640) v23 p99-100 June '91

SUBJECTS COVERED:
Superfund sites
Road construction

13 AST

TITLE: EPA's NPL accuracy questioned
SOURCE: Public Works (ISSN 0033-3840) v122 p114+ April '91

SUBJECTS COVERED:
Health risk assessment
Superfund sites

14 AST

AUTHOR: Doty, Carolyn B.; Travis, Curtis C.
TITLE: Is EPA's National Priorities List correct?
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v24 p1778-80 December '90

SUBJECTS COVERED:
Superfund sites
Ranking (Statistical methods)
Health risk assessment

15 AST

AUTHOR: Rubin, Debra
TITLE: PCBs contained innovatively
SOURCE: ENR (ISSN 0891-9526) v225 p26 December 24 '90
Discussion. 226:3 Mr 11 '91

SUBJECTS COVERED:
Superfund sites

Geotextiles
PCB disposal

16 AST

AUTHOR: Cadwallader, Mark W.
TITLE: Liners keep Superfund waste in its place
SOURCE: The Management of World Wastes (ISSN 0745-6921) v32 p32-3 December '89

SUBJECTS COVERED:
Hazardous landfills/Lining
Hazardous substances/Cleanup
Superfund sites

17 AST

AUTHOR: Hermanson, Mark H.; Hites, Ronald A.
TITLE: Long-term measurements of atmospheric polychlorinated biphenyls in the vicinity of Superfund dumps
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v23 p1253-8 October '89

SUBJECTS COVERED:
Polychlorinated biphenyls/Analysis
Air pollution/Indiana
Landfills/Environmental aspects
Superfund sites

18 AST

AUTHOR: Donnelly, K. C.; Brown, K. W.; DiGiullio, D. G.
TITLE: Mutagenic characterization of soil and water samples from a Superfund site
SOURCE: Nuclear and Chemical Waste Management (ISSN 0191-815X) v8 no2 p135-41 '88

SUBJECTS COVERED:
PCB disposal
Mutagenic substances/Analysis
Biological assay
Superfund sites

19 AST

AUTHOR: Marsh, Gary M.; Constantino, Joseph P.; Logue, James N.
TITLE: Exposure to the Drake superfund site: morbidity among former employees and family members
SOURCE: Journal of Environmental Health (ISSN 0022-0892) v50 p389-94 July/August '88

SUBJECTS COVERED:
Superfund sites
Chemical workers/Diseases and hygiene

Bladder/Cancer

20 AST

AUTHOR: Zirschky, J.; Gentry, B.; Marcus, P.
TITLE: Superfund and contamination of workers' homes
SOURCE: American Industrial Hygiene Association Journal (ISSN 0002-8894) v48 pA718+ November '87

SUBJECTS COVERED:
Superfund sites
Industrial waste disposal/Laws and regulations
Chemical workers/Diseases and hygiene

21 AST

AUTHOR: Repa, E. W.; Herrmann, J. G.; Tokarski, E. F.
TITLE: Evaluating asphalt cap effectiveness at Superfund site
SOURCE: Journal of Environmental Engineering (ISSN 0733-9372) v113 p649-53 June '87

SUBJECTS COVERED:
Superfund sites
Asphalt lining
Waste disposal in the ground

22 AST

TITLE: Statement of Academy of Hazardous Materials Management on Superfund hazardous waste worker health and safety training program to National Institute of Environmental Health Sciences
SOURCE: Pollution Engineering (ISSN 0032-3640) v19 p48 April '87

SUBJECTS COVERED:
Sanitation workers/Health and safety
Hazardous waste management industry/Laws and regulations
Superfund sites

23 AST

TITLE: New Superfund measure focuses on federal sites
SOURCE: Engineering News-Record (ISSN 0013-807X) v217 p11 December 11 '86

SUBJECTS COVERED:
Military bases/Waste
Superfund sites

24 AST

TITLE: N.J. holds Superfund steady
SOURCE: Engineering News-Record (ISSN 0013-807X) v215 p27 December 19 '85

SUBJECTS COVERED:
Superfund sites

25 AST
TITLE: EPA boosts list of superfund sites to 850
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v63 p5-6 September 9 '85

SUBJECTS COVERED:
Superfund sites

26 AST
AUTHOR: Ferguson, James S.; Martin, William F.
TITLE: An overview of occupational safety and health guidelines for Superfund sites
SOURCE: American Industrial Hygiene Association Journal (ISSN 0002-8894) v46 p175-80 April '85

SUBJECTS COVERED:
Superfund sites
Occupational health/Standards
Poisons, Industrial/Safety measures

SUPERFUND SITES/CLEANUP

1 AST
AUTHOR: Holland, J. Kent:Jr.
TITLE: Allocating cleanup contracting risks
SOURCE: Water/Engineering & Management (ISSN 0273-2238) v140 p14-15 April '93

SUBJECTS COVERED:
Contractors/Litigation
Insurance, Liability
Superfund sites/Cleanup

2 AST
AUTHOR: Tunnicliffe, Peter W.; Daniel, John E.; Kiely, Carolyn M.
TITLE: Superfund's pending reauthorization
SOURCE: Water Environment & Technology (ISSN 1044-9493) v5 p64-8 April '93

SUBJECTS COVERED:
Superfund sites/Cleanup

3 AST
AUTHOR: Durda, Judi L.
TITLE: Ecological risk assessments under Superfund
SOURCE: Water Environment & Technology (ISSN 1044-9493) v5 p42-6 April '93

SUBJECTS COVERED:
Environmental impact analysis
Superfund sites/Cleanup

4 AST

AUTHOR: Penmetsa, Ravi K.; Grenney, William J.
TITLE: STEP: model for technology screening for hazardous-waste-site cleanup
SOURCE: Journal of Environmental Engineering (ISSN 0733-9372) v119 p231-47 March/April '93

SUBJECTS COVERED:
Superfund sites/Cleanup
Environmental engineering software
Object-oriented programming

5 AST

AUTHOR: Michaels, Abraham
TITLE: Superfund
SOURCE: Public Works (ISSN 0033-3840) v124 p16 April '93

SUBJECTS COVERED:
Superfund sites/Cleanup

6 AST

TITLE: Robot removes contaminated concrete flooring
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p49 March 15 '93

SUBJECTS COVERED:
Mobile robots/Remote control
Superfund sites/Cleanup

7 AST

AUTHOR: Nocera, John J.; Matthews, Gregory P.; Simmons, Thomas M.
TITLE: Sampling sediment on a complex site
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p54-6 March '93

SUBJECTS COVERED:
Soil sampling
Superfund sites/Cleanup

8 AST

AUTHOR: Austin, Teresa
TITLE: Superfund: new leadership, old problems
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p46-9 March '93

SUBJECTS COVERED:
Superfund sites/Cleanup

9 AST
AUTHOR: Duplancic, Neno
TITLE: Stop Superfund stagnation
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p6 March '93

SUBJECTS COVERED:
Superfund sites/Cleanup

10 AST
AUTHOR: Powers, Mary Buckner
TITLE: Cleanup firms shortlisted for Marathon Battery site
SOURCE: ENR (ISSN 0891-9526) v230 p25 February 1 '93

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts
Nickel cadmium batteries/Manufacture

11 AST
TITLE: Superfund sites: will SACM sack 'em?
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p22+ February '93

SUBJECTS COVERED:
Superfund sites/Cleanup

12 AST
AUTHOR: Krukowski, John
TITLE: SITE publishes fifth Technology Profiles (Superfund Innovative Technology Evaluation)
SOURCE: Pollution Engineering (ISSN 0032-3640) v25 p22-3 January 15 '93

SUBJECTS COVERED:
Superfund sites/Cleanup
Scientific literature

13 AST
AUTHOR: Scalf, Marion R.
TITLE: EPA's Superfund technical support project
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v32 p313-19 December '92

SUBJECTS COVERED:
Superfund sites/Cleanup

Decision support systems

14 AST

TITLE: Corps cleanup awards could be bid soon
SOURCE: ENR (ISSN 0891-9526) v229 p14 December 14 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts

15 AST

AUTHOR: Ichniowski, Tom
TITLE: Feds propose billings cleanup
SOURCE: ENR (ISSN 0891-9526) v229 p9 December 14 '92

SUBJECTS COVERED:
Government contracts/Accounting
Superfund sites/Cleanup
Overhead expenses

16 AST

AUTHOR: Lewis, N. M.; Barkley, N. P.; Williams, Tracie
TITLE: 1992 update of U.S. EPA's Superfund Innovative Technology Evaluation (SITE) emerging technology program
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1644-56 December '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous substances/On site treatment

17 AST

TITLE: New technology tested at Michigan Superfund site
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v63 p28 January '93

SUBJECTS COVERED:
Soil remediation technologies
Superfund sites/Cleanup

18 AST

AUTHOR: Dosani, M. A.; Taylor, M. L.; Wentz, J. A.
TITLE: Results of field demonstrations of a newly developed pilot-scale debris washing system
SOURCE: Environmental Progress (ISSN 0278-4491) v11 p272-7 November '92

SUBJECTS COVERED:
Hazardous substances/On site treatment

Decontamination
Superfund sites/Cleanup

19 AST

TITLE:	PRPs seek new approach for Texas Superfund site
SOURCE:	ENR (ISSN 0891-9526) v229 p11 November 16 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous substances/Laws and regulations

20 AST

AUTHOR:	Bradford, Hazel
TITLE:	Superfund looks forward
SOURCE:	ENR (ISSN 0891-9526) v229 p10 November 9 '92

SUBJECTS COVERED:
Government liability
Superfund sites/Cleanup

21 AST

AUTHOR:	Juliani, Carla
TITLE:	Superfund cleanup, commercial real estate and regulatory programs to be addressed by ASTM environmental assessment committee
SOURCE:	ASTM Standardization News (ISSN 0090-1210) v20 p13-17 October '92

SUBJECTS COVERED:
Environmental property assessment
Superfund sites/Cleanup

22 AST

AUTHOR:	Hasbach, Ann
TITLE:	Waste characterization and removal at Superfund site
SOURCE:	Pollution Engineering (ISSN 0032-3640) v24 p14 October 15 '92

SUBJECTS COVERED:
Superfund sites/Cleanup

23 AST

AUTHOR:	Thibert, Neil F.; De Leon, Dana Grant
TITLE:	Solution-oriented approach to Superfund cleanup
SOURCE:	Public Works (ISSN 0033-3840) v123 p42-4 November '92

SUBJECTS COVERED:
Superfund sites/Cleanup

24 AST

AUTHOR: Staley, Laurel
TITLE: Site demonstration of the Retech plasma centrifugal furnace: the use of plasma to vitrify contaminated soil
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1372-6 October '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration
Solidification (Hazardous waste)

25 AST

AUTHOR: Ember, Lois
TITLE: Firm hit with biggest waste cleanup fine yet (Chemical Waste Management)
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v70 p7 October 19 '92

SUBJECTS COVERED:
Hazardous waste management industry/Laws and regulations
Superfund sites/Cleanup

26 AST

AUTHOR: Steinway, Daniel M.
TITLE: Superfund initiatives favor lenders, municipalities
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p25-7 September 15 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Government liability
Hazardous waste management industry/Laws and regulations

27 AST

AUTHOR: Bryant, Christopher R.
TITLE: EPA unveils Superfund Accelerated Cleanup Model
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p21-2 September 15 '92

SUBJECTS COVERED:
Superfund sites/Cleanup

28 AST

AUTHOR: Thackston, Edward L.; Palermo, Michael R.
TITLE: Predicting effluent PCBs from Superfund site dredged material
SOURCE: Journal of Environmental Engineering (ISSN 0733-9372) v118 p657-65 September/October '92

SUBJECTS COVERED:

Dredging spoil
PCB disposal/Cleanup
Superfund sites/Cleanup

29 AST

TITLE: Two companies agree to fund cleanup work
SOURCE: ENR (ISSN 0891-9526) v229 p21-2 September 28 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Superfund/Finance

30 AST

AUTHOR: Dienemann, Erik; Goldfarb, William; Ahlert, Robert C.
TITLE: Evolution of the Superfund remedy selection process, including an assessment of implementation of permanent and alternative remedial technologies
SOURCE: Environmental Progress (ISSN 0278-4491) v11 p165-72 August '92

SUBJECTS COVERED:
Superfund sites/Cleanup
United States/Environmental Protection Agency Superfund Amendments and Reauthorization Act of 1986

31 AST

AUTHOR: Meckes, Mark C.; Renard, Esperanza; Rawe, Jim
TITLE: Solvent extraction processes: a survey of systems in the SITE program
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p1118-21 August '92

SUBJECTS COVERED:
Soil vapor extraction
Superfund sites/Cleanup

32 AST

TITLE: Excess cleanup: who pays?
SOURCE: ENR (ISSN 0891-9526) v229 p8 August 31 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup costs
Superfund sites/Cleanup
Pollution liability

33 AST

AUTHOR: Krukowski, John
TITLE: Superfund task force head: reforms on track

SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p17 September 1 '92

SUBJECTS COVERED:
Pollution liability
Superfund sites/Cleanup
Superfund Amendments and Reauthorization Act of 1986

34 AST
TITLE: EPA, PRPs sign pact to clean Stringfellow
SOURCE: ENR (ISSN 0891-9526) v229 p14 August 17 '92

SUBJECTS COVERED:
Acid waste
Soil vapor extraction
Superfund sites/Cleanup

35 AST
AUTHOR: Truitt, Wm. Roger
TITLE: Court overturns Superfund landfill decision
SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p20+ August '92

SUBJECTS COVERED:
Landfills/Laws and regulations
Superfund sites/Cleanup

36 AST
TITLE: Corps cleanups to get 'super' contractors
SOURCE: ENR (ISSN 0891-9526) v229 p10 July 13 '92

SUBJECTS COVERED:
Government contracts
Superfund sites/Cleanup

37 AST
TITLE: Corps tries new approaches on Jersey Superfund site
SOURCE: ENR (ISSN 0891-9526) v229 p20-1 July 6 '92 Discussion. 229:8 S 14 '92

SUBJECTS COVERED:
Superfund sites/CleanupHazardous substances/Thermal treatment

38 AST
AUTHOR: Connors, Paul
TITLE: Aeration of groundwater at a Superfund site
SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p15-16 July '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Water purification/Aeration

39 AST

AUTHOR: Garvey, Diane; Donovan, Patrick
TITLE: Wastewater sludge used at a Superfund site
SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p9-12 July '92

SUBJECTS COVERED:
Sewage sludge/Recycling
Reclamation of land
Superfund sites/Cleanup

40 AST

AUTHOR: Powers, Mary Buckner; Rubin, Debra K.
TITLE: Superfund proves risky to IT--and others (Monsanto vs. International Technology over cleanup of MOTCO site)
SOURCE: ENR (ISSN 0891-9526) v228 p32 April 20 '92

SUBJECTS COVERED:
Hazardous waste incineration
Superfund sites/Cleanup
Contractors/Litigation

41 AST

AUTHOR: Ichniowski, Tom
TITLE: Superfund contractors face added scrutiny of overhead charges
SOURCE: ENR (ISSN 0891-9526) v228 p14-15 April 20 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Overhead expenses
Government contracts/Accounting

42 AST

TITLE: OHM wins Superfund job
SOURCE: ENR (ISSN 0891-9526) v228 p8+ April 13 '92

SUBJECTS COVERED:
Hazardous waste management industry
Superfund sites/Cleanup
Hazardous waste incineration

43 AST

AUTHOR: Ichniowski, Tom; Rubin, Debra
TITLE: Superfund accounts bring dispute (CH2M Hill)
SOURCE: ENR (ISSN 0891-9526) v228 p9 March 30 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts/Accounting
Overhead expenses

44 AST

TITLE: Bringing back the Arkansas
SOURCE: Compressed Air (ISSN 0010-4426) v97 p36-43 June '92

SUBJECTS COVERED:
Arkansas River
Mine drainage
Superfund sites/Cleanup

45 AST

AUTHOR: Booth, Pieter N.; Jacobson, Michael A.
TITLE: Development of cleanup standards at Superfund sites: an evaluation of consistency
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p762-6 June '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous substances/Laws and regulations

46 AST

TITLE: Community relations program plays role in site cleanup
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p77-8 May 1 '92

SUBJECTS COVERED:
Environmental engineers/Public relations
Superfund sites/Cleanup

47 AST

AUTHOR: Storck, William
TITLE: Municipalities liable for share of cleanup costs
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v70 p5 March 23 '92

SUBJECTS COVERED:
Hazardous substances/Cleanup costs
Superfund sites/Cleanup
Municipal finance

48 AST

AUTHOR: Miller, Stanton
TITLE: Cleanup delays at the largest Superfund sites
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v26 p658-9 April '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Smelting works/Environmental aspects
Environmental pollution/Montana

49 AST
AUTHOR: Nichols, Alan B.
TITLE: EPA promotes new technologies
SOURCE: Water Environment & Technology (ISSN 1044-9493) v4 p33-4 April '92

SUBJECTS COVERED:
Superfund sites/Cleanup

50 AST
AUTHOR: Wolfe, Paris R.
TITLE: Superfund questioned as environmental answer
SOURCE: Recycling Today (Scrap Market Edition) (ISSN 1051-1091) v30 p25-6 March 15 '92

SUBJECTS COVERED:
Environmental pollution/United States
Hazardous waste management industry/Laws and regulations
Superfund sites/Cleanup

51 AST
AUTHOR: Frank, Uwe; Esposito, Carolyn; Sullivan, Daniel
TITLE: Personnel protection through reconnaissance robotics at Superfund remedial sites
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p341-5 March '92

SUBJECTS COVERED:
Sanitation workers/Health and safety Mobile robots/Remote control
Superfund sites/Cleanup
Air pollution/Testing

52 AST
TITLE: Superfund sites involve more local governments than previously estimated
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p242+ March '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Local government

53 AST
TITLE: Motco will rebid cleanup job as negotiations break down

SOURCE: ENR (ISSN 0891-9526) v228 p12 February 10 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration
Letting of contracts

54 AST

AUTHOR: Krukowski, John
TITLE: [Richard J.] Guimond takes aim at Superfund
SOURCE: Pollution Engineering (ISSN 0032-3640) v24 p31-2 February 15 '92

SUBJECTS COVERED:
Superfund sites/Cleanup

55 AST

AUTHOR: Singh, Virendra; Monti, Amy
TITLE: Value engineering at a Superfund site
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p60-3 March '92

SUBJECTS COVERED:
Landfills/Environmental aspects
Value analysis
Superfund sites/Cleanup

56 AST

AUTHOR: English, Deborah; Whitlock, Carol; Hargens, Dean
TITLE: Coal-gas conundrum
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p49-51 March '92

SUBJECTS COVERED:
Coal tar
Hazardous substances/Biological treatment
Superfund sites/Cleanup

57 AST

AUTHOR: Tusa, Wayne K.
TITLE: Reassessing the risk assessment
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v62 p46-8 March '92

SUBJECTS COVERED:
Health risk assessment
Superfund sites/Cleanup

58 AST

TITLE: EPA announces FY 1991 Superfund accomplishments
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v42 p12 January '92

SUBJECTS COVERED:
Superfund sites/Cleanup

59 AST
AUTHOR: Rubin, Debra K.
TITLE: New "czar" speaks out
SOURCE: ENR (ISSN 0891-9526) v228 p34-5 January 20 '92

SUBJECTS COVERED:
Superfund sites/Cleanup

60 AST
TITLE: Motco may change cleanup plans
SOURCE: ENR (ISSN 0891-9526) v228 p16 January 13 '92

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration

61 AST
AUTHOR: Lewis, N. M.; Gatchett, A. M.
TITLE: U.S. Environmental Protection Agency's SITE Emerging Technology Program: 1991 update
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1645-53 December '91

SUBJECTS COVERED:
Superfund sites/Cleanup

62 AST
AUTHOR: Hanson, David
TITLE: EPA to review Superfund risk analysis
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v69 p15 December 23 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Health risk assessment
Conflict of interests

63 AST
AUTHOR: Rubin, Debra K.; Bradford, Hazel
TITLE: Superfund under the gun
SOURCE: ENR (ISSN 0891-9526) v227 p9 December 16 '91

SUBJECTS COVERED:
Government contracts/Accounting
Superfund sites/Cleanup

64 AST

AUTHOR: O'Neill, Eileen J.
TITLE: Working to increase the use of innovative cleanup technologies
SOURCE: Water Environment & Technology (ISSN 1044-9493) v3 p48-51 December '91

SUBJECTS COVERED:
Superfund sites/Cleanup

65 AST

TITLE: Groundwater cleanups are focus of new study
SOURCE: ENR (ISSN 0891-9526) v228 p15 January 6 '92

SUBJECTS COVERED:
Groundwater pollution
Superfund sites/Cleanup

66 AST

AUTHOR: McGinnis, Gary D.; Borazjani, Hamid; Hannigan, Mary
TITLE: Bioremediation studies at a northern California Superfund site
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v28 p145-58 September '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Wood preservatives
Hazardous substances/Biological treatment

67 AST

AUTHOR: Dial, Clyde J.; Houthoofd, Janet M.; Harris, Eugene F.
TITLE: Engineering Bulletins: aids to the development of remedial alternatives
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1393-6 October '91

SUBJECTS COVERED:
Superfund sites/Cleanup

68 AST

TITLE: Clean Sites releases cleanup case studies to show "what works"
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1296 October '91

SUBJECTS COVERED:
Superfund sites/Cleanup

69 AST

AUTHOR: Conrad, Laura
TITLE: Testing solar-energy technology
SOURCE: Water Environment & Technology (ISSN 1044-9493) v3 p24+ November '91

SUBJECTS COVERED:
Solar power
Superfund sites/Cleanup

70 AST

AUTHOR: Topudurti, Kirankumar
TITLE: New technologies tested for groundwater cleanup at Superfund sites
SOURCE: Water Environment & Technology (ISSN 1044-9493) v3 p24 November '91

SUBJECTS COVERED:
Groundwater pollution
Superfund sites/Cleanup

71 AST

TITLE: Superfund hit again over its inefficiencies
SOURCE: ENR (ISSN 0891-9526) v227 p25 November 11 '91

SUBJECTS COVERED:
Hazardous substances/Cleanup costs
Superfund sites/Cleanup

72 AST

AUTHOR: Krukowski, John
TITLE: Reilly unveils reforms to streamline Superfund
SOURCE: Pollution Engineering (ISSN 0032-3640) v23 p39 November '91

SUBJECTS COVERED:
Superfund sites/Cleanup

73 AST

AUTHOR: Steinway, Daniel M.
TITLE: Municipal superfund liability: controversy erupts
SOURCE: Pollution Engineering (ISSN 0032-3640) v23 p20-2 November '91

SUBJECTS COVERED:
Pollution liability
Government liability
Superfund sites/Cleanup

74 AST

TITLE: Toxic waste program lacks science base
SOURCE: Science (ISSN 0036-8075) v254 p797 November 8 '91

SUBJECTS COVERED:
Superfund sites/Cleanup

75 AST
AUTHOR: Zheng, C.; Bennett, G. D.; Andrews, C. B.
TITLE: Analysis of ground-water remedial alternatives at a Superfund site
SOURCE: Ground Water (ISSN 0017-467X) v29 p838-48 November/December '91 30:440-2 My/Je '92

SUBJECTS COVERED:
Groundwater pollution/New Jersey
Superfund sites/Cleanup

76 AST
TITLE: Superfund liability standard studied
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v61 p25 November '91

SUBJECTS COVERED:
Superfund sites/Cleanup

77 AST
AUTHOR: Ichniowski, Tom; Setzer, Steven W.
TITLE: Superfund fallout begins
SOURCE: ENR (ISSN 0891-9526) v227 p8-9 October 14 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts/Accounting

78 AST
AUTHOR: Ember, Lois
TITLE: Measures set to hasten Superfund cleanups
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v69 p6 October 7 '91

SUBJECTS COVERED:
Government contracts/Accounting
Superfund sites/Cleanup

79 AST
AUTHOR: Brandt, Ellen
TITLE: The Superfund cleanup game (Jim Greeley of Chemical Waste Management, Inc.)
SOURCE: Chemical Engineering (ISSN 0009-2460) v98 p55-6+ September '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste management industry

80 AST
AUTHOR: Merwin, Donald P.
TITLE: Fear of lawsuits keeps Superfund cleanup at bay
SOURCE: Highway & Heavy Construction (ISSN 0362-0506) v134 p18-20 October '91

SUBJECTS COVERED:
Pollution liability
Superfund sites/Cleanup
Hazardous substances/Cleanup costs

81 AST
TITLE: Cleanup approaches studied
SOURCE: ENR (ISSN 0891-9526) v227 p16 September 23 '91

SUBJECTS COVERED:
Environmental law/United States
Superfund sites/Cleanup

82 AST
AUTHOR: Aident, Michael; Foster, Michael; Stolte, William
TITLE: MOTCO superfund site cleanup and restoration
SOURCE: Waste Management (ISSN 0956-053X) v11 no3 p135-46 '91
CONTAINS: bibliography; flow diagram; illustration(s); diagram

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration Incinerators/Environmental aspects

83 AST
TITLE: EPA issues fifth RFP for SITE emerging technology program
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p1030 August '91

SUBJECTS COVERED:
Superfund sites/Cleanup

84 AST

AUTHOR: Hanson, David J.
TITLE: Cities fight to avoid Superfund liability for municipal landfills
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v69 p16-17 August 26 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Pollution liability
Municipal finance

85 AST
TITLE: Keeping new technology in "site"
SOURCE: Chemical Engineering Progress (ISSN 0360-7275) v87 p12 August '91

SUBJECTS COVERED:
Superfund sites/Cleanup

86 AST
AUTHOR: Carraway, James W.; Doyle, J. Robert
TITLE: Innovative remedial action at a wood-treating Superfund site
SOURCE: Tappi Journal (ISSN 0734-1415) v74 p113-18 July '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Wood preservatives
Hazardous substances/On site treatment

87 AST
TITLE: Firms to spend millions in well pollution pact
SOURCE: ENR (ISSN 0891-9526) v227 p22-3 July 22 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Organic water pollutants

88 AST
AUTHOR: Ember, Lois
TITLE: Woburn Superfund case settled for $69.4 million
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v69 p15 July 22 '91

SUBJECTS COVERED:
Damages
Superfund sites/Cleanup
Volatile organic compounds

89 AST
AUTHOR: Rubin, Debra K.

TITLE: Contracts under scrutiny
SOURCE: ENR (ISSN 0891-9526) v227 p10 July 1-8 '91

SUBJECTS COVERED:
Government investigations
Superfund sites/Cleanup
Government contracts/Accounting

90 AST
TITLE: Biggest Superfund award let
SOURCE: ENR (ISSN 0891-9526) v226 p10 June 17 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts

91 AST
AUTHOR: de Percin, Paul R.
TITLE: Demonstration of in situ steam and hot-air stripping technology
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p873-7 June '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Steam jets
Volatile organic compounds

92 AST
TITLE: Hydraulic containment used on Superfund job
SOURCE: ENR (ISSN 0891-9526) v226 p20-1 April 29 '91

SUBJECTS COVERED:
Superfund sites/Cleanup

93 AST
AUTHOR: Martin, John F.
TITLE: Overview and update of the Superfund Innovative Technology Evaluation (SITE) Demonstration Program
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p344-7 March '91

SUBJECTS COVERED:
Superfund sites/Cleanup

94 AST
TITLE: Technologies gain slow nod
SOURCE: ENR (ISSN 0891-9526) v226 p15 March 11 '91

SUBJECTS COVERED:

Superfund sites/Cleanup

95 AST

AUTHOR: Glenn, William M.
TITLE: Starting the new year on a solid green note
SOURCE: Water & Pollution Control (ISSN 0820-4446) v129 p22 February '91

SUBJECTS COVERED:
Environmental law/Canada
Superfund sites/Cleanup

96 AST

AUTHOR: de Percin, Paul R.; Sawyer, Stephen
TITLE: Long-term monitoring of the HAZCON stabilization process at the Douglassville, Pennsylvania Superfund site
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v41 p88-91 January '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Leaching (in soils)
Hazardous substances/Chemical treatment

97 AST

AUTHOR: Raghavan, R.; Coles, E.; Dietz, D.
TITLE: Cleaning excavated soil using extraction agents: a state-of-the-art review
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v26 p81-7 January '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Solvent extraction processes
Industrial waste disposal/Laws and regulations

98 AST

TITLE: EPA loosens rules on Superfund work
SOURCE: ENR (ISSN 0891-9526) v226 p15-16 January 28 '91

SUBJECTS COVERED:
Superfund sites/Cleanup
Government contracts/Laws and regulations

99 AST

TITLE: Computer to track Superfund project data
SOURCE: ENR (ISSN 0891-9526) v226 p27-8 January 21 '91

SUBJECTS COVERED:

Management information systems/Public administration
Superfund sites/Cleanup

100 AST
AUTHOR: Sanning, D. E.; Lewis, N. M.
TITLE: 1990 update of the U.S. Environmental Protection Agency's SITE emerging technology program
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p1706-16 December '90

SUBJECTS COVERED:
Superfund sites/Cleanup

101 AST
TITLE: Clean sites: better method of selecting remedies needed for superfund sites
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p1610+ December '90

SUBJECTS COVERED:
Superfund sites/Cleanup

102 AST
TITLE: Cleanup links companies
SOURCE: ENR (ISSN 0891-9526) v225 p26+ December 17 '90

SUBJECTS COVERED:
Electronics plants/Waste
Superfund sites/Cleanup

103 AST
AUTHOR: Rubin, Debra K.
TITLE: EPA celebrates by getting tougher
SOURCE: ENR (ISSN 0891-9526) v225 p9-10 December 10 '90

SUBJECTS COVERED:
Superfund/Finance
Superfund sites/Cleanup

104 AST
AUTHOR: Fender, Ron
TITLE: A guide to controlling site remediation costs
SOURCE: Pollution Engineering (ISSN 0032-3640) v22 p86-91 November '90

SUBJECTS COVERED:
Hazardous substances/Cleanup costs
Superfund sites/Cleanup

105 AST

AUTHOR: Patel, Yogesh B.; Shah, Mahabal K.; Cheremisinoff, Paul N.
TITLE: Methods of site remediation
SOURCE: Pollution Engineering (ISSN 0032-3640) v22 p58-64+ November '90

SUBJECTS COVERED:
Hazardous substances/On site treatment
Superfund sites/Cleanup

106 AST

AUTHOR: Travis, Curtis C.; Doty, Carolyn B.
TITLE: Can contaminated aquifers at Superfund sites be remediated?
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v24 p1464-6 October '90 Discussion. 25:370-1 Mr '91; 25:810 My '91

SUBJECTS COVERED:
Groundwater pollution
Water purification
Pumping
Superfund sites/Cleanup

107 AST

AUTHOR: Eklund, Bart; Summerhays, John
TITLE: Procedures for estimating emissions from the cleanup of Superfund sites
SOURCE: Journal of the Air & Waste Management Association (ISSN 1047-3289) v40 p17-23 January '90

SUBJECTS COVERED:
Superfund sites/Cleanup
Air pollution/Testing
Volatile organic compounds/Analysis

108 AST

TITLE: Dioxin incineration set for Superfund site (Jacksonville, Ark.)
SOURCE: ENR (ISSN 0891-9526) v225 p11 September 6 '90

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration

109 AST

AUTHOR: Billings, Clayton H.
TITLE: Water for Superfund sites
SOURCE: Public Works (ISSN 0033-3840) v121 p102 August '90

SUBJECTS COVERED:
Water purification
Superfund sites/Cleanup

110 AST

AUTHOR: Klecka, Gary M.; Davis, John W.; Gray, Doug R.
TITLE: Natural bioremediation of organic contaminants in ground water: Cliffs-Dow Superfund site
SOURCE: Ground Water (ISSN 0017-467X) v28 p534-43 July/August '90

SUBJECTS COVERED:
Organic groundwater pollutants/Biodegradation
Water/Microbiology
Superfund sites/Cleanup

111 AST

AUTHOR: Jones, George R.
TITLE: PLC helps solvent extraction process clean up Superfund site
SOURCE: I&CS (ISSN 0746-2395) v63 p111-12 May '90

SUBJECTS COVERED:
Solvent extraction processes
Hazardous substances/Chemical treatment
Numerical controllers
Superfund sites/Cleanup

112 AST

TITLE: Shirco electric infrared incineration system at the Peak Oil Superfund site; EPA technology demonstration summary
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v23 p113-20 March '90

SUBJECTS COVERED:
Hazardous waste incineration
PCB disposal/Cleanup
Heating, Infrared
Superfund sites/Cleanup

113 AST

AUTHOR: Dienemann, E. A.; Kosson, D. S.; Ahlert, R. C. TITLE: Evaluation of serial anaerobic/aerobic packed bed bioreactors for treatment of a Superfund leachate
SOURCE: Journal of Hazardous Materials (ISSN 0304-3894) v23 p21-42 March '90

SUBJECTS COVERED:
Bioreactors
Leachates
Superfund sites/Cleanup

114 AST

TITLE: Court OKs restart of Superfund cleanup
SOURCE: ENR (ISSN 0891-9526) v223 p43+ September 21 '89

SUBJECTS COVERED:
Superfund sites/Cleanup

115 AST
TITLE: EPA's Superfund fix unveiled
SOURCE: ENR (ISSN 0891-9526) v222 p12 June 15 '89

SUBJECTS COVERED:
Superfund sites/Cleanup

116 AST
TITLE: Superfund emerging technologies selected
SOURCE: Pollution Engineering (ISSN 0032-3640) v21 p36-8 March '89

SUBJECTS COVERED:
Superfund sites/Cleanup

117 AST
AUTHOR: de Percin, Paul R.
TITLE: Description of EPA SITE demonstration of the HAZCON stabilization process at the Douglassville, Pennsylvania Superfund site
SOURCE: JAPCA (ISSN 0894-0630) v39 p282-6 March '89

SUBJECTS COVERED:
Industrial waste disposal/Chemical treatment
Superfund sites/Cleanup
Soil analysis

118 AST
AUTHOR: Harless, James D.
TITLE: State providing Superfund technical assistance to local governments
SOURCE: Public Works (ISSN 0033-3840) v120 p60-1 March '89

SUBJECTS COVERED:
Hazardous waste management industry
Superfund sites/Cleanup
Industrial waste disposal/Finance

119 AST
AUTHOR: Harless, James D.
TITLE: Superfund technical assistance: the Tennessee experience
SOURCE: Journal of Environmental Health (ISSN 0022-0892) v51 p140 January/February '89

SUBJECTS COVERED:
Superfund sites/Cleanup

120 AST
AUTHOR: Hirschhorn, Joel S.; Oldenburg, Kirsten U.
TITLE: Are we cleaning up? An assessment of superfund
SOURCE: Chemical Engineering Progress (ISSN 0360-7275) v84 p55-65 December '88

SUBJECTS COVERED:
Superfund sites/Cleanup

121 AST
TITLE: Solidification technology success at Superfund site
SOURCE: Pollution Engineering (ISSN 0032-3640) v20 p32+ December '88

SUBJECTS COVERED:
Petroleum refineries/Waste
Industrial waste disposal/Lime treatment
Superfund sites/Cleanup

122 AST
TITLE: Superfund cleanup of oil/solvent storage facility
SOURCE: Pollution Engineering (ISSN 0032-3640) v20 p75-7 September '88

SUBJECTS COVERED:
Superfund sites/Cleanup
Hazardous waste incineration

123 AST
TITLE: Superfund site cleaned by solvent extraction process
SOURCE: Public Works (ISSN 0033-3840) v119 p109 September '88

SUBJECTS COVERED:
Superfund sites/Cleanup
Solvent extraction processes

124 AST
TITLE: NCP may complicate Superfund cleanups
SOURCE: The Management of World Wastes (ISSN 0745-6921) v31 p14 February '88

SUBJECTS COVERED:
Superfund sites/Cleanup

125 AST
TITLE: Love Canal seen as test case for Superfund
SOURCE: Journal Water Pollution Control Federation (ISSN 0043-1303) v60 p10+ January '88

SUBJECTS COVERED:

Environmental pollution/Physiological effect
Superfund sites/Cleanup
Dioxin

126 AST
TITLE: EPA attacked on Superfund
SOURCE: ENR (ISSN 0891-9526) v219 p13 December 3 '87

SUBJECTS COVERED:
Superfund sites/Cleanup

127 AST
AUTHOR: Fairless, Billy J.; Bates, Dale I.; Hudson, Jody
TITLE: Procedures used to measure the amount of 2,3,7,8-tetrachlorodibenzo-p-dioxin in the ambient air near a Superfund site cleanup operation
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v21 p550-5 June '87

SUBJECTS COVERED:
Dioxin/Analysis
Air pollution/Testing
Superfund sites/Cleanup

128 AST
AUTHOR: Webster, David M.
TITLE: Enclosed thermal soil aeration for removal of volatile organic contamination at the McKin Superfund site
SOURCE: Journal of the Air Pollution Control Association (ISSN 0002-2470) v36 p1156-63 October '86

SUBJECTS COVERED:
Superfund sites/Cleanup
Soil pollution
Hazardous substances/Chemical treatment

129 AST
AUTHOR: Ember, Lois
TITLE: EPA assailed on enforcing Superfund cleanups
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v64 p24-5 May 26 '86

SUBJECTS COVERED:
Superfund sites/Cleanup
Environmental law

130 AST
TITLE: Sites at two universities are on Superfund high-priority list for cleanup of wastes

SOURCE: Chemical & Engineering News (ISSN 0009-2347) v64 p26-7 February 3 '86

SUBJECTS COVERED:
Superfund sites/Cleanup

131 AST
AUTHOR: Josephson, Julian
TITLE: Implementing Superfund (cleaning up abandoned hazardous waste sites)
SOURCE: Environmental Science & Technology (ISSN 0013-936X) v20 p23-8 January '86

SUBJECTS COVERED:
Poisons, Industrial
Superfund sites/Cleanup
Environmental law/United States

132 AST
AUTHOR: Ember, Lois R.
TITLE: Efficacy of cleanup strategy at major superfund site questioned (Pitman, N.J.)
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v63 p10-12 December 2 '85

SUBJECTS COVERED:
Superfund sites/Cleanup
Leaching (in soils)

133 AST
AUTHOR: Hankin, Sam
TITLE: Superfund cleanup doctrine irks paint and chemical firms
SOURCE: Modern Paint and Coatings (ISSN 0098-7786) v75 p156+ October '85

SUBJECTS COVERED:
Paint factories/Waste
Industrial waste disposal/Laws and regulations
Superfund sites/Cleanup

134 AST
TITLE: Superfund chief outlines strategy on hazardous waste cleanups (interview with William N. Hedeman, Jr.)
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v63 p17-18 June 3 '85

SUBJECTS COVERED:
Superfund sites/Cleanup

135 AST
AUTHOR: Ember, Lois R.
TITLE: Stringfellow cleanup mishaps show need to alter Superfund law
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v63 p11-14+ May 27 '85

SUBJECTS COVERED:
Acid waste
Superfund sites/Cleanup

136 AST
TITLE: Progress report: Superfund site cleanup
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v55 p12 February '85

SUBJECTS COVERED:
Superfund sites/Cleanup

137 AST
TITLE: EPA reports on Superfund experience
SOURCE: Journal of the Air Pollution Control Association (ISSN 0002-2470) v35 p291-2 March '85

SUBJECTS COVERED:
Superfund sites/Cleanup

138 AST
TITLE: Superfund strategy: EPA cleanup estimates disputed
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v63 p6 March 11 '85

SUBJECTS COVERED:
Superfund sites/Cleanup

139 AST
AUTHOR: Ward, Bud
TITLE: The new kid on the Superfund block--Clean Sites, Inc.
SOURCE: Pollution Engineering (ISSN 0032-3640) v16 p20-1 July '84

SUBJECTS COVERED:
Superfund sites/Cleanup

140 AST
AUTHOR: Godfrey, K. A.:Jr.
TITLE: Superfund site cleanups
SOURCE: Civil Engineering (American Society of Civil Engineers) (ISSN 0885-7024) v54 p60-4 April '84

SUBJECTS COVERED:

Superfund sites/Cleanup

141 AST
TITLE: Fewer sites to rely on Superfund for cleanup
SOURCE: Chemical & Engineering News (ISSN 0009-2347) v61 p5 November 21 '83

SUBJECTS COVERED:
Superfund sites/Cleanup

9.2 Appendix B - Government Reports Literature Search

Below, the government project search results for the years 1988 to 1993 may be found. The search resulted in a list of 207 technical reports. It is important to note that for space reasons all Records of Decision (ROD) have been removed.

4 of 207 Complete Record Tagged
AN- PB93-163046/HDMl
TI- Engineering Bulletin: Air Pathway Analysisl
CS- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.l
RN- EPA/540/S-92/013l
NT- See also PB89-180053, PB89-180061, PB90-113374, PB90-113382 and PB92-180033.l
PY- Nov 92l
PG- 10pl
PC- PC A02/MF A01 l
LA- Englishl
CP- United Statesl
AB- The bulletin presents information on estimating toxic air emissions from Superfund sites.^The focus is on the collection of air emissions data during the site inspection and remedial investigation/feasibility study and the use of these data for the selection or implementation of treatment technologies.^Emissions of volatile compounds and particulate matter during site disturbances, such as excavation, may be several orders of magnitude greater than the emissions level of an undisturbed site.^The potential air emissions from the undisturbed and disturbed site must be considered before developing a site mitigation strategy.l
DE- *Superfund^*Toxic substances^*Air pollution^*Waste disposal^Remedial action^ Inspection^Feasibility studies^Volatile organic compounds^Particulates^ Hazardous materials^Contractorsl
ID- *Air Pathway Analysis^Remedial project managers^On-scene coordinators^ NTISEPAORDl
SH- 68A (Environmental Pollution and Control_Air Pollution and Control)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)ll

7 of 207 Complete Record Tagged
AN- PB93-159317/HDMl
TI- Public Health Assessment for Circuitron Corporation, Farmingdale, Nassau County, New York, Region 2. CERCLIS No. NYD981184229^Final reptl

CS- New York State Dept. of Health, Albany.|
SP- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
NT- See also PB91-173112. Sponsored by Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
PY- 18 Feb 93|
PG- 41p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The Circuitron Corporation site, which is on the National Priorities List, is situated near the Nassau County-Suffolk County border in East Farmingdale, Suffolk County, New York.^Subsurface soils at the site are contaminated with metals and volatile organic compounds, primarily copper and 1,1,1-trichloroethane, respectively.^Groundwater from the shallow aquifer under the site is significantly contaminated with 1,1,1-trichloroethane at levels exceeding the New York State Department of Health standard for public water supplies and the respective maximum contaminant level set by the United States Environmental Protection Agency.^Currently, groundwater in the shallow aquifer is not used as a source of drinking water or for other domestic purposes.^The potential for impacts to indoor air quality at nearby businesses warrants the need for further investigation.^Other exposure pathways of concern include inhalation, ingestion, and direct contact with on-site soil/sediment/fugitive dusts only during anticipated remedial activities which involve excavation of on-site soils.|
DE- *Public health^*Environmental surveys^*Risk assessment^*Hazardous materials^ Waste disposal^Volatile organic compounds^Metals^Ingestion(Biology)^ Toxicity^Copper^Indoor air pollution^Exposure^Path of pollutants^Inhalation^ Skin(Anatomy)^Remedial action|
ID- *Suffolk County(New York)^National Priorities List^Ethane/trichloro^ NTISHEWTSD|
SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57Y (Medicine and Biology_Toxicology)||

14 of 207 Complete Record Tagged
AN- DE93001640/HDM|
TI- Unique issues concerning 'placement' vs 'movement' of contaminated soils at ORNL's CERCLA sites|
AU- Greer, J. K. ^Schrof, C. A. |
CS- Oak Ridge National Lab., TN.|
RN- CONF-921029-9|
SP- Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- Annual Department of Energy model conference on waste management and environmental restoration, Oak Ridge, TN (United States), 19-22 Oct 1992. Sponsored by Department of Energy, Washington, DC.|
PY- 1992|
PG- 11p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|

DT- Conference proceeding|
AB- At Oak Ridge National Laboratory, which is owned and operated by the US Department of Energy (DOE), there are several areas where hazardous wastes and/or radioactive materials have been placed in shallow land burial trenches or "auger" holes for disposal.^Since Oak Ridge Reservation (ORR) has been placed on the National Priority List (NPL) by the US Environmental Protection Agency (EPA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) applies to waste disposal sites at ORNL.^Under CERCLA, the RCRA regulations, pertaining to the LDRs, apply to CERCLA activities if the regulations are deemed "applicable or relevant and appropriate" (ARARS) by the lead agency or by the EPA.^This report discusses the following issue: Under what conditions will contaminated soil and debris generated at a Superfund site be subject to the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs) treatment standards.|
DE- *ORNL^*Soils^Evaluation^Excavation^Ground Disposal^*Radioactive Waste Management^Regulations^Remedial Action^Removal^US EPA^US Superfund^Meetings|
ID- EDB/054000^EDB/052002^*Hazardous materials^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

15 of 207 Complete Record Tagged
AN- DE93605933/HDM|
TI- Underground Research Laboratory room 209 instrument array. Vol. 1,2. Measured response to excavation|
AU- Lang, P. A. ^Kuzyk, G. W. ^Babulic, P. J. ^Bilinsky, D. M. ^Everitt, R. A. |
CS- Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.|
RN- AECL-9566-3(VOL.1,2)|
NT- U.S. Sales Only.|
PY- Jun 91|
PG- 280p|
PC- PC A13/MF A03 |
LA- English|
CP- Canada|
AB- An in situ excavation response test was conducted at the 240 Level of the Underground Research Laboratory (URL).^The test was carried out in conjunction with the drill-and-blast excavation of a near-circular tunnel (Room 209), about 3.5 m in diameter.^The tunnel was excavated through a tunnel axis.^Three modelling groups made predictions of the response of the rock mass and hydraulic behaviour of the water-bearing fracture to excavation.^The tunnel was excavated in two stages, a pilot tunnel followed by a slash, providing two complete sets of response measurements.^Careful excavation was carried out to ensure the excavation shape after each blast round agreed closely with the planned shape incorporated in the numerical models.^Instrumentation installed before the tunnel was extended monitored the complete strain tensor at eight locations around the tunnel, radial displacements and piezometric pressures at nine locations in the fracture.^ As well, tunnel convergence, water flows from the fracture, and hydraulic conductivity of the fracture at nine locations, were measured after each

excavation step.^The final tunnel profiles were accurately surveyed, and the geology was mapped in detail.^The results are presented in this report for comparison with the modellers' predictions (reported in AECL--9566-2).^ Some preliminary conclusions and recommendations regarding the field testing are presented.^(Atomindex citation 23:083904)|
DE- *Tunnels^Excavation^Geologic Fractures^Ground Water^Hydrology^Rock Mechanics^Strain Gages|
ID- *Foreign technology^EDB/052002^*Underground Research Laboratory^ *Radioactive waste disposal^*Hazardous materials^NTISINIS|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^48F (Natural Resources and Earth Sciences_Geology and Geophysics)||

16 of 207 Complete Record Tagged
AN- PB93-133387/HDM|
TI- Innovative Treatment Technologies: Semi-Annual Status Report (Fourth Edition)|
AU- Fiedler, L. |
CS- Environmental Protection Agency, Washington, DC. Technology Innovation Office.|
RN- EPA/542/R-92/011|
NT- See also PB92-173210.|
PY- Oct 92|
PG- 87p|
PC- PC A05/MF A01 |
LA- English|
CP- United States|
AB- The twice yearly report contains site-specific information on Superfund sites (both remedial and emergency response actions) and non-Superfund sites (within the Departments of Defense and Energy) where innovative treatment technologies have been or are being used.^Innovative treatment technologies are treatment technologies for which a lack of data on cost and performance makes their selection and use at Superfund sites more difficult.^The report documents the use of the following innovative treatment technologies to treat ground water in situ, soils, sediments, sludge, and solid-matrix wastes; bioremediation (ex situ), bioremediation (in situ), chemical treatment, dechlorination, in situ flushing, in situ vitrification, soil vapor extraction, soil washing, solvent extraction, thermal desorption, and other technologies.|
DE- *Hazardous materials^*Waste treatment^*Ground water^*Soils^Water pollution control^Sediments^Sludge^Biological treatment^Extraction^Dechlorination^In-situ processing^Excavation^Tables(Data)^Vitrification^Vapors^Flushing|
ID- *Superfund^*Remedial action^NTISEPAERR|
SH- 68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)||

17 of 207 Complete Record Tagged
AN- PB93-131878/HDM|
TI- Techniques for the Fabrication of Geomembrane Filled Seams^Journal article|

AU- Carson, D. A. ^Landreth, R. E. |
CS- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
RN- EPA/600/J-92/412|
NT- Pub. in Waste Management and Research, v10 p399-410 1992. See also PB92-188770.|
PY- c1992|
PG- 14p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Journal article|
AB- Geomembranes employed to overlay the excavation for landfills must be seamed together at the site of the landfill.^To ensure the integrity of the containment system of the landfill, these sheets or blankets must be carefully seamed.^The methods in present, common use are extrusion fillet welding whereby the extrudate is placed over the edge of the seam; extrusion flat welding whereby the extrudate is placed between the two sheets to be joined; hot wedge seaming, a thermal fusion bonding, whereby an electrically heated wedge melts the sheets to be joined, after which a roller applies pressure to ensure the seal; hot air seaming whereby hot air between the sheets melt the surfaces to be joined; chemical fusion whereby a liquid chemical is applied between the two sheets to be joined; and chemical adhesive whereby a dissolved bonding agent (adherent) is applied between the two sheets to be joined.^(Copyright (c) 1992 ISWA.)|
DE- *Geotechnical fabrics^*Waste management^*Inspection^*Hazardous materials^ *Seaming^Land pollution control^Earth fills^Field tests^Welding^Adhesives^ Bonding^Extruding^Reprints|
ID- *Geosynthetic materials^NTISEPAORD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^71B (Materials Sciences_Adhesives and Sealants)^94G (Industrial and Mechanical Engineering_Manufacturing Processes and Materials Handling)||

18 of 207 Complete Record Tagged
AN- DE92040571/HDM|
TI- Remote visual examination system for characterization of waste sites|
AU- Sumsion, M. L. |
CS- Westinghouse Hanford Co., Richland, WA.|
RN- WHC-SA-1585^CONF-9207102-67|
SP- Department of Energy, Washington, DC.|
CN- AC06-87RL10930|
NT- Institute of Nuclear Materials Management (INMM) annual meeting, Orlando, FL (United States), 19-22 Jul 1992. Sponsored by Department of Energy, Washington, DC.|
PY- Jul 92|
PG- 14p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- A remote visual examination system for characterizing waste sites is a versatile color television system capable of acquiring information in high-radiation or hazardous areas.^The system can characterize waste in piping

runs up to 1500 ft long with diameters of 2 inches and up.^Complementary information such as temperature, grade, radiation dose, anomaly location and hazardous gas level can all be monitored simultaneously with the visual images.^The system can be converted for tank or vault examinations.^Large cost savings and enhanced personnel safety may be realized by using this system.^Excavation time and money can be saved and nondestructive evaluation of piping systems and tanks can be performed.|
DE- *Hazardous Materials^*Radioactive Wastes^*Remote Viewing Equipment^ Evaluation^Inspection^Pipes^Remedial Action^Tanks^Meetings|
ID- EDB/052002^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^94K (Industrial and Mechanical Engineering_Laboratory and Test Facility Design and Operation)||

19 of 207 Complete Record Tagged
AN- PB93-116093/HDM|
TI- Superfund Innovative Technology Evaluation (SITE) Program|
CS- Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.|
RN- EPA/540/8-91/005|
NT- See also PB88-242961.|
PY- 1991|
PG- 21p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The U.S.^Environmental Protection Agency's Superfund Innovative Technology Evaluation (SITE) Program, now in its fifth year, serves several purposes, including (1) the development and implementation of innovative treatment technologies for hazardous waste remediation and (2) the development and implementation of monitoring and measurement technologies for evaluating the nature and extent of hazardous waste site contamination.^The update bulletin, developed as a part of the Technology Transfer Program, highlights progress over the past year under the Demonstration, Emerging Technologies, and Monitoring and Measurement Technologies Programs.|
DE- *Hazardous materials^*Waste treatment^Monitoring^Sites^Biodeterioration^ Incinerators^Soils^Washing^Chemical analysis^Photographs^Excavation^ Profiles^Oxidation reduction reactions|
ID- *Superfund^SITE program^Vacuum extraction^National priorities list^NTISGPO^ NTISEPAADM|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)^43F (Problem Solving Information for State and Local Governments_Environment)||

20 of 207 Complete Record Tagged
AN- PB93-100121/HDM|
TI- Demonstration of a Trial Excavation at the McColl Superfund Site^ Application analysis rept. (Final)|

CS- IT Corp., Cincinnati, OH.|
RN- EPA/540/AR-92/015|
SP- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
CN- EPA-68-02-4284|
NT- See also PB92-226448. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
PY- Oct 92|
PG- 61p|
PC- PC A04/MF A01 |
LA- English|
CP- United States|
AB- The project describes the trial excavation performed at the McColl Hazardous Waste Site.^Excavation at this site presents unique problems due to the high potential for release of sulfur dioxide and volatile odorous compounds contained in the waste.^The excavation demonstration was used to obtain information on the utilization of an enclosure and associated air treatment systems around the excavation to minimize air emissions and the use of foam vapor suppressants to reduce emissions from the waste during excavation.^In addition, information was obtained on processing the tar fraction of this waste by mixing it with cement and fly ash.^The demonstration is documented in two reports: (1) a Technology Evaluation Report describing the field activities and laboratory results; and (2) this Applications Analysis Report, which interprets the data and discusses the potential applicability of the technology.|
DE- *Superfund^*Hazardous materials^*Air pollution control^*Remedial action^ *Waste treatment^Excavation^Design criteria^Performance evaluation^Economic analysis^Technology utilization^Volatile organic compounds^Sulfur dioxide^ Materials handling^Incineration|
ID- *Fullerton(California)^NTISEPAORD|
SH- 68A (Environmental Pollution and Control_Air Pollution and Control)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

21 of 207 Complete Record Tagged
AN- DE92019945/HDM|
TI- Development of robotics technology for remote characterization and remediation of buried waste|
AU- Noakes, M. W. ^Richardson, B. S. ^Burks, B. L. ^Sandness, G. R. |
CS- Oak Ridge National Lab., TN.|
RN- CONF-9207102-60|
SP- Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- Institute of Nuclear Materials Management (INMM) annual meeting, Orlando, FL (United States), 19-22 Jul 1992. Sponsored by Department of Energy, Washington, DC.|
PY- 1992|
PG- 7p|
PC- PC A02/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- Detection, characterization, and excavation of buried objects and materials are important steps in the restoration of subsurface disposal sites.^The US

Department of Energy (DOE), through its Buried Waste Robotics Program, is developing a Remote Characterization System (RCS) to address the needs of remote subsurface characterization and, in a joint program with the US Army, is developing a teleoperated excavator.^Development of the RCS is based on recent DOE remote characterization testing and demonstrations performed at Oak Ridge National Laboratory and Idaho National Engineering Laboratory.^The RCS, which will be developed and refined over a two- to three-year period, is designed to (1) increase safety by removing on-site personnel from hazardous areas, (2) remotely acquire real-time data from multiple sensors, (3) increase cost-effectiveness and productivity by partial automation of the data collection process and by gathering and evaluating data from multiple sensors in real time, and (4) reduce costs for other waste-related development programs through joint development efforts and reusable standardized subsystems.^For retrieval of characterized waste, the Small Emplacement Excavator, an existing US Army backhoe that is being converted to teleoperated control, will be used to demonstrate the feasibility of retrofitting commercial equipment for high-performance remote operations.|

DE- *Earthmoving Equipment^*Explosives^*Hazardous Materials^*Radioactive Wastes^
Automation^Excavation^Performance Testing^Radiation Hazards^Remedial Action^ *Remote Handling Equipment^Robots^Underground Disposal^Vehicles^Meetings|

ID- EDB/420203^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^41C (Manufacturing Technology_Robots and Robotics)||

22 of 207 Complete Record Tagged

AN- PB92-216027/HDM|

TI- Feasibility Study: Hazardous Waste Remediation at the Chabarovice Site. Volume 1^Export trade information|

CS- CH2M Hill International Corp., Gainesville, FL.|

RN- TDP-91-717A-VOL-1|

NT- This document was provided to NTIS by the U.S. Trade and Development Program, Rosslyn, VA.|

PY- Nov 91|

PG- 230p|

PC- PC$44.50 |

LA- English|

CP- United States|

AB- The feasibility study (FS) project grew out of a study of hazardous waste sites in the Czech and Slovak Federal Republic (CSFR) sponsored in 1990 by the U.S.^Trade and Development Program (TDP).^The TDP study recommended funding an FS for remedial actions at the Chabarovice site.^The TDP issued a grant for the FS to the Czech Republic, Ministry of Environment.^The Chabarovice waste site is about 1 kilometer southeast of Chabarovice, immediately south of the road from Chabarovice to Usti nad Labem.^Disposal of ash and clinker at the site began in 1908, and disposal of chemical wastes began in the mid-1970s.^The site is owned by Spolchemie, a large chemical plant in Usti nad Labem.^The details of the site description and of the geological setting are presented in Appendix A and Appendix D. The site resembles a small, flat volcano with a caldera in the center.|

DE- *Czechoslovakia^*Sites^*Hazardous materials^*Waste treatment^Ground water^
Feasibility studies^Runoff^Capping^Removal^Disposal^Excavation^Evaluation^
Comparison^Licenses^Design criteria^Requirements^Screening^Surface waters^
Hydrogeology^Coal seams^Aquifers|
ID- Remedial action^Alternative planning^Chabarovice Site^NTISUSTDP|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and
Control)^48G (Natural Resources and Earth Sciences_Hydrology and Limnology)^
48F (Natural Resources and Earth Sciences_Geology and Geophysics)||

23 of 207 Complete Record Tagged
AN- DE92014819/HDM|
TI- Resource Conservation and Recovery Act, Part B Permit Application. Chapter
D, Appendix D1 (conclusion): Volume 3, Revision 1.0|
CS- Westinghouse Electric Corp., Carlsbad, NM. Waste Isolation Pilot Plant
Project.|
SP- Department of Energy, Washington, DC.|
CN- AC04-86AL31950|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- 1992|
PG- 1395p|
PC- PC A99/MF E16 |
LA- English|
CP- United States|
AB- This report, Part B (Vol.^3) of the permit application for the WIPP
facility, contains information related to the site characterization of the
facility, including geology, design, rock salt evaluations, maps, drawings,
and shaft excavations.^(CBS)|
DE- *Alpha-Bearing Wastes^*WIPP^Compiled
Data^Design^Excavation^Geology^*Permit
Applications^Salt Deposits^Shafts^Site Characterization^Stratigraphy^
Underground Disposal^Tables(Data)|
ID- EDB/052002^EDB/056000^*Hazardous materials^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and
Control)^68F (Environmental Pollution and Control_Radiation Pollution and
Control)^77G (Nuclear Science and Technology_Radioactive Wastes and
Radioactivity)||

24 of 207 Complete Record Tagged
AN- DE92010543/HDM|
TI- Development of a teleoperated backhoe for buried waste excavation|
AU- Burks, B. L. ^Killough, S. M. ^Thompson, D. H. |
CS- Oak Ridge National Lab., TN.|
RN- CONF-920851-2|
SP- Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- Spectrum '92: nuclear and hazardous waste management international topical
meeting, Boise, ID (United States), 23-27 Aug 1992. Sponsored by Department
of Energy, Washington, DC.|
PY- 1992|
PG- 6p|
PC- PC A02/MF A01 |
LA- English|

CP- United Statesl
DT- Conference proceedingl
AB- For nearly five decades the United States (US) Department of Energy (DOE) and its predecessor agencies have engaged in broad-based research and development activities as well as nuclear weapons component production.^As a by-product of these activities, large quantities of waste materials have been granted.^One of the most common approaches used for solid waste storage was to bury waste containers in pits and trenches.^With the current emphasis on environmental restoration, DOE now plans to either retrieve much of the legacy of buried waste or stabilize the waste in place via in situ vitrification or other means.^Because of the variety of materials that have been buried over the years, the hazards of retrieval are significant if performed using conventional manned operations.^The potential hazards, in addition to radiation exposure, include pyrophorics, toxic chemicals, and explosives.^Although manifests exist for much of the buried waste, these records are often incomplete compared to today's requirements.^ Because of the potential hazards and uncertainty about waste contents and container integrity, it is highly desirable to excavate these wastes using remotely operated equipment.^In this paper the authors describe the development of a teleoperated military tractor called the Small Emplacement Excavator (SEE).^Development of the SEE is being funded jointly by both DOE and the US Army.^The DOE sponsor is the Office of Technology Development (OTD) Robotics Program.^The US Army sponsor is the Program Manager for Ammunition Logistics, Picatinny Arsenal.^The primary interest for DOE is in the application to remote excavation of buried waste, while the primary emphasis for the US Army is in the remote retrieval of unexploded ordnance.^ Technical requirements for these two tasks are very similar and, therefore, justify a joint development project.^1 ref.l
DE- *Earthmoving Equipment^*Explosives^*Hazardous Materials^*Radioactive Wastes^
Design^Excavation^Remote Control^Vehicles^*Waste Disposal^Meetingsl
ID- EDB/420203^NTISDEl
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77F (Nuclear Science and Technology_Radiation Shielding, Protection, and Safety)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^50C (Civil Engineering_Construction Equipment, Materials, and Supplies)ll

27 of 207 Complete Record Tagged
AN- PB92-226448/HDMl
TI- Technology Evaluation Report: Site Program Demonstration of a Trial Excavation at the McColl Superfund Site^Final reptl
CS- IT Corp., Cincinnati, OH.l
RN- EPA/540/R-92/015l
SP- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.l
CN- EPA-68-02-4284l
NT- See also PB92-105857. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.l
PY- Sep 92l
PG- 212pl
PC- PC A10/MF A03 l

LA- Englishl
CP- United Statesl
AB- A trial excavation of approximately 137 cubic yards of waste was performed at the McColl Superfund Site in Fullerton, CA, to better determine the nature of the waste, any treatment needed to improve its handling characteristics, and the extent of air emissions that might occur during excavation.^The type of information is necessary to plan full-scale remediation of the highly acidic petroleum refinery waste buried at the site.^The trial excavation was conducted within a temporary enclosure with air exhausted from the enclosure through a sodium hydroxide-based wet scrubber and activated-carbon bed adsorber to reduce air emissions of sulfur dioxide and organic compounds.^Foam was used in an attempt to suppress atmospheric releases from the raw waste during excavation, storage, and processing.^The air exhaust was monitored for total hydrocarbons and sulfur dioxide before and after the air emission control system.^In addition, total hydrocarbons and sulfur dioxide were monitored along the site perimeter to determine potential impact of air emissions on the nearby community.l
DE- *Soils^*Incinerators^*Waste treatment^*Hazardous materials^Excavation^Sites^ Refineries^Activated carbon treatment^Adsorption^Sulfur dioxide^Monitoring^ Pilot plants^Scrubbers^Hydrocarbons^Air pollution^Petroleum^Wastesl
ID- *Superfund^*Fullerton(California)^Oil recycling^NTISEPAORDl
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^48E (Natural Resources and Earth Sciences_Soil Sciences)ll

30 of 207 Complete Record Tagged
AN- AD-A252 968/3/HDMl
TI- Full-Scale Incineration System Demonstration at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 8. Delisting^Final rept. Sep 86-Feb 89l
AU- Haley, D. J. l
CS- EG and G Idaho, Inc., Idaho Falls.l
RN- AFESC/ESL-TR-89-39-VOL-8l
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.l
NT- See also Volume 1, AD-A252 956.l
PY- Jul 91l
PG- 93pl
PC- PC A05/MF A01 l
LA- Englishl
CP- United Statesl
AB- Volume VIII documents the regulatory and technical lessons learned concerning disposition of soil after treatment.^The report also documents the data collected in support of soil disposition.^It explains EPA's use of the Vertical Horizontal Spread/Organic Leachate Model (VHS/OLM) to show the health risk of a hazardous waste site.^Field operations and subsequent analyses were undertaken to support delisting of the soil, including the verification test burn, a RCRA trial burn, and data collected during routine operations.^Conclusions are presented that can be drawn from the delisting process.^It examines problems with EPA's Practical Quantitation Limits and VHS/OLM, the cost and level of effort, the technical complexity, the required concentrations needed for delisting, and the Air Force response to EPA's implied delisting denial.^Six recommendations are offered

to anyone considering submission of a delisting petition for a hazardous waste.|
DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^Lessons learned^Cost effectiveness^Decontamination^Recovery^Naval shore facilities^ Herbicides^Contaminants^Sampling^Excavation^Dioxins|
ID- *Hazardous wastes^Incineration^Gulfport(Mississippi)^*Naval Battalion Contruction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

31 of 207 Complete Record Tagged
AN- AD-A252 967/5/HDM|
TI- Full-Scale Incineration System Demonstration at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 6. Project Management/Site Services^Final rept. Sep 86-Feb 89|
AU- Cook, J. A. |
CS- EG and G Idaho, Inc., Idaho Falls.|
RN- AFESC/ESL-TR-89-39-VOL-7|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 8, AD-A252 968.|
PY- Jul 91|
PG- 101p|
PC- PC A06/MF A02 |
LA- English|
CP- United States|
AB- The demonstration program consisted of three phases.^The first phase, the Verification Test Burn, demonstrated the effectiveness of the 100 ton/day incinerator to destroy soil contaminated with constituents of HO, in particular 2,3,7,8-tetrachlorinated dibenzo dioxin (2,3,7,8-TCDD).^The second phase demonstrated the ability of the incinerator to meet the requirements of the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, which specifies that the incinerator must meet or exceed a Destruction and Removal Efficiency of 99.9999%.^The third phase determined the cost and reliability of using the incineration on a long-term basis.^ This report summarizes the daily activities during operations at the NCBC and the Idaho National Engineering Laboratory (INEL) project management oversight.|
DE- *Incinerators^*Pollution abatement^*Waste disposal^Management planning and control^Environmental protection^*Air pollution^Water pollution^Hazardous materials^Cost effectiveness^Decontamination^Recovery^Naval shore facilities^Herbicides^Contaminants^Sampling^Excavation^Dioxins|
ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

32 of 207 Complete Record Tagged
AN- AD-A252 966/7/HDMI
TI- Full-Scale Incineration System Demonstration at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 6. Soil Excavation^Final rept. Sep 86-Feb 89I
AU- Deiro, S. W. I
CS- EG and G Idaho, Inc., Idaho Falls.I
RN- AFESC/ESL-TR-89-39-VOL-6I
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.I
NT- See also Volume 7, AD-A252 967.I
PY- Jul 91I
PG- 188pI
PC- PC A09/MF A02 I
LA- EnglishI
CP- United StatesI
AB- During the third phase of the NCBC Demonstration Project, 1,006 20 by 20-foot plots were excavated from a depth of 3 inches up to as much as 51 inches.^The total soil excavated from these plots was approximately 15,000 cu. d. The equipment used in the soil excavation task were a bulldozer, front-end loader, dump truck, asphalt mill (planer), and track hoe.^Air monitoring was performed at all times during excavation to minimize the possibility of movement of contaminated dust offsite.^Immediately after the excavation of a plot, a bottom-of-hole sample was taken from the plot and shipped to an analytical laboratory for 2,3,7,8-TCDD analysis.^As the soil was excavated, it was placed in one of three soil storage tents located near the incinerator.^A material handler, using a front-end loader, transferred the soil from the storage tents to the weigh hopper/shredder unit where it was weighed, shredded into small pieces, and dropped onto a covered feed conveyor.^The covered conveyor belt carried the soil to the feed hopper where the auger fed the soil into the rotary kiln incinerator.^ The soil in the rotary kiln was subjected to a minimum temperature of 1,450 F for 20 to 40 minutes to volatilize the organics.^At the outlet of the kiln, the burned solids (ash) fell into a water quench tank, while the gases and submicron particulate flowed upward through the cyclones and crossover duct to the Secondary Combustion Chamber.I
DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^Ashes^*Air pollution^Excavation^Decontamination equipment^*Earth handling equipment^Decontamination^Recovery^Naval shore facilities^ Herbicides^Contaminants^Soils^DioxinsI
ID- *Hazardous wastes^Incineration^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAFI
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)II

33 of 207 Complete Record Tagged
AN- AD-A252 963/4/HDMI
TI- Full-Scale Incineration System Demonstration Verification Test Burns at the

Naval Battalion Construction Center, Gulfport, Mississippi. Volume 3. Treatability Tests. Part 5^Final rept. Sep 86-Feb 89|
AU- Haley, D. J. ^Thomas, R. W. ^Derrington, D. B. |
CS- EG and G Idaho, Inc., Idaho Falls.|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 6, AD-A252 964.|
PY- Jul 91|
PG- 138p|
PC- PC A07/MF A02 |
LA- English|
CP- United States|
AB- The information contained in this volume describes the events, the planning efforts, and the data results of a test burn conducted on a 100 ton/day mobile incinerator that was used to process soil contaminated with constituents of herbicide orange.^This volume is subdivided into five parts; Part 1 contains the final report on the verification test burns, Parts 2 through 5 contain the appendixes.^Volumes I and III through VIII describe the incinerator operations, the soil excavation activities, and the additional testing required by the Environmental Protection Agency.|
DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^ Decontamination^Recovery^Naval shore facilities^Herbicides^Contaminants^ Sampling^Excavation^Dioxins|
ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

34 of 207 Complete Record Tagged
AN- AD-A252 962/6/HDM|
TI- Full-Scale Incineration System Demonstration Verification Test Burns at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 3. Treatability Tests. Part 4^Final rept. Sep 86-Feb 89|
AU- Haley, D. J. ^Thomas, R. W. ^Derrington, D. B. |
CS- EG and G Idaho, Inc., Idaho Falls.|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 3, Part 5, AD-A252 963.|
PY- Jul 91|
PG- 351p|
PC- PC A16/MF A03 |
LA- English|
CP- United States|
AB- The information contained in this volume describes the events, the planning efforts, and the data results of a test burn conducted on a 100 ton/day mobile incinerator that was used to process soil contaminated with constituents of herbicide orange.^This volume is subdivided into five parts; Part 1 contains the final report on the verifications test burns, Parts 2 through 5 contain the appendixes.^Volumes I and III through VIII

describe the incinerator operations, the soil excavation activities, and the additional testing required by the Environmental Protection Agency.|

DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^*Air pollution^ Water pollution^Environmental protection^Hazardous materials^ Decontamination^Recovery^Naval shore facilities^Herbicides^Sampling^ Aromatic hydrocarbons^Contaminants^Excavation^Dioxins|

ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

35 of 207 Complete Record Tagged

AN- AD-A252 961/8/HDM|

TI- Full-Scale Incineration System Demonstration Verification Test Burns at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 3. Treatability Tests. Part 3^Final rept. Sep 86-Feb 89|

AU- Haley, D. J. ^Thomas, R. W. ^Derrington, D. B. |

CS- EG and G Idaho, Inc., Idaho Falls.|

SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|

NT- See also Volume 3, Part 4, AD-A252 962.|

PY- Jul 91|

PG- 264p|

PC- PC A12/MF A03 |

LA- English|

CP- United States|

AB- The information contained in this volume describes the events, the planning efforts, and the data results of a test burn conducted on a 100 ton/day mobile incinerator that was used to process soil contaminated with constituents of herbicide orange.^This volume is subdivided into five parts; Part 1 contains the final report on the verification test burns, Parts 2 through 5 contain the appendixes.|

DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^ Decontamination^Recovery^Naval shore facilities^Herbicides^Contaminants^ Sampling^Excavation^Dioxins^Water wells|

ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

36 of 207 Complete Record Tagged

AN- AD-A252 960/0/HDM|

TI- Full-Scale Incineration System Demonstration Verification Test Burns at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 3. Treatability Tests. Part 2^Final rept. Sep 86-Feb 89|

AU- Haley, D. J. ^Thomas, R. W. ^Derrington, D. B. |
CS- EG and G Idaho, Inc., Idaho Falls.|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 3, Part 3, AD-A252 961.|
PY- Jul 91|
PG- 275p|
PC- PC A12/MF A03 |
LA- English|
CP- United States|
AB- The information contained in this volume describes the events, the planning efforts, and the data results of a test conducted on a 100 ton/day mobile incinerator that was used to process soil contaminated with constituents of herbicide orange.^This volume is subdivided into five parts; Part 1 contains the final report on the verification test burns, Parts 2 through 5 contain the appendixes.^Volumes I and III through VIII describe the incinerator operations, the soil excavation activities, and the additional testing required by the Environmental Protection Agency.|
DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^Cost effectiveness^Decontamination^Recovery^Naval shore facilities^Herbicides^ Contaminants^Sampling^Excavation^Dioxins|
ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

37 of 207 Complete Record Tagged
AN- AD-A252 959/2/HDM|
TI- Full-Scale Incineration System Demonstration Verification Test Burns at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 3. Treatability Tests. Part 1^Final rept. Sep 86-Feb 89|
AU- Haley, D. J. ^Thomas, R. W. ^Derrington, D. B. |
CS- EG and G Idaho, Inc., Idaho Falls.|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 3, Part 2, AD-A252 960.|
PY- Jul 91|
PG- 249p|
PC- PC A11/MF A03 |
LA- English|
CP- United States|
AB- In December 1986, the mobile waste incinerator system, MWP-2000 was used to successfully treat soil contaminated with 2,3,7,8-tetrachlorodi-benzo-p-dioxin (TCDD) at the Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi.^The contamination resulted from earlier spills at a herbicide orange (HO) storage area at NCBC.^The mobility and availability of this plant provided a means of demonstrating the incinerator technology at full size under field conditions as part of the research, test, and evaluation phase of the U.S.^Air Force Environmental Restoration Program.^

This report covers the verification test burns, which was the first phase of three phases.^The MWP-2000 incinerator system is designed to destroy and detoxify solid, semisolid, and/or liquid wastes.^Major components of the system are (1) a waste feed system, (2) rotary kiln with outlet cyclones, secondary combustion chamber (SCC) with an auxiliary feed system, air pollution control train, storage tanks and other support equipment.^Soil is fed to the kiln where it is exposed to temperatures in the 1200-1800 deg F range.^Soil and gases exit the kiln, where the soil is collected and the gases pass through a cyclone, to separate out particulates, and enter the SCC.^The gases are raised to a temperature of 2100-2200 deg F in the SCC to complete destruction of primary organic hazardous constituents that are present.^Exiting gases flow through the air pollution control train and out the stack.|

DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^ Decontamination^Recovery^Naval shore facilities^Herbicides^Contaminants^ Sampling^Excavation^Dioxins|

ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAF|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

38 of 207 Complete Record Tagged

AN- AD-A252 958/4/HDM|

TI- Full-Scale Incineration System Trial Burns at the Naval Construction Battalion Center, Gulfport, Mississippi. Volume 2, Part 2^Final rept. Sep 86-Feb 89|

AU- Haley, D. J. ^Thomas, R. W. |

CS- EG and G Idaho, Inc., Idaho Falls.|

SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|

NT- See also Volume 3, Part 1, AD-A252 959.|

PY- Jul 91|

PG- 219p|

PC- PC A10/MF A03 |

LA- English|

CP- United States|

AB- This volume describes the tests conducted on a 100 ton/day mobile incinerator that was used to process soil contamination with the constituents of Herbicide Orange, namely 2,4,5-T, 2,4-D, and trace quantities of dioxin.^The purpose of the tests was to determine if the incinerator could satisfy requirements of the Resource Conservation and Battalion Center in Gulfport, Mississippi.^This volume provides specific details concerning the planning efforts and data results from the tests.|

DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^Cost effectiveness^Decontamination^Recovery^Naval shore facilities^Herbicides^ Contaminants^Sampling^Excavation^Dioxins|

ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^

NTISDODXA^NTISDODAFI
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

39 of 207 Complete Record Tagged
AN- AD-A252 957/6/HDM|
TI- Full-Scale Incineration System Trial Burns at the Naval Battalion Construction Center, Gulfport, Mississippi. Volume 2, Part 1^Final rept. Sep 86-Feb 89|
AU- Haley, D. J. ^Thomas, R. W. |
CS- EG and G Idaho, Inc., Idaho Falls.|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|
NT- See also Volume 2, Part 2, AD-A252 958.|
PY- Jul 91|
PG- 349p|
PC- PC A15/MF A03 |
LA- English|
CP- United States|
AB- Although six tests were planned, only three were actually completed.^ Weather and sampling problems forced the cancellation of the other three tests.^This report describes the equipment and procedures used to conduct the tests, in addition to the detailed results of the trial burn.^The rationable for the various technical and managerial decisions is given.^The information contained in this volume describes the events, the planning efforts, and the data results of a trial burn conducted on a 100 ton/day mobile incinerator that was used to process soil contaminated with constituents of herbicide orange.|
DE- *Incinerators^*Pollution abatement^*Waste disposal^*Soils^Environmental protection^*Air pollution^Water pollution^Hazardous materials^Cost effectiveness^Decontamination^Recovery^Naval shore facilities^Herbicides^ Contaminants^Sampling^Excavation^Dioxins|
ID- Incineration^*Hazardous wastes^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^Installation restoration^Herbicide orange^ NTISDODXA^NTISDODAFI
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

40 of 207 Complete Record Tagged
AN- AD-A252 956/8/HDM|
TI- Full-Scale Incineration System Demonstration at the Naval Construction Battalion Center, Gulfport, Mississippi. Volume 1. Project Summary^Final rept. Sep 86-Feb 89|
AU- Cook, J. A. ^Haley, D. J. |
CS- EG and G Idaho, Inc., Idaho Falls.|
RN- AFESC/ESL-TR-89-39-VOL-1|
SP- Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab.|

NT- See also Volume 2, Part 1, AD-A252 957.|
PY- Jul 91|
PG- 218p|
PC- PC A10/MF A03 |
LA- English|
CP- United States|
AB- This volume describes the projects as a whole.^The overall goal of the project was to determine the reliability and cost-effectiveness of a 100 tons/day rotary kiln incinerator in processing soil contaminated with dioxins and other hazardous constituents of Herbicide Orange.^The demonstration project consisted of three phases: (1) demonstration of the effectiveness of the incinerator to process the soil; (2) Demonstration of the ability of the incinerator to meet Resource Conservation and Recovery Act requirements; and (3) Determination of the cost and reliability of using the incinerator on a long-term basis.^Five verification test burns were conducted and evaluated for a range of operating conditions.^One hundred tons of contaminated soil were processed.^Soil feed rates ranged between 2.8 and 6.3 tons/hour.^Average kiln temperatures for the five test burns varied between 1,355 and 1,645 F. The Secondary Combustion Chamber average temperatures for the five test burn varied between 2, 097 and 2,174 F.|
DE- *Incinerators^*Pollution abatement^Environmental protection^*Waste disposal^ *Soils^*Air pollution^Cost effectiveness^Water pollution^Hazardous materials^Decontamination^Recovery^Naval shore facilities^Herbicides^ Excavation^Management planning and control^Dioxins|
ID- Incineration^Gulfport(Mississippi)^*Naval Battalion Construction Center(Mississippi)^*Hazardous wastes^Herbicide orange^Installation restoration^NTISDODXA^NTISDODAF|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

42 of 207 Complete Record Tagged
AN- DE92012568/HDM|
TI- Use of noninvasive geophysical techniques for the In situ Vitrification Program. Volume 1, Literature review: Revision 1|
AU- Josten, N. E. ^Marts, S. T. ^Carpenter, G. S. |
CS- EG and G Idaho, Inc., Idaho Falls.|
RN- EGG-WTD-9432-VOL.1-REV.1|
SP- Department of Energy, Washington, DC.|
CN- AC07-76ID01570|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- Nov 91|
PG- 45p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- In situ vitrification (ISV) is a waste pit remediation technology that can potentially eliminate the need for pit excavation.^The ISV program at the Idaho National Engineering Laboratory (INEL) funded this study to evaluate geophysical techniques that might be useful for performing detailed screening of the materials, soil conditions, and local geology of waste

pits targeted for remediation.^The evaluation focuses on a specific set of characterization objectives developed by ISV engineers.^The objectives are based on their assessment of safety, environmental, and cost efficiency issues associated with the ISV process.^A literature review of geophysical case histories was conducted and a geophysical survey was performed at the INEL simulated waste pit so that the evaluation could be based on demonstrable results.|

DE- *Alpha-Bearing Wastes^*Radioactive Waste Facilities^Electric Fields^ Electromagnetic Fields^Evaluation^*Geophysical Surveys^Ground Disposal^ Idaho National Engineering Laboratory^*In-Situ Processing^Measuring Methods^ Radar^Soils^*Vitrification|

ID- EDB/052001^EDB/540250^EDB/052002^*Hazardous materials^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^48F (Natural Resources and Earth Sciences_Geology and Geophysics)||

44 of 207 Complete Record Tagged

AN- DE92011510/HDM|

TI- Research, development, demonstration, testing, and evaluation characterization technology project: FY90 year-end report on subsurface detection methods|

AU- Sandness, G. A. ^Stewart, T. L. |

CS- Battelle Pacific Northwest Labs., Richland, WA.|

RN- PNL-8028|

SP- Department of Energy, Washington, DC.|

CN- AC06-76RL01830|

NT- Sponsored by Department of Energy, Washington, DC.|

PY- Mar 92|

PG- 41p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

AB- Most of the site cleanup projects to be conducted at US Department of Energy (DOE) facilities will include subsurface investigations using geophysical sensors.^When performed at an early state of a site characterization effort, they will help define site boundaries and waste distributions, provide guidance for the optimization of subsurface sampling plans, reduce the cost of site exploration tasks, and enhance the safety of personnel involved in sampling and excavation activities.^In FY 89, researchers of Pacific Northwest Laboratory constructed a digital data acquisition system (DAS) to be used in geophysical surveys of hazardous waste burial sites.^The DAS is essentially a specialized microcomputer that has been ruggedized to permit operation on a moving off-road vehicle.^It was designed primarily to record and display ground-penetrating radar (GPR) data, but it is capable of simultaneously or separately recording data produced by other types of geophysical sensors.^Our work in FY 90 focused primarily on improving certain hardware components of the DAS and on writing the software needed to process and display the recorded data on a personal computer (PC)-based data processing system.^A secondary aspect of our work during the past year was constructed and testing a breadboard version of a time-domain metal detector.^Metal detectors are commonly used in site characterization surveys to detect and map metallic wastes such as 55-gal drums, storage tanks, pipes, and cables.^However, currently available instruments tend to be unstable, difficult to use, and generally unsuitable for quantitative site characterization measurements.|

DE- *Geologic Structures^*Geophysical Surveys^*Hazardous Materials^*Metals^ *Waste Disposal^Battelle Pacific Northwest Laboratories^Computer Codes^ Computer Graphics^Computer Networks^Data Acquisition^Data Processing^Design^ Detection^Evaluation^IBM Computers^Image Processing^Operation^Radar^ Recording Systems^Site Characterization^Subsurface Environments|

ID- EDB/052002^EDB/053001^EDB/990301^EDB/580000^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^48F (Natural Resources and Earth Sciences_Geology and Geophysics)||

47 of 207 Complete Record Tagged

AN- DE92009783/HDM|

TI- M-Area basin closure, Savannah River Site|

AU- McMullin, S. R. ^Horvath, J. G. |

CS- Westinghouse Savannah River Co., Aiken, SC.|

RN- WSRC-MS-91-191^CONF-910981-61|

SP- Department of Energy, Washington, DC.|

CN- AC09-89SR18035|

NT- Environmental remediation '91 conference, Pasco, WA (United States), 8-11 Sep 1991. Sponsored by Department of Energy, Washington, DC.|

PY- 1991|

PG- 13p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

DT- Conference proceeding|

AB- M-Area, on the Savannah River Site, processes raw materials and manufactures fuel and target rods for reactor use.^Effluent from these processes were discharged into the M-Area settling basin and Lost Lake, a natural wetland.^The closure of this basin began in 1988 and included the removal and stabilization of basin fluids, excavation of all contaminated soils from affected areas and Lost Lake, and placement of all materials in the bottom of the emptied basin.^These materials were covered with a RCRA style cap, employing redundant barriers of kaolin clay and geosynthetic material.^Restoration of excavated uplands and wetlands is currently underway.|

DE- *Savannah River Plant^*Settling Ponds^Chemical Composition^Containment Systems^Cost Estimation^Drainage^Enriched Uranium^Excavation^Fuel Rods^ *Hazardous Materials^Moisture^*Radioactive Waste Management^Radioactive Wastes^*Remedial Action^Revegetation^Site Characterization^Sludges^Soils^ Waste Retrieval^Waste Water^Wetlands^Meetings|

ID- EDB/052002^EDB/054000^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^77I (Nuclear Science and Technology_Reactor Fuels and Fuel Processing)||

AN- DE92008536/HDMI
TI- Waste minimization in environmental sampling and analysis|
AU- Brice, D. A. ^Nixon, J. ^Lewis, E. T. |
CS- Westinghouse Environmental Management Co. of Ohio, Cincinnati.|
RN- FEMP-2257^CONF-9205103-2|
SP- Department of Energy, Washington, DC.|
CN- AC05-86OR21600|
NT- National Ground Water Association (NGWA) outdoor conference, Las Vegas, NV (United States), 9-13 May 1992. Sponsored by Department of Energy, Washington, DC.|
PY- 1992|
PG- 13p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- Environmental investigations of the extent and effect of contamination, and projects to remediate such contamination, are designed to mitigate perceived threats to human health and the environment.^During the course of these investigations, excavations, borings, and monitoring wells are constructed: monitoring wells are developed and purged prior to sampling; samples are collected; equipment is decontaminated; constituents extracted and analyzed; and personal protective equipment is used to keep workers safe.^All of these activities generate waste.^A large portion of this waste may be classified as hazardous based on characteristics or constituent components.^Waste minimization is defined as reducing the volume and/or toxicity of waste generated by a process.^Waste minimization has proven to be an effective means of cost reduction and improving worker health, safety, and environmental awareness in the industrial workplace through pollution prevention.^Building waste minimization goals into a project during the planning phase is both cost effective and consistent with total quality management principles.^Application of waste minimization principles should be an integral part of the planning and conduct of environmental investigations.^Current regulatory guidance on planning environmental investigations focuses on data quality and risk assessment objectives.^ Waste minimization should also be a scoping priority, along with meeting worker protection requirements, protection of human health and the environment, and achieving data quality objectives.^Waste volume or toxicity can be reduced through the use of smaller sample sizes, less toxic extraction solvents, less hazardous decontamination materials, smaller excavations and borings, smaller diameter monitoring wells, dedicated sampling equipment, well-fitting personal protective equipment, judicious use of screening technologies, and analyzing only for parameters of concern.|
DE- Environment^Minimization^Contamination^Data Acquisition^Environmental Exposure^Environmental Policy^Environmental Quality^Hazardous Materials^ Occupational Safety^Public Health^Radioactive Waste Disposal^Radioactive Wastes^Regulations^Remedial Action^*Risk Assessment^Sampling^Technology Utilization^Toxic Materials^US DOE Program Management^Meetings|
ID- EDB/540230^EDB/054000^*Waste minimization^*Health hazards^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and

Safety)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^57U (Medicine and Biology_Public Health and Industrial Medicine)^57V (Medicine and Biology_Radiobiology)||

53 of 207 Complete Record Tagged
AN- DE92008213/HDM|
TI- Waste Management Plan for the Oak Ridge National Remedial Investigation/Feasibility Study|
CS- Oak Ridge National Lab., TN.|
SP- Bechtel National, Inc., Oak Ridge, TN (United States).^Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- Apr 88|
PG- 144p|
PC- PC A07/MF A02 |
LA- English|
CP- United States|
AB- In accordance with the requirements of the Remedial Investigation/Feasibility Study (RI/FS) Project Quality Assurance Plan, this Waste Management Plan establishes clear lines of responsibility and authority, documentation requirements, and operational guidance for the collection, identification, segregation, classification, packaging, certification, and storage/disposal of wastes.^These subjects are discussed in the subsequent sections of this document.|
DE- *ORNL^Alpha-Bearing Wastes^Containers^Excavation^Feasibility Studies^ *Hazardous Materials^High-Level Radioactive Wastes^Liquid Wastes^Low-Level Radioactive Wastes^Organizing^Personnel^Planning^*Radioactive Waste Management^*Remedial Action^Soils^Solid Wastes|
ID- EDB/052000^EDB/990100^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

61 of 207 Complete Record Tagged
AN- DE92008380/HDM|
TI- Accelerated cleanup of the 316-5 Process Trenches at the Hanford Site|
AU- Henckel, G. C. ^Johnson, W. L. |
CS- Westinghouse Hanford Co., Richland, WA.|
RN- WHC-SA-1202^CONF-910981-56|
SP- Department of Energy, Washington, DC.|
CN- AC06-87RL10930|
NT- Environmental remediation '91 conference, Pasco, WA (United States), 8-11 Sep 1991. Sponsored by Department of Energy, Washington, DC.|
PY- Sep 91|
PG- 11p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- In October, 1990, the US Department of Energy, the US Environmental

Protection Agency, and the Washington State Department of Ecology signed an Agreement in Principle to accelerate remedial actions on the Hanford Site.^ Removal of contaminated sediments from the 300 Area (316-5) Process Trenches was on of the three initial candidate locations identified for the accelerated remediation.^The trenches have received small quantities of radioactive and hazardous wastes in large volumes of process water (up to 11,360,000 L/day).^The trenches are approximately 300 m west of the Columbia River and 7 m above the water table.^The trenches are an active interim permitted disposal facility that may remain active for the next few years.^In order to reduce the potential for migration of contaminants from the trench sediments into the groundwater, an expedited response action to remove approximately 2,500 m(sup 2) of soil from the active p[illegible]ion of the trenches is being performed.^Field activities were initiated in July 1991 with site preparation.^The first trench to be excavated was completed by August 15, 1991.^Approximately 2 weeks were needed to begin removal activities in the second trench.^The second trench should be completed by October 1, 1991, with the subsequent construction of an interim cover over the consolidated materials completed by December 1991.|

DE- *Hanford Reservation^*Sediments^Columbia River^Contamination^Excavation^ Ground Water^*Hazardous Materials^Liquid Wastes^*Radioactive Effluents^ Radioactive Waste Disposal^Radioactive Wastes^Radionuclide Migration^ Removal^Sampling^Soils^Water Quality^Meetings|

ID- EDB/052002^EDB/540330^EDB/540350^EDB/540250^*Remedial action^Water pollution control^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

62 of 207 Complete Record Tagged

AN- DE92006870/HDM|

TI- Accelerated cleanup of mixed waste units on the Hanford Site, Richland, Washington|

AU- Erickson, J. K. ^Johnson, W. L. ^Wintczak, T. M. |

CS- Westinghouse Hanford Co., Richland, WA.|

RN- WHC-SA-1465^CONF-920307-27|

SP- Department of Energy, Washington, DC.|

CN- AC06-87RL10930|

NT- Waste management '92, Tucson, AZ (United States), 1-5 Mar 1992. Sponsored by Department of Energy, Washington, DC.|

PY- Jan 92|

PG- 14p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

DT- Conference proceeding|

AB- This report provides a basic description of the Expedited Response Action Program currently being implemented at the Hanford Site.^Included is reference to the applicable regulations regarding the program's implementation.^The first three expedited response actions (a burial ground exhumation and drum removal project, a sediment removal and consolidation project, and a soil vapor extraction and treatment project) are discussed in detail in the form of case studies.|

DE- *Hanford Reservation^*Hazardous Materials^*Radioactive Wastes^Containers^ Decontamination^Excavation^Implementation^Management^Planning^Radioactive Waste Disposal^*Remedial Action^Removal^Sediments^Soils^Meetings|
ID- EDB/052002^EDB/540250^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

66 of 207 Complete Record Tagged
AN- PB92-179670/HDM|
TI- Demonstration of Waste Treatment Technologies|
AU- Martin, J. F. |
CS- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
RN- EPA/600/A-92/091|
NT- Presented at the Engineering and Technology Conference (1st) on Waste Management Technology, Technology Transfer and Training, San Juan, PR., April 24-26, 1991. See also PB90-216516.|
PY- 1991|
PG- 7p|
PC- PC A02/MF A01 |
LA- English|
CP- United States|
AB- The need for long-term, permanent treatment schemes as alternatives to land disposal has been highlighted by legislation such as the Hazardous and Solid Waste Amendments of the Resource Conservation and Recovery Act (RCRA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986.^SARA directed the U.S.^Environmental Protection Agency to establish an 'Alternative or Innovative Treatment Technology Research and Demonstration Program' to identify promising waste treatment technologies, assist with their evaluation, and promote their use at Superfund sites.^In response to this directive the Superfund Innovative Technology Evaluation (SITE) Program was formed.^Twenty technology demonstrations have been completed in the SITE Program to date.^Those completed within the past year include microfiltration (DuPont and the Oberlin Filter Company), waste excavation and emissions control (EPA Region 9), integrated vapor extraction and steam vacuum stripping (AWD Technologies), solidification of contaminated soil (Silicate Technology Corporation), and flame reactor recovery of lead (Horsehead Resource Development Company).|
DE- *Waste treatment^*Hazardous materials^*Remedial action^Substitutes^Waste disposal^Pollution regulations^Demonstration programs^Air pollution control^ Stripping(Distillation)^Solidification^Superfund^Materials recovery^Flame chamber process^Excavation^Filtration^Extraction|
ID- *Superfund Innovative Technology Evaluation Program^Cleanup operations^ Microfiltration^Superfund Amendments and Reauthorization Act^NTISEPAORD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^43F (Problem Solving Information for State and Local Governments_Environment)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)||

67 of 207 Complete Record Tagged

AN- DE92004568/HDMI
TI- Hanford Federal Facility Agreement and Consent Order quarterly progress report for the period ending September 30, 1991I
CS- Department of Energy, Richland, WA. Richland Operations Office.I
RN- DOE/RL-91-41I
PY- Nov 91I
PG- 97pI
PC- PC A05/MF A02 I
LA- EnglishI
CP- United StatesI
AB- This is the tenth quarterly report as required by the Hanford Federal Facility Agreement and Consent Order (Ecology et al.^1990, 1991), also known as the Tri-Party Agreement, established between the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology).^The Tri-Party Agreement sets the plan and schedule for achieving regulatory compliance and cleanup of waste sites at the Hanford Site.^This report covers progress for the quarter that ended September 30, 1991.^Expedited response actions completed at the 300 Area process trenches.^Under the Resource Conversation and Recovery Act of 1976 (RCRA) or Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) regulations, investigating waste site cleanup methods, developing and selecting methods, and implementing the cleanup can require several years.^However, cleanup can begin before all the studies are completed if the contaminants at a particular waste site potentially threaten people or the environment, or where preventive measures are appropriate.^An expedited response is being performed on this site because of the proximity of the waste disposal site to the Columbia River.^This expedited cleanup project involved removing and isolating contaminated soil in the process trenches to prevent further spread of the contaminants.^The removal of contaminated soil from the 300 Area Process Trenches has been completed ahead of schedule.^Field work began on July 1, and actual excavation began July 31 on the east trench.^ All the soil planned to be removed in both the east and west trenches has been removed and placed at the end of the trenches where it will be isolated from future discharges.^The contaminated soil stored at the end of the trenches will be covered to prevent erosion and spread of contaminants and await final disposition.I
DE- *Hanford Reservation^Decommissioning^High-Level Radioactive Wastes^ Maintenance^Planning^Progress Report^*Radioactive Waste Management^ Radioactive Waste Processing^Regulations^*Remedial Action^Risk Assessment^ Schedules^Storage Facilities^Tanks^Waste RetrievalI
ID- EDB/052002^EDB/054000^*Hazardous materials^*Waste management^NTISDEI
SH- 68F (Environmental Pollution and Control_Radiation Pollution and Control)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)II

71 of 207 Complete Record Tagged
AN- PB92-963351/HDMI
TI- Summary of Treatment Technology Effectiveness for Contaminated SoilI
CS- Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.I
RN- OSWER-9355.4-06I

NT- Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada, and Mexico; all others $400). Single copies also available in paper copy or microfiche.|
PY- Jun 90|
PG- 532p|
PC- PC A23/MF A04 |
LA- English|
CP- United States|
AB- The document presents the results of a study conducted by the Office of Emergency and Remedial Response that collected soil treatment data and analyzed the effectiveness of treatment technologies on contaminant treatability groups.^The document presents the recommendations developed for the treatment of contaminated soil.|
DE- *Hazardous materials^*Soils^*Waste treatment^Effectiveness^Toxicity^ Environmental transport^Pollution control^Excavation^Guidelines^US EPA^ Desorption^Heat treatment^Sterilization^Bacteria^Waste disposal|
ID- *Superfund^*Remedial response^Soil washing^Dechlorination^NTISEPAERR|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^48E (Natural Resources and Earth Sciences_Soil Sciences)^43F (Problem Solving Information for State and Local Governments_Environment)||

72 of 207 Complete Record Tagged
AN- PB92-166743/HDM|
TI- Personnel Protection through Reconnaissance Robotics at Superfund Remedial Sites^Journal article|
AU- Frank, U. ^Esposito, C. ^Sullivan, D. |
CS- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
RN- EPA/600/J-92/140|
NT- Pub. in Jnl. of Air and Waste Management Association, v42 n3 p341-345 Mar 92. See also PB90-134164.|
PY- c1992|
PG- 6p|
PC- PC A02/MF A01 |
LA- English|
CP- United States|
DT- Journal article|
AB- Investigation, mitigation, and clean-up of hazardous materials at Superfund sites normally require on-site workers to perform hazardous and sometimes potentially dangerous functions.^Such functions include site surveys and the reconnaissance for airborne and buried toxic environmental contaminants.^ Workers conducting on-site air monitoring risk dermal, ocular and inhalation exposure to hazardous chemicals, while those performing excavations also risk in addition the potential exposure to fire, explosion, and other physical injury.^EPA's current efforts to protect its workers and mitigate these risks include the use of robotic devices.^Using robots offers the ultimate in personnel protection by removing the worker from the site of potential exposure.^The paper describes the demonstration of a commercially-available robotic platform modified and equipped for air monitoring and the ongoing research for the development of a ground penetrating radar (GPR) system to detect buried chemical waste drums.^These robotic devices can be ultimately routinely deployed in the field for the purpose of conducting inherently safe reconnaissance activities during

Superfund/SARA remedial operations.|
DE- *Superfund^*Robotics^*Occupational safety and health^*Air pollution monitoring^*Hazardous materials^Waste management^Occupational exposure^ Inhalation^Reconnaissance^Computer aided control systems^Robots^Remedial action^Site surveys^Environmental transport^Mitigation^Drums(Containers)^ Automatic control|
ID- Cleanup^NTISEPAORD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^68A (Environmental Pollution and Control_Air Pollution and Control)^ 57U (Medicine and Biology_Public Health and Industrial Medicine)^41C (Manufacturing Technology_Robots and Robotics)||

80 of 207 Complete Record Tagged
AN- DE92004503/HDM|
TI- Dose and risk assessment for intrusion into mixed waste disposal sites|
AU- Kennedy, W. E. ^Aaberg, R. L. |
CS- Battelle Pacific Northwest Labs., Richland, WA.|
RN- PNL-SA-20032^CONF-911043-3|
SP- Department of Energy, Washington, DC.|
CN- AC06-76RL01830|
NT- Hanford symposium on health and the environment: current topics in occupational health (30th), Richland, WA (United States), 29 Oct - 1 Nov 1991. Sponsored by Department of Energy, Washington, DC.|
PY- Oct 91|
PG- 16p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- Sites previously used for disposal of radioactive and hazardous chemical materials have resulted in situations that pose a potential threat to humans from inadvertent intrusion.^An example generic scenario analysis was developed to demonstrate the evaluation of potential exposure to either cleanup workers or members of the public who intrude into buried waste containing both radioactive and hazardous chemical contaminants.^The example scenarios consist of a collection of exposure routes (or pathways) with specific modeling assumptions for well-drilling and for excavation to construct buildings.^These scenarios are used to describe conceptually some potential patterns of activity by non-protected human beings during intrusion into mixed-waste disposal sites.^The dose from exposure to radioactive materials is calculated using the GENII software system and converted to risk by using factors from ICRP Publication 60.^The hazard assessment for nonradioactive materials is performed using recent guidelines from the US Environmental Protection Agency (EPA).^The example results are in the form of cancer risk for carcinogens and radiation exposure.|
DE- *Human Populations^*Radioactive Waste Facilities^Acetonitrile^Biological Radiation Effects^Biphenyl^Carcinogens^Chlorinated Aliphatic Hydrocarbons^ Dose Rates^Human Intrusion^Neoplasms^Occupational Exposure^Radiation Doses^ *Risk Assessment^Simulation^Meetings|
ID- EDB/560300^EDB/560160^*Hazardous materials^NTISDE|
SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^

68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57V (Medicine and Biology_Radiobiology)||

91 of 207 Complete Record Tagged
AN- DE92001850/HDM|
TI- Quarry residuals RI/FS scoping document. Weldon Spring Site Remedial Action Project|
CS- MK-Ferguson Co., St. Charles, MO.|
RN- DOE/OR/21548-194|
SP- Jacobs Engineering Group, Inc., St. Charles, MO (United States).^Department of Energy, Washington, DC.|
CN- AC05-86OR21548|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- Oct 91|
PG- 57p|
PC- PC A04/MF A01 |
LA- English|
CP- United States|
AB- The purpose of this document is to serve as a planning tool for the implementation of the Quarry Residual Remedial Investigation/Feasibility Study (RI/FS) process and to provide direct input to revising and updating the 1988 Work Plan for the Weldon Spring Site Remedial Action Project (WSSRAP) Remedial Investigation/Feasibility Study-Environmental Impact Statement for the Weldon Spring Site (RI/FS-EIS) (Peterson et al.^1988) for this effort.^The scoping process is intended to outline the tasks necessary to develop and implement activities in compliance with the Comprehensive Environmental Response, Compensation and Liability Act-National Environmental Policy Act (CERCLA-NEPA) process from detailed planning through the appropriate decision document.^In addition to scoping the entire process, this document will serve as the primary tool for planning and accomplishing all activities to be developed in the Quarry Residual RI/FS Work Plan.^Subsequent tasks are difficult to plan at this time.^10 refs., 5 figs., 5 tabs.|
DE- *Radioactive Waste Facilities^*Remedial Action^Air Quality^Chemical Wastes^ Contamination^Data Analysis^Environmental Impacts^Excavation^Feasibility Studies^Ground Water^*Hazardous Materials^Laws^Missouri^Planning^Program Management^Public Health^Public Relations^Radioactive Waste Storage^ Radioactive Wastes^Regulations^Safety^Sediments^Sludges^Soils^Surface Waters^Task Scheduling^Transport^Water Quality|
ID- EDB/540250^EDB/540350^EDB/053000^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

92 of 207 Complete Record Tagged
AN- DE92000418/HDM|
TI- Treatability study for WAG 6 (SWSA 6) trench water|
AU- Taylor, P. A. |
CS- Oak Ridge National Lab., TN.|

RN- ORNL/ER-17|
SP- Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- Aug 91|
PG- 71p|
PC- PC A04/MF A01 |
LA- English|
CP- United States|
AB- The Environmental Restoration Program at Oak Ridge National Laboratory (ORNL) is examining methods for remediation and final closure of Waste Area Grouping 6 (WAG 6) under a Resource Conservation and Recovery Act (RCRA) closure plan.^WAG 6 consists primarily of Solid Waste Storage Area 6 (SWSA 6), where solid low- level radioactive waste (and some hazardous waste) was buried from 1968 to 1985 in shallow trenches.^To support the feasibility study that is being prepared for closure of WAG 6, lab-scale treatability tests were performed on the water from selected trenches in SWSA 6 to determine if the trench water could be treated at the existing wastewater treatment plants at ORNL.^Water from 23 of the 500 trenches in SWSA 6 has been sampled and analyzed to date, and the 4 most highly contaminated trenches identified thus far supplied the water used in the treatability tests.^The softening and ion-exchange processes used in the Process Wastewater Treatment Plant (PWTP) reduced the (sup 90)Sr concentration, which was the only radionuclide present in the trench water at above the discharge limits, from 260 to 0.2 Bq/L.^The air stripping and activated carbon adsorption processes used in the Nonradiological Wastewater Treatment Plant (NRWTP) removed volatile and semivolatile organics (mostly toluene, xylene, and naphthalene), which were the main contaminants in the trench water, to below detection limits.^The trench water treated in the lab-scale equipment easily met all discharge limits for the PWTP and the NRWTP.^6 refs., 2 figs., 9 tabs.|
DE- *Hazardous Materials^*Low-Level Radioactive Wastes^*ORNL^*Waste Water^ Compiled Data^Contamination^Evaluated Data^Excavation^Flowsheets^Laboratory Equipment^Naphthalene^Phenols^Radioactive Waste Processing^Radioisotopes^ Remedial Action^Resource Recovery Acts^Sampling^Sludges^Testing^Toluene^ Underground Disposal^Waste Disposal^Wells^Xylenes^Zeolites^Tables(data)|
ID- EDB/540350^EDB/053000^EDB/052000^*Water pollution control^Sewage treatment
plants^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

93 of 207 Complete Record Tagged
AN- PB92-109339/HDM|
TI- Health Assessment for Northwest Transformer, Salvage Yard, Everson, Whatcom County, Washington, Region 10. CERCLIS No. WAD980833974^Final rept|
CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
NT- Supersedes PB90-119512.|
PY- 14 Apr 89|
PG- 15p|

PC- PC A03/MF A01 l
LA- Englishl
CP- United Statesl
AB- The Northwest Transformer Salvage Yard is a National Priorities List (NPL) Site located in Whatcom County, Washington, approximately two miles south of the town of Everson, Washington.^Between 1958-1985, the site served as a storage and refurbishing area for electrical transformers, capacitors, and other electrical equipment.^An Immediate Removal Action was performed at the site in 1985, and included the excavation and removal of on-site contaminated soils, liquids, and electrical equipment.^Subsequent sampling and analysis of on-site and off-site soils and groundwater revealed polychlorinated biphenyls (PCBs), chlorinated dibenzo-p-dioxins, and chlorinated dibenzofurans.^Identified pathways for the migration of site-associated contaminants include those associated with groundwater, surface water, soil, and bioaccumulation.^Potential pathways for human exposure to site contaminants include ingestion of contaminated groundwater, soils, or foodchain entities, inhalation of fugitive dusts, and dermal contact with contaminated groundwater, surface water, soil, or wood from an on-site building.^Under current conditions the site poses a potential threat to human health in the event of unauthorized site entry, or the ingestion of contaminated groundwater.l
DE- *Risk assessment^*Environmental surveys^*Public health^*Hazardous materials^ Waste disposal^Ingestion(Biology)^Inhalation^Toxicity^Path of pollutants^ Electric equipment^Polychlorinated dibenzodioxins^Polychlorinated dibenzofurans^Polychlorinated biphenyls^Water pollution^Exposurel
ID- *Whatcom County(Washington)^NTISHEWTSDl
SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57Y (Medicine and Biology_Toxicology)^49G (Electrotechnology_Resistive, Capacitive, and Inductive Components)ll

97 of 207 Complete Record Tagged
AN- DE91016705/HDMl
TI- Site remediation considerations and foundation excavation plan for the Walter Reed Army Institute of Research building, Forest Glen, Marylandl
AU- Hambley, D. F. ^Harrison, W. ^Foster, S. A. ^Schweighauser, M. J. l
CS- Argonne National Lab., IL. Energy Systems Div.l
RN- ANL/ESD/TM-17l
SP- Department of Energy, Washington, DC.l
CN- W-31109-ENG-38l
NT- Sponsored by Department of Energy, Washington, DC.l
PY- Apr 91l
PG- 265pl
PC- PC A12/MF A03 l
LA- Englishl
CP- United Statesl
AB- The US Army Corps of Engineers North Atlantic Division, Baltimore District (CENAB), intends to design and construct a medical and dental research facility for the Walter Reed Army Institute of Research (WRAIR) at the Walter Reed Army Medical Center (WRAMC) at Forest Glen, Maryland.^Because

almost 100% of the proposed building site is located on an uncontrolled landfill that was thought to possibly contain medical, toxic, radioactive, or hazardous waste, it was assumed that remediation of the site might be necessary prior to or in conjunction with excavation.^To assess (1) the need for remediation and (2) the potential hazards to construction workers and the general population, the Baltimore District contracted with Argonne National Laboratory to undertake a site characterization and risk assessment and to develop a foundation-excavation plan.^The results of the site characterization and a qualitative risk assessment have been presented in a previous report.^This report presents the foundation-excavation plan.^ 38 refs., 16 figs., 11 tabs.|

DE- *Construction^*Sanitary Landfills^Air^Buildings^Chemical Wastes^Dusts^ Environmental Exposure Pathway^Excavation^Gaseous Wastes^Ground Water^ Hazardous Materials^Hazards^Human Populations^Indoor Air Pollution^ Ingestion^Inhalation^Laboratory Animals^Organic Matter^Radioactive Wastes^ *Remedial Action^Risk Assessment^Site Characterization^Soils^Surface Waters^ Volatile Matter^*Waste Management|

ID- EDB/054000^EDB/570000^EDB/540250^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)^89C (Building Industry Technology_Construction Management and Techniques)||

98 of 207 Complete Record Tagged

AN- PB91-228064/HDM|

TI- In situ Steam Extraction Treatment^Engineering bulletin|

CS- Science Applications International Corp., Cincinnati, OH.|

RN- EPA/540/2-91/005|

SP- Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.|

CN- EPA-68-C8-0062|

NT- Sponsored by Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.|

PY- May 91|

PG- 9p|

PC- PC A02/MF A01 |

LA- English|

CP- United States|

AB- In situ steam extraction removes volatile and semivolatile hazardous contaminants from soil and groundwater without excavation of the hazardous waste.^Waste constituents are removed in situ by the technology and are not actually treated.^The use of steam enhances the stripping of volatile contaminants from soil and can be used to displace contaminated groundwater under some conditions.^The resultant condensed liquid contaminants can be recycled or treated prior to disposal.^The steam extraction process is applicable to organic wastes but has not been used for removing insoluble inorganics and metals.^Steam is injected into the ground to raise the soil temperature and drive off volatile contaminants.^Alternatively, steam can be injected to form a displacement front by steam condensation to displace groundwater.^The contaminated liquid and steam condensate are then collected for further treatment.^Two types of systems are discussed in the

document: the mobile system and the stationary system.^The bulletin provides information on the technology applicability, limitations, a description of the technology, types of residuals produced, site requirements, the latest performance data, the status of the technology, and sources for further information.|
DE- *Hazardous materials^*In-situ processing^*Water pollution control^*Ground water^*Soil treatment^*Extraction^Remedial action^Volatile organic compounds^Steam injection^Organic compounds^Waste treatment^Waste recycling^ Land pollution control^Performance evaluation|
ID- NTISEPAORD^NTISEPAERR|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)||

99 of 207 Complete Record Tagged
AN- DE91014084/HDM|
TI- Use of noninvasive geophysical techniques for the in situ vitrification program. Volume 1, Literature review|
AU- Josten, N. E. ^Marts, S. T. ^Carpenter, G. S. |
CS- EG and G Idaho, Inc., Idaho Falls.|
RN- EGG-WTD-9432|
SP- Department of Energy, Washington, DC.|
CN- AC07-76ID01570|
NT- Sponsored by Department of Energy, Washington, DC.|
PY- Jan 91|
PG- 45p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- In situ vitrification (ISV) is a waste pit remediation technology that may eliminate the need for pit excavation.^Efficient, cost effective implementation of ISV depends on prior knowledge of the targeted waste pit environment and the contained waste forms.^Three categories of ISV waste characterization needs have been identified: waste material characterization, to locate and identify individual waste forms within the waste pit; waste site characterization, to delineate pit boundaries, soil layering, and bulk properties of pit soils; and melt monitoring and postmelt characterization, to monitor the ISV melt process and determine physical properties of the vitrified waste.^The use of noninvasive geophysical methods to obtain this information was evaluated in this report, based on the findings of an extensive literature review.^This document is the first volume of a three volume report to evaluate geophysical methods for use in the detailed characterization of waste pits.^ Geophysical waste characterization is being considered as a means to enhance the efficiency and cost effectiveness of the ISV process.^Volume 1 documents the results of a broad-based literature review conducted to assess the capabilities and limitations of geophysical methods in common use and to identify promising new technologies.^47 refs.|
DE- *Idaho National Engineering Laboratory^Soils^*Waste Forms^Density^Electric Conductivity^*Geophysical Surveys^*In-Situ Processing^Moisture^Physical Properties^Porosity^*Remedial Action^*Vitrification|
ID- EDB/052002^EDB/054000^EDB/580000^Hazardous materials^Radioactive wastes^ NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^48F (Natural Resources and Earth Sciences_Geology and Geophysics)^ 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)ll

129 of 207 Complete Record Tagged
AN- PB91-800904/HDMl
TI- Hazardous Materials Waste Disposal: General Studies. January 1984-September 1991 (Citations from the NTIS Database)^Rept. for Jan 84-Sep 91l
CS- National Technical Information Service, Springfield, VA.l
NT- Supersedes PB90-856907.l
PY- Aug 91l
PG- 40pl
PC- PC N01/MF N01 l
LA- Englishl
CP- United Statesl
DT- Bibliographyl
AB- The bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^(Contains 148 citations with title list and subject index.)l
DE- *Bibliographies^*Solid waste disposal^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Earth fills^Excavation^Removal^ Military chemical agents^Regulations^Legislationl
ID- Published Searches^Water pollution abatement^NTISNTISN^NTISNTISNl
SH- 68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^91A* (Urban and Regional Technology and Development_Environmental Management and Planning)^43F* (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)ll

130 of 207 Complete Record Tagged
AN- DE91787773/HDMl
TI- Geofront keikaku no mondaiten wo saguru. Shutoshite jiban(center dot)ganban kogaku no tachiba kara. (Searching problmes in geofront project. Mainly from standpoint of ground and rock engineering)l
CS- Muroran Inst. of Tech. (Japan).l
RN- ETDE/JP-MF-1787773l
NT- In Japanese. ^U.S. Sales Only.l
PY- 30 Nov 90l
PG- 31pl
PC- PC A03/MF A01 l
LA- Japanesel
CP- Japanl
AB- Utilization of the underground space can be made available provided that the underground space is constructed, and its long-term safety is assured.^ Constructing an underground space in diversified rock conditions requires accumulation of scientific technologies in many areas.^For an underground space utilization in Hokkaido, there should be works applied as its own

including development and effective utilization of new energies, when viewed from utilizing the regionalism, such as climatic and geographical conditions, and industrial features.^Results from these efforts may provide predictions on possibilities that can develop into technologies applicable widely to northern regions.^For the purpose of searching technological problems surrounding the geofront project from the above viewpoint, Muroran University of Engineering has held a symposium in 1990 to discuss survey methods, underground water problems, and excavation methods on five presentations relating to the geofront project.|

DE- Underground^*Underground Facilities^Wastes^Climates^Construction^Excavation^Hazardous Materials^Industry^Rock Beds^Rural Areas^Soils^Temperature Distribution^Underground Storage^Waste Disposal|

ID- *Foreign technology^EDB/422000^*Engineering geology^Japan^NTISDEE|

SH- 48F (Natural Resources and Earth Sciences_Geology and Geophysics)^48G (Natural Resources and Earth Sciences_Hydrology and Limnology)^50D (Civil Engineering_Soil and Rock Mechanics)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

131 of 207 Complete Record Tagged

AN- DE91012811/HDM|

TI- In situ vitrification: Application to buried waste|

AU- Callow, R. A. ^Thompson, L. E. |

CS- EG and G Idaho, Inc., Idaho Falls.|

RN- EGG-M-90450^CONF-910270-60|

SP- Department of Energy, Washington, DC.|

CN- AC07-76ID01570|

NT- Waste management '91, Tucson, AZ (USA), 24-28 Feb 1991. Sponsored by Department of Energy, Washington, DC.|

PY- 28 Jan 91|

PG- 35p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

DT- Conference proceeding|

AB- Two in situ vitrification field tests were conducted in June and July 1990 at Idaho National Engineering Laboratory.^In situ vitrification is a technology for in-place conversion of contaminated soils into a durable glass and crystalline waste form and is being investigated as a potential remediation technology for buried waste.^The overall objective of the two tests was to assess the general suitability of the process to remediate buried waste structures found at Idaho National Engineering Laboratory.^In particular, these tests were designed as part of a treatability study to provide essential information on field performance of the process under conditions of significant combustible and metal wastes, and to test a newly developed electrode feed technology.^The tests were successfully completed, and the electrode feed technology provided valuable operational control for successfully processing the high metal content waste.^The results indicate that in situ vitrification is a feasible technology for application to buried waste.^2 refs., 5 figs., 2 tabs.|

DE- *Idaho National Engineering Laboratory^*In-Situ Processing^*Radioactive Wastes^Soils^Contamination^Excavation^Field Tests^Metals^Minimization^*Remedial Action^Sludges^Underground Disposal^*Vitrification^Volatile Matter^Waste Forms^Meetings|

ID- EDB/052001^EDB/054000^*Soil contamination^*Hazardous materials^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

132 of 207 Complete Record Tagged
AN- DE91011481/HDM|
TI- Design and construction issues associated with sealing of a repository in salt|
AU- Cook, R. ^Case, J. |
CS- Westinghouse Electric Corp., Carlsbad, NM. Waste Isolation Pilot Plant Project.|
RN- DOE/WIPP-90-030C^CONF-910270-48|
SP- Department of Energy, Washington, DC.|
CN- AC04-86AL31950|
NT- Waste management '91, Tucson, AZ (USA), 24-28 Feb 1991. Sponsored by Department of Energy, Washington, DC.|
PY- 1991|
PG- 27p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- The isolation of radioactive wastes in geologic repositories requires that man-made penetrations such as shafts, tunnels and boreholes are adequately sealed.^This paper presents the current design and construction issues for sealing a repository in salt and outlines some proposed solutions.^The sealing components include shaft seals, tunnel seals, panel seals, and disposal room backfill.^The performance requirements and construction constraints determine the types of materials selected and their necessary properties.^The current issues of interest include: (1) selection of materials for rigid bulkheads used to promote recovery of the disturbed zone permeability; (2) the selection of bulkhead geometry to cutoff flow through more permeable zones, or zones where recovery of the backfill properties occurs more slowly or not at all; and (3) the interaction of fluids with hazardous wastes with brine and, subsequently, with seal materials that might affect seal material longevity.^19 refs., 5 figs., 1 tab.|
DE- *High-Level Radioactive Wastes^*Seals^*WIPP^Backfilling^Boreholes^Brines^ Construction^Deformation^Design^Dissolution^Fractures^Geologic Formations^ Ground Water^Grouting^Hazardous Materials^Performance^Permeability^Porosity^ Quality Control^*Radioactive Waste Disposal^Radioactive Waste Facilities^ Sealing Materials^Service Life^Shaft Excavations^Tunnels^US DOE^Meetings|
ID- EDB/052002^NTISDE|
SH- 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^ 71B (Materials Sciences_Adhesives and Sealants)||

143 of 207 Complete Record Tagged
AN- PB91-198937/HDM|
TI- Ecologisch Herstel van Thermisch Gereinigde Grond (Ecological Recovery of Thermically Cleaned Soil)|

AU- Kappers, F. I. |
CS- Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven (Netherlands).|
RN- RIVM-718601002|
NT- Text in Dutch; summary in English.^Available only in the U.S., Canada and Mexico. All others refer to National Institute of Public Health and Environmental Protection, P.O. Box 1, 3720 BA Bilthoven, The Netherlands.|
PY- Nov 90|
PG- 76p|
PC- PC A05/MF A01 |
LA- Dutch|
CP- Netherlands|
AB- Many contaminated sites in the Netherlands are rigorously cleaned-up by excavation of the hazardous soil and subsequently thermal treatment for destruction of the contaminants.^This results in a complete dead product.^ When the soil is redeposited it has to be recolonized by organisms.^To assess the possibilities of ecological recovery of these soils, a field experiment in a grassland was performed during one year in 42 enclosures of 60 cm diameter each.^They consisted of a core of the unpolluted grassland soil with the natural micro- and meso-organisms, placed in thermically cleaned soil.^Eighteen enclosures were fertilized.^Six controls contained no core, but only unpolluted soil or cleaned soil.^The colonization by nematodes, other mesofauna, bacteria and vegetation as well as some abiotic parameters were studied.^It was concluded that (1) Rhabditidae were the first nematodes to colonize the cleaned soil (bacteria-feeding r-strategists); (2) nematode species present in the cleaned soil were also found in the core; (3) wind was an important vector in nematode dispersion; (4) additions of fertilizer stimulated colonization by nematodes.^ Thermically cleaned soil is not a good habitat for organisms unless soil is improved with nutrients, organic matter and N-fixing vegetation.|
DE- *Soil treatment^*Hazardous materials^*Remedial action^*Heat treatments^ *Terrestrial ecosystems^Land pollution control^Grasslands^Field tests^ Microorganisms^Netherlands^Nematodes^Vegetation^Wind(Meteorology)^ Fertilizers^Habitats^Nutrients^Organic matter|
ID- *Foreign technology^*Cleanup ope ations^NTISTFNPO|
SH- 68GE (Environmental Pollution and Control_General)^57H (Medicine and Biology_Ecology)^57K (Medicine and Biology_Microbiology)^48E (Natural Resources and Earth Sciences_Soil Sciences)||

144 of 207 Complete Record Tagged
AN- PB91-194001/HDM|
TI- Guidelines for Handling Excavated Acid-Producing Materials^Rept. for 19 Mar 87-19 Mar 89|
AU- Byerly, D. W. |
CS- Tennessee Univ., Knoxville. Dept. of Geological Sciences.|
RN- FHWA/FL-90/007|
SP- Federal Highway Administration, Tallahassee, FL. Florida Div.|
CN- DTFH71-87-C-00007|
NT- Sponsored by Federal Highway Administration, Tallahassee, FL. Florida Div.|
PY- Sep 90|
PG- 91p|
PC- PC A05/MF A01 |
LA- English|

CP- United Statesl
AB- The study addresses handling of acid-producing materials excavated in the process of road building.^Guidelines for detecting potential AD problems and for dealing with the acidic drainage (AD) problem, generated through literature review, case studies, and research, are organized for use during the pre-design, and construction phases of a project.^Due to the diversity among construction sites, there can be no generic plan for coping with the potential AD problem.^Site variables, including, topography, volume of material to be excavated, climate, and hydrology, necessitate site-specific planning.^Embankments designed for encapsulating acid-producing material are recommended based upon testing performed during the study.^All rock to be exposed through excavation should be considered suspect for AD production until proven otherwise through geologic and/or geophysical investigations.l
DE- *Excavation^*Acidic rocks^*Highway construction^*Leaching^Embankments^ Hazardous materials^Field tests^Hazards^Encapsulating^Hydrology^Highway planning^Drainage^Water pollution^Environmental impactsl
ID- NTISGPO^NTISDOTFHAl
SH- 50A (Civil Engineering_Highway Engineering)^50C (Civil Engineering_Construction Equipment, Materials, and Supplies)^68D (Environmental Pollution and Control_Water Pollution and Control)ll

145 of 207 Complete Record Tagged
AN- PB91-800151/HDMl
TI- Hazardous Materials Waste Disposal: Water, January 1988-July 1991 (Citations from the NTIS Database)^Rept. for Jan 88-Jul 91l
CS- National Technical Information Service, Springfield, VA.l
NT- See also PB90-856915, PB91-800144 and PB91-800060.l
PY- Jun 91l
PG- 50pl
PC- PC N01/MF N01 l
LA- Englishl
CP- United Statesl
DT- Bibliographyl
AB- The bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances into and from the water.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^Considerable attention is given to waste disposal sites at military installations and to incineration operations.^Citations pertaining specifically to radioactive waste disposal, state by state toxic release inventories, Best Demonstrated Available Technology as defined by Environmental Protection Agency, Health Assessments for individual companies sponsored by the Toxic Substances and Disease Registry, Atlanta, GA., and the Superfund Record of Decisions are excluded.^(The bibliography contains 153 citations with a subject index.)l
DE- *Bibliographies^*Solid waste disposal^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Earth fills^Excavation^Removal^ Military chemical agents^Regulations^Legislation^Waterl
ID- Published Searches^*Water pollution abatement^NTISNTISN^NTISNTISNl
SH- 68D* (Environmental Pollution and Control_Water Pollution and Control)^68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^ 91A* (Urban and Regional Technology and Development_Environmental

Management and Planning)^43F* (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)||

146 of 207 Complete Record Tagged
AN- PB91-800144/HDM|
TI- Hazardous Materials Waste Disposal: Air. January 1988-July 1991 (Citations from the NTIS Database)^Rept. for Jan 88-Jul 91|
CS- National Technical Information Service, Springfield, VA.|
NT- Supersedes PB89-863518 and PB90-856915. See also PB90-856907.|
PY- Jun 91|
PG- 34p|
PC- PC N01/MF N01 |
LA- English|
CP- United States|
DT- Bibliography|
AB- The bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances into and from the air.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^Considerable attention is given to waste disposal sites at military installations and to incineration operations.^Citations pertaining specifically to radioactive waste disposal, state by state toxic release inventories, Best Demonstrated Available Technology as defined by Environmental Protection Agency, Health Assessments for individual companies sponsored by the Toxic Substances and Disease Registry, Atlanta, GA., and the Superfund Record of Decisions are excluded.^(The bibliography contains 91 citations with a subject index.)|
DE- *Bibliographies^*Solid waste disposal^*Air pollution^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Earth fills^Excavation^Removal^Military chemical agents^Regulations^Legislation|
ID- Published Searches^Water pollution abatement^NTISNTISN^NTISNTISN|
SH- 68A* (Environmental Pollution and Control_Air Pollution and Control)^68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^91A* (Urban and Regional Technology and Development_Environmental Management and Planning)^43F* (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)||

148 of 207 Complete Record Tagged
AN- PB91-921414/HDM|
TI- Superfund Record of Decision (EPA Region 10): Teledyne Wah Chang, Albany, OR. (First Remedial Action), December 1989|
CS- Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.|
RN- EPA/ROD/R10-90/021|
NT- Portions of this document are not fully legible.^Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.|
PY- 28 Dec 89|

PG- 60p|
PC- PC A04/MF A01 |
LA- English|
CP- United States|
AB- The Teledyne Wah Chang (TWC) site, in Millersburg, Oregon, is an active plant used to produce nonferrous metals and products.^The site consists of a 110-acre plant site, which contains the plant's former sludge ponds, and a 115-acre farm site, which contains four active wastewater sludge ponds.^ Portions of the TWC site are within the Willamette River's 100- and 500-year floodplain.^The Wah Chang Corporation began operating a U.S.^Bureau of Mines zirconium metal sponge pilot plant under contract with the U.S.^ Atomic Energy Commission in 1956.^Additional facilities were subsequently built near the plant beginning in 1957 to produce nonferrous metals and products.^The Lower River Solids Pond (LRSP) and Schmidt Lake sludge pond, which stored wastewater generated from the plant operations, are being addressed by this remedial action.^The sludge in both the LRSP and Schmidt Lake contains heavy metals, organic compounds, and trace levels of radionuclides.^The selected remedial action for the site includes excavation of 85,000 cubic yards of sludge with partial solidification of the sludge, followed by offsite disposal in a permitted solid waste landfill.|
DE- *Hazardous materials^*Pollution control^*Sludge disposal^Sites^Industrial wastes^Organic compounds^Radioactive wastes^Volume^Schmidt Lake^Design^ Ground water^Earth fills^Excavation^Solidification^Sludge^Cost analysis|
ID- *Superfund^First remedial action^*Millersburg(Oregon)^Record of Decision^ Heavy metals^*Cleanup^NTISEPAERR|
SH- 68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68F (Environmental Pollution and Control_Radiation Pollution and Control)^48G (Natural Resources and Earth Sciences_Hydrology and Limnology)^ 43F (Problem Solving Information for State and Local Governments_Environment)||

153 of 207 Complete Record Tagged
AN- DE91007673/HDM|
TI- Development of technologies for the long-term containment of low-level radioactive and hazardous wastes into geologic formations|
AU- Lomenick, T. F. |
CS- Oak Ridge National Lab., TN.|
RN- CONF-900802-6|
SP- Department of Energy, Washington, DC.|
CN- AC05-84OR21400|
NT- American Chemical Society national meeting (200th), Washington, DC (USA), 26-31 Aug 1990. Sponsored by Department of Energy, Washington, DC.^Portions of this document are illegible in microfiche products.|
PY- 1990|
PG- 34p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- In the humid eastern half of the country, the disposal of low-level radioactive wastes has evolved from the use of shallow, sanitary landfill type, excavations to current plans for the complete containment of long

half-life radionuclides in large-diameter boreholes and other excavations in the deeper subsurface.^In general, the aim of current procedures and regulations is to prevent the migration of contaminants into groundwaters.^ For the short half-life materials, burials may be accommodated in lined and capped trenches along with "tumulus" or concrete encased structures that would ensure containment for a few tens of years to perhaps several hundreds of years.^The greatest interest though is planned where new and emerging technologies are being developed to emplace special and long half-life wastes into geologic formations at moderate to deep depths for complete containment for periods of thousands of years.^7 refs., 2 figs.|

DE- *Low-Level Radioactive Wastes^*Radioisotopes^Boreholes^Containment^ Contamination^Feasibility Studies^*Geologic Formations^Ground Water^ *Hazardous Materials^Underground Disposal^Uranium 238^Meetings|

ID- EDB/052002^Water pollution^NTISDE|

SH- 68F (Environmental Pollution and Control_Radiation Pollution and Control)^ 68D (Environmental Pollution and Control_Water Pollution and Control)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^ 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^ 48F (Natural Resources and Earth Sciences_Geology and Geophysics)||

154 of 207 Complete Record Tagged

AN- AD-A230 431/9/HDM|

TI- Post Remedial Action Report, Lansdowne Radioactive Residence Complex, Dismantlement/Removal Project. Volume 3. Radiological Closeout Documentation^Final rept. 2 Jun 88-12 Oct 89|

AU- Trujillo, P. |

CS- Chem-Nuclear Systems, Inc., Columbia, SC.|

RN- CENAB-CO-HTW/90-01/EPA(S)-VOL-3|

CN- DACW45-88-C-0213|

NT- See also Volume 4, AD-A230 432.|

PY- Jun 90|

PG- 306p|

PC- PC A14/MF A02 |

LA- English|

CP- United States|

AB- The radiological closeout report was prepared to document the successful completion of final remediation of a radium contaminated duplex residence and associated properties located in Lansdowne, Pennsylvania.^This report addresses the efforts to provide radiological coverage of the project from initial award through final verification.^The report includes plan preparation, training, personnel monitoring, air sampling, environmental compliance, radiological surveys, verification of cleanup to allowable limits, radiological techniques, soil sampling and verification methods utilized.^The report is formatted by major task, with associated data provided for each major task or division of work.^(MM)|

DE- Air^Cleaning^Corrections^Monitoring^Pennsylvania^Personnel^Preparation^ Radiology^Radium^Removal^Sampling^Soils^Surveys^Verification|

ID- Lansdowne(Pennsylvania)^Radioactive contamination^Ionizing radiation^ Radiation protection^Personnel safety^Radiation monitors^Soil sureys^Gamma ray spectroscopy^Health physics^Radioactive waste disposal^Alpha particles^ Beta particles^Dosimetry^Water pollution^Residential section^Radiological^ Remediation^USEPA Superfund^Soil excavation^Residence dismantlement^Air sampling^Radiological monitoring^Airborne radioactivity^Activity analysis^

*Radioactive site remediation^*Hazardous wastes^*Radioactive hazard removal^ Remedial action^NTISDODXA|
SH- 68F (Environmental Pollution and Control_Radiation Pollution and Control)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^57V (Medicine and Biology_Radiobiology)^57U (Medicine and Biology_Public Health and Industrial Medicine)||

155 of 207 Complete Record Tagged
AN- AD-A230 430/1/HDM|
TI- Post Remedial Action Report, Lansdowne Radioactive Residence Complex, Dismantlement/Removal Project. Volume 2. Contractor Operations^Final rept. 2 Jun 88-12 Oct 89|
AU- Huston, R. L. |
CS- Chem-Nuclear Systems, Inc., Columbia, SC.|
RN- CENAB-CO-HTW/90-01/EPA(S)-VOL-2|
CN- DACW45-88-C-0213|
NT- See also Volume 3, AD-A230 431. Includes maps.|
PY- Jun 90|
PG- 151p|
PC- PC A08/MF A01 |
LA- English|
CP- United States|
AB- The operations closeout report was prepared to document the successful completion of final remediation of the USEPA Superfund Cleanup of a radium-contaminated duplex residence and associated properties located in Lansdowne, Pennsylvania.^This report addresses the efforts to perform the residence dismantlement, soil remediation, and restoration of the site to a useable condition.^It covers the period from contract award through all stages of project conduct, including plan preparation, mobilization, initial site preparation, site clearing and security arrangements, dismantlement of structures, excavation of contaminated soils, transportation and disposal of radioactively contaminated and hazardous wastes, final verification of compliance to release criteria, site restoration and demobilization.^Pertinent data such as final waste volumes, results of testing, and site configuration prior to, during and post remediation are included.^The site organizational structure, individual responsibilities and subcontractors utilized are provided.^(MM)|
DE- Awards^Clearances^Configurations^Contamination^Contractors^Contracts^ Corrections^Disposal^Excavation^Hazardous materials^Mobilization^ Organizations^Pennsylvania^Preparation^Release^Removal^Sites^Soils^Test and evaluation^Verification^Volume^Wastes|
ID- Lansdowne(Pennsylvania)^Radioactive contamination^Decontamination^ Radioactive hazards^Health physics^Residential section^Final report^Radium^ Remediation^USEPA Superfund^Soil excavation^Residence dismantlement^ *Hazardous wastes^Radioactive waste^Transportation^Cleanup^*Radioactive site remediation^*Radioactive hazard removal^*Remedial action^NTISDODXA|
SH- 68F (Environmental Pollution and Control_Radiation Pollution and Control)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^50B (Civil Engineering_Civil Engineering)||

156 of 207 Complete Record Tagged
AN- AD-A227 500/6/HDM|
TI- Installation Restoration Program Stage 3. Remedial Investigation/Feasibility Study Elmendorf AFB, Alaska. Volume 2. Section 5 - Bibliography Text^Final rept. Mar 88-May 90|
CS- Black and Veatch, Overland Park, KS.|
CN- F33615-87-D-4021|
NT- See also Volume 4, AD-A227 503.|
PY- May 90|
PG- 277p|
PC- PC A13/MF A02 |
LA- English|
CP- United States|
AB- Contents of this volume consist, primarily of, alternative remedial measures and recommendations for restoration of each site studied.^A feasibility study (FS) of alternative remedial measures is required for 7 of the 32 sites investigated at Elmendorf AFB.^Alternative remedial measures for Sites D-16, IS-1, SP-5/5A, SP-7/10 and SP-15 are developed and evaluated.|
DE- *Air force facilities^Contaminants^Recovery^Hazardous materials^Sites^ *Waste disposal^*Water pollution^Ground water^Soils^Earth fills^Excavation^ Drainage^Petroleum products^Spilling^Maps^Alaska|
ID- IRP(Installation Restoration Program)^Elmendorf Air Force Base(Alaska)^ Hazardous wastes^Landfills^*Remedial action^NTISDODXA|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

157 of 207 Complete Record Tagged
AN- PB91-115626/HDM|
TI- Health Assessment for Jasco Chemical Corporation, Mountain View, Santa Clara County, California, Region 9. CERCLIS No. CAD009103318^Preliminary rept|
CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
PY- 30 Aug 90|
PG- 14p|
PC- PC A03/MF A03 |
LA- English|
CP- United States|
AB- In compliance with the Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act, as amended, the Agency for Toxic Substances and Disease Registry (ATSDR) has prepared Health Assessment reports for sites currently on, or proposed for, the National Priorities List.^In the report, the presence and nature of health hazards at this site are assessed, and the public health implications specific to this site are evaluated.^The Health Assessment is based on such factors as the nature, concentration, toxicity, and extent of contamination at the site; the existence of potential pathways for the human exposure; the size and nature of the community likely to be exposed; and any other information available.|
DE- *Toxicity^*Hazardous materials^*Public health^*Water pollution^Exposure^

Humans^Sites^Concentration(Composition)^Chemical industry^Inhalation^Air pollution^Water wells^Ground water^Soils^Excavation^Chloromethanes^ Chloroethanes|
ID- *Health assessment^*Santa Clara County(California)^Volatile organic compounds^Chloroethenes^NTISHEWTSD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^57Y (Medicine and Biology_Toxicology)^43F (Problem Solving Information for State and Local Gove:nments_Environment)||

158 of 207 Complete Record Tagged
AN- PB90-249483/HDM|
TI- Superfund: A Six Year Perspective|
CS- Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.|
RN- EPA/9200.5-000|
PY- Oct 86|
PG- 45p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The report describes why and how Superfund came to be, how it operates, what it achieved during its first six years, and the future direction of the program under the Superfund Amendments and Reauthorization Act.|
DE- *Hazardous materials^*Pollution control^Project management^Legislation^ Financing^National government^Sites^Waste disposal^Storage tanks^Ground water^Removal^Barriers^Dioxin^Tires^Fires^Air pollution^Technical assistance^Excavation^Waste treatment|
ID- *Superfund^Comprehensive Environmental Response Compensation and Liability Act of 1980^Clean up^*National priorities list^Chemical spills^Remedial action^NTISEPAERR|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68GE (Environmental Pollution and Control_General)^70F (Administration and Management_Public Administration and Government)||

159 of 207 Complete Record Ta ged
AN- DE90011946/HDM|
TI- Technologies to remediate hazardous waste sites|
AU- Falco, J. W. |
CS- Battelle Pacific Northwest Labs., Richland, WA.|
RN- PNL-SA-18030^CONF-9004208-1|
SP- Department of Energy, Washington, DC.|
CN- AC06-76RL01830|
NT- Mixed waste regulation conference, Washington, DC (USA), 17-18 Apr 1990. Sponsored by Department of Energy, Washington, DC.^Portions of this document are illegible in microfiche products.|
PY- Mar 90|
PG- 19p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|

DT- Conference proceeding|
AB- Technologies to remediate hazardous wastes must be matched with the properties of the hazardous materials to be treated, the environment in which the wastes are imbedded, and the desired extent of remediation.^Many promising technologies are being developed, including biological treatment, immobilization techniques, and in situ methods.^Many of these new technologies are being applied to remediate sites.^The management and disposal of hazardous wastes is changing because of federal and state legislation as well as public concern.^Future waste management systems will emphasize the substitution of alternatives for the use of hazardous materials and process waste recycling.^Onsite treatment will also become more frequently adopted.^5 refs., 7 figs.^(ERA citation 15:034146)|
DE- *Hazardous Materials^Biodegradation^Carbon Dioxide^Cleaning^Contamination^ Decontamination^Excavation^Ground Water^Mercury^Metals^Organic Matter^ Radioisotopes^Recycling^Remedial Action^Soils^Solidification^Stripping^ Technology Assessment^Volatile Matter^Waste Management^Meetings|
ID- EDB/052000^EDB/054000^Waste treatment^Waste disposal^Waste recycling^ Technology utilization^NTISDE|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^43F (Problem Solving Information for State and Local Governments_Environment)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)||

162 of 207 Complete Record Tagged
AN- PB90-251026/HDM|
TI- Ein Verfahren zur Analyse von Bodenaushub auf PAHs, PCBs und PCDD/PCDFs (Procedure for Analysis of PAHs, PCBs, and PCDD/PCDFs in Excavated Material)|
AU- Tausch, H. ^Kainzbauer, J. ^Puehringer, M. |
CS- Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H. Inst. fuer Biologie.|
RN- OEFZS-4516^BL-890/89|
NT- Text in German; summary in English.|
PY- Nov 89|
PG- 20p|
PC- PC E05/MF E05 |
LA- English|
CP- Austria|
AB- The analysis of the compound classes PAHs, PCBs, and PCDD/PCDFs in excavated material is described in detail.^After Soxhlet extraction PCBs can be directly determined by gas chromatography and electron capture detector.^PAHs are isolated from the raw extract by liquid/liquid extraction and analyzed by gas chromatography/flame ionization detection.^ PCDDs and PCDFs are Soxhlet extracted, fractionated by LC in four steps and finally analyzed by coupled gas chromatography/mass spectrometry (Selected Ion Monitoring).|
DE- *Environmental surveys^*Chemical analysis^*Materials handling^*Hazardous materials^Excavation^Aromatic polycyclic hydrocarbons^Extraction^Chlorine organic compounds^Gas chromatography^Mass spectroscopy|
ID- *Foreign technology^Electron capture^Liquid chromatography^Flame ionization^ Polychlorinated biphenyls^Polychlorinated dibenzodioxins^Polychlorinated dibenzofurans^NTISTFARC|
SH- 68GE (Environmental Pollution and Control_General)^99A

(Chemistry_Analytical Chemistry)||

163 of 207 Complete Record Tagged
AN- NTN90-0643/HDM|
TI- Cleaning Excavated Soil Using Extraction Agents: A State-of-the-Art Review^ NTIS Tech Note|
CS- Environmental Protection Agency, Washington, DC.|
NT- FOR ADDITIONAL INFORMATION: Detailed information about the technology described may be obtained by ordering the NTIS report, NTIS order number, PB89-212757/AS, cost, $15.95.|
PY- Aug 90|
PG- 1p|
PC- Not Available NTIS |
LA- English|
CP- United States|
AB- This citation summarizes a one-page announcement of technology available for utilization.^EPA is now sponsoring research on new treatment technologies to destroy, detoxify, or incinerate hazardous waste; on ways to recover and reuse hazardous waste; and on methods to decrease the volume of hazardous waste requiring treatment or disposal.^One of the research areas initiated by the EPA is use of extraction agents for washing excavated contaminated soil.^Washing excavated soil holds promise for being applicable to all contaminants.^Soil washing employing extraction agents consists of soil excavation, above-ground treatment, isolation and removal or destruction of the contaminant, and redeposit of the cleaned soil.^Each of the above-ground treatment techniques for separating the contaminant from the soil uses an extraction agent--a liquid, gas, chemical additive, or combination of agents--that mobilizes the contaminant, which is chemically or physically attached to the soil particles.^Specifically, this report: (1) surveys the contaminants (by type and concentration) and soil (by type and quantity) at the various National Priority List (NPL) sites to define the most frequently occurring problems at these sites; (2) reviews the extractive treatment technologies that have potential for cleaning the contaminants from soils; and (3) recommends areas for future research.|
DE- *Hazardous materials^*Waste treatment^*Extractors|
ID- *Land pollution control^*Remedial action^NTISNTND|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

164 of 207 Complete Record Tagged
AN- PB90-250416/HDM|
TI- Health Assessment for Rio Grande Oil Company Refinery (Rio Grande I), National Priorities List, Sour Lake, Texas, Region 6. CERCLIS No. TXD980795736^Preliminary rept|
CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
PY- 16 May 90|
PG- 25p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The Rio Grande Oil Company Refinery (Rio Grande I) site is a proposed National Priorities List site located adjacent to the City of Sour Lake in

Hardin County, Texas.^Rio Grande I was the site of an oil refinery in the 1920s and 1930s.^Refinery wastes were disposed of on site in open, unlined pits.^A privately-funded remediation effort removed 3,410 cubic yards of waste material from the site in November 1987.^Elevated levels of mercury, zinc, and bis(2-ethylhexyl)phthalate were detected in soil on site after remediation.^No groundwater contamination was detected.^Based on the available environmental sampling information, the Rio Grande I site is not of public health concern under current conditions.|

DE- *Public health^*Environmental surveys^*Hazardous materials^Toxicity^ Refineries^Industrial wastes^Sampling^Pits(Excavation)^Mercury(Metal)^ Cadmium^Zinc^Phthalates^Ground water^Acceptability|

ID- *Risk assessment^*Soil contamination^Rio Grand Oil Refinery^*Sour Lake(Texas)^NTISHEWTSD|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57Y (Medicine and Biology_Toxicology)^44G (Health Care_Environmental and Occupational Factors)||

165 of 207 Complete Record Tagged

AN- PB90-246562/HDM|

TI- Health Assessment for Acme Solvents Reclamation, Inc., Winnebago County, Illinois, Region 5. CERCLIS No. ILD053219259 (Amended)^Final rept|

CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|

NT- See also PB90-105941.|

PY- 12 Apr 90|

PG- 17p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

AB- The Acme Solvents Reclamation, Inc.^(Acme) National Priorities List (NPL) Site is located in Winnebago County, Illinois.^The site is located in a semi-rural area characterized by low density housing.^There are volatile organic compounds (VOCs), base neutral extractable compounds (BNECs), polychlorinated biphenyls (PCBs), and several metals present in the soil, sediment, groundwater, air, and/or leachate at or around the site.^The Record of Decision (ROD) signed September 1985, mandated several remedial actions which included the provision of interim alternate water, excavation and incineration of waste and contaminated soil, landfilling of non-incinerable waste in an off-site Resource Conservation and Recovery Act (RCRA) landfill, and continued investigation of the connection between the groundwater flow and the bedrock.|

DE- *Public health^*Environmental surveys^*Solvents^*Hazardous materials^ Exposure^Toxicity^Site surveys^Waste disposal^Substitutes^Metals^Air pollution^Water pollution|

ID- *Risk assessment^*Winnebago County(Illinois)^Soil contamination^Volatile organic compounds^Polychlorinated biphenyls^Path of pollutants^Remedial action^Superfund^NTISHEWTSD|

SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57Y (Medicine and Biology_Toxicology)^44G (Health Care_Environmental and Occupational Factors)^43F (Problem Solving Information for State and Local

Governments_Environment)||

166 of 207 Complete Record Tagged
AN- PB90-244187/HDM|
TI- Health Assessment for Oronogo-Duenweg Mining Belt, Jasper County, Missouri, Region 7. CERCLIS No. MDD980686281^Preliminary rept|
CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
PY- 18 Jun 90|
PG- 29p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The Oronogo-Duenweg Mining Belt site, Jasper County, Missouri, has been proposed by the U.S.^Environmental Protection Agency (EPA) for inclusion on the National Priorities List (NPL).^Referred to as the Missouri portion of the Tri-State (Missouri, Kansas, and Oklahoma) Mining District, the site comprises approximately 20 square miles and was the location of the most concentrated mining effort in the Tri-State District.^As a result of commercial zinc and lead mining operations that occurred from about 1850 until the late 1960s, shallow groundwater, surface water, sediment, and surface soil are contaminated with heavy metals (zinc, lead, cadmium, and nickel).^Municipalities in the area use both surface water and a deep aquifer for water supplies; individual households outside these centers rely on a shallow aquifer for water.^Based upon information reviewed, the Agency for Toxic Substances and Disease Registry (ATSDR) has concluded that this site is of public health concern because of the risk to human health resulting from probable exposure to hazardous substances at concentrations that may result in adverse human health effects.|
DE- *Public health^*Environmental surveys^*Mines(Excavations)^*Hazardous materials^*Oronogo-Duenweg Mining Belt^Water pollution^Exposure^Toxicity^ Site surveys^Sediments^Water supply^Land use|
ID- *Risk assessment^*Jasper County(Missouri)^Mine wastes^Soil contamination^ Heavy metals^Path of pollutants^NTISHEWTSD|
SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^ 48A (Natural Resources and Earth Sciences_Mineral Industries)^57U (Medicine and Biology_Public Health and Industrial Medicine)^57Y (Medicine and Biology_Toxicology)^44G (Health Care_Environmental and Occupational Factors)^43F (Problem Solving Information for State and Local Governments_Environment)||

167 of 207 Complete Record Tagged
AN- PB90-241969/HDM|
TI- Health Assessment for Fort Hartford Coal Stone Quarry, Olaton, Kentucky, Region 4. CERCLIS No. KYD980844625^Preliminary rept|
CS- Agency for Toxic Substances and Disease Registry, Atlanta, GA.|
PY- 18 Jun 90|
PG- 20p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The Fort Hartford Stone Quarry site, an underground mine located near Olaton, Kentucky, in Ohio County, has been proposed by the U.S.^

Environmental Protection Agency for addition (Update 7) to the National Priorities List.^Mine tunnels contain piles of wastes from aluminum smelting.^Ammonia and lead have been detected at levels of concern; hydrogen sulfide, methane, hydrogen, and aluminum may also be of concern.^ The lead may not be associated with the wastes being managed on-site.^ Approximately 15 persons reportedly live within one-half mile of the site, and the nearest residence is about 1,500 feet to the southeast.^Olaton, a small community of about a dozen houses, is 2 miles to the southeast; approximately 1,400 persons reside within 4 miles.^Local fishermen have complained about odors, and citizens have expressed concerns about mine tunnels and gases affecting a school now under construction about 2 miles from the site.^Wastes, groundwater, subsurface gases, and ambient air may be substantive environmenal pathways for site-related contaminants.^The site is of potential public health concern.^Area residents may be exposed to site-related contaminants through use of groundwater from private water supply wells.^On-site workers and future remedial workers potentially may be exposed--via inhalation, ingestion, or dermal contact--to contaminants in the waste materials and evolving gases.^Persons off-site also may be exposed to contaminants through inhalation of ambient air and to subsurface gases if gases migrate below ground and accumulate within homes, businesses, and public buildings.^Subsurface gases also could pose a threat of physical injury if they collect on-site or in buildings off-site at levels at which ignition or explosion may occur.|

DE- *Hazardous materials^*Public health^*Environmental surveys^*Mines(Excavations)^State government^Site surveys^Exposure^Water pollution^Air pollution^Demography^Toxicity^Recommendations^Hydrogen^Methane^Land use^ Ammonia^Aluminum^Hydrogen sulfide^Lead(Metal)^Explosions^Inhalation^ Injestion(Biology)^Humans|

ID- *Toxic substances^*Mine wastes^*Fort Hartford Stone Quarry^ *Olaton(Kentucky)^Path of pollutants^Occupational safety and health^ NTISHEWTSD|

SH- 68G (Environmental Pollution and Control_Environmental Health and Safety)^ 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^48A (Natural Resources and Earth Sciences_Mineral Industries)^57U (Medicine and Biology_Public Health and Industrial Medicine)^57Y (Medicine and Biology_Toxicology)^44G (Health Care_Environmental and Occupational Factors)||

168 of 207 Complete Record Tagged

AN- DE90009205/HDM|

TI- WSSRAP (Weldon Spring Site Remedial Action Project) quarry preliminary engineering report. Revision 2^Progress rept|

CS- MK-Ferguson Co., St. Charles, MO.|

RN- DOE/OR/21548-094-REV.2|

SP- Jacobs Engineering Group, Inc., St. Charles, MO.^Department of Energy, Washington, DC.|

CN- AC05-86OR21548|

NT- Sponsored by Department of Energy, Washington, DC.^Portions of this document are illegible in microfiche products.|

PY- Jan 90|

PG- 122p|

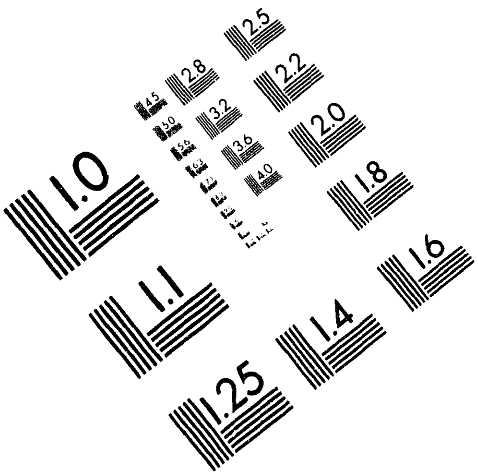
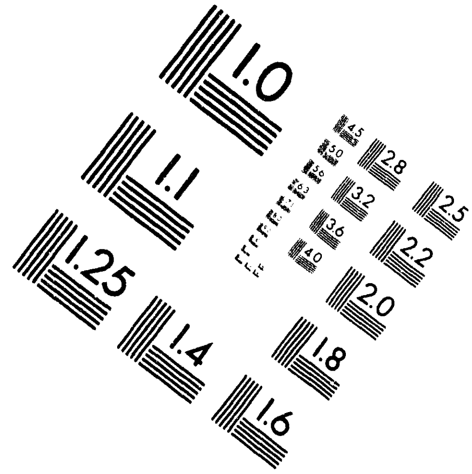
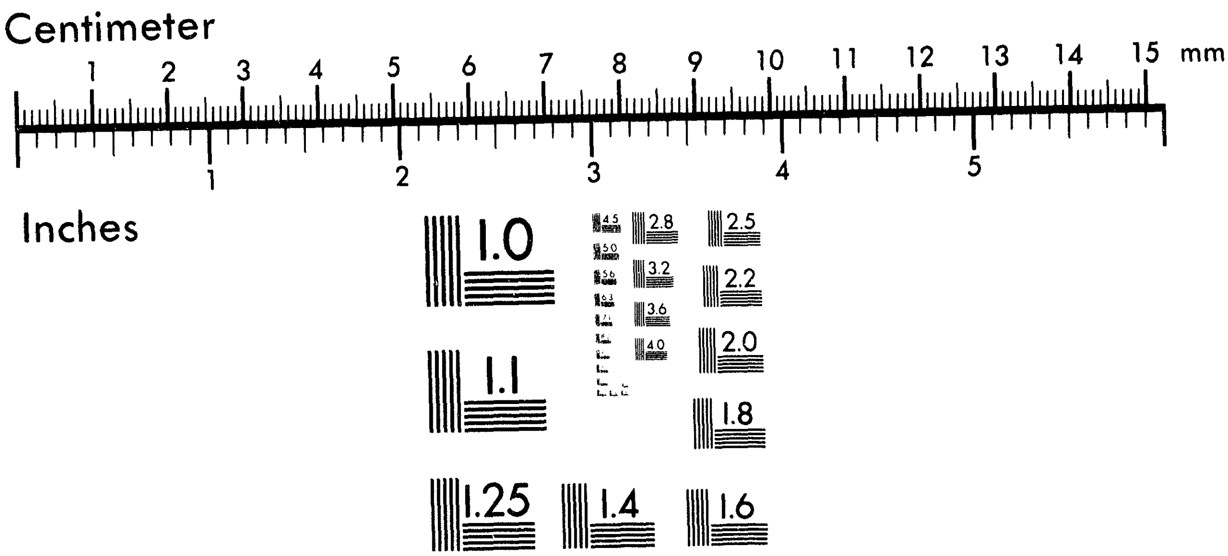
PC- PC A06/MF A01 |

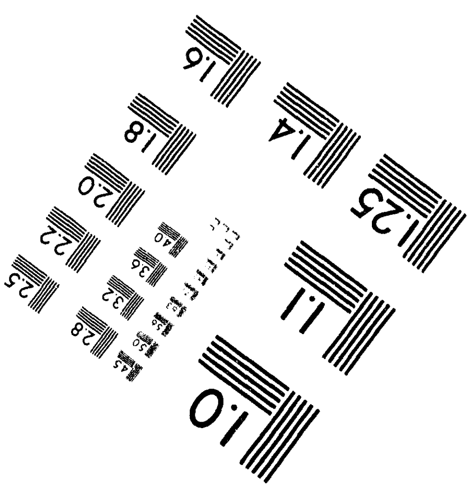
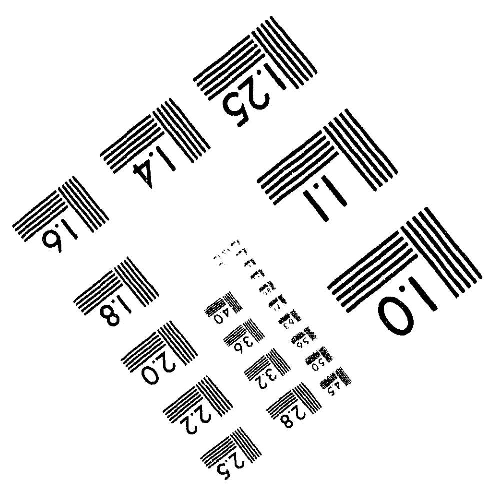
LA- English|

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

3 of 4

CP- United States|
AB- The removal, transport, and temporary storage of radiologically and chemically contaminated bulk waste from the Weldon Spring Quarry will be accomplished by dividing the work into three subcontract packages.^The major portion of the work will come under the bulk waste excavation package; construction of a temporary storage area (TSA) at the Weldon Spring Chemical Plant and of a haul road between the quarry and the TSA comprise the other two packages.^Cost estimates to complete the removal range from $5 million to $9.4 million due to a high degree of uncertainty regarding both the productivity of the excavating equipment and the effectiveness of planned dewatering efforts.^Quarry wastes will be substantially dewatered and the water treated before discharge.^Waste will be excavated in three phases, using conventional construction equipment, with preliminary sorting of waste at the quarry before transport to the TSA.^ Special attention will be given to controlling the spread of contamination by careful monitoring and control of surface and groundwater drainage and of particulate and radiological contamination of the air.^6 refs., 21 figs., 8 tabs.|
DE- *Daughter Products^*Decommissioning^*Hazardous Materials^*Radioactive Wastes^*Radon 222^*Remedial Action^Accidents^Air^Contamination^Cost Estimation^Dewatering Equipment^Emergency Plans^Excavation^Ground Water^ Implementation^Land Transport^Missouri^Monitoring^Particulates^Planning^ Progress Report^Radiation Protection^Radioactive Waste Storage^ Radioecological Concentration^Removal^Safety^Site Preparation^Surface Waters^Transport^Trucks^Waste Storage^*Water Treatment|
ID- EDB/052002^EDB/053000^EDB/054000^NTISDE|
SH- 68F (Environmental Pollution and Control_Radiation Pollution and Control)^ 68D (Environmental Pollution and Control_Water Pollution and Control)^97R (Energy_Environmental Studies)^77I (Nuclear Science and Technology_Reactor Fuels and Fuel Processing)||

172 of 207 Complete Record Tagged
AN- TIB/B90-80511/HDM|
TI- Altlastensanierung '88. Bd. 2. (Sanitation of old contaminated soils '88. Vol. 2)|
AU- Wolf, K. ^Brink, W.J. ^Colon, F.J. |
CS- Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.).|
SP- Bundesministerium fuer Umwelt-, Naturschutz und Reaktorsicherheit, Bonn (Germany, F.R.);^Umweltbundesamt, Berlin (Germany, F.R.).|
NT- In German,^2. international TNO/BMFT conference on contaminated soil - BMFT status seminar, Hamburg (Germany, F.R.), 11-15 Apr 1988.|
PY- 1989|
PG- 669p|
PC- PC E99 |
LA- German|
CP- Germany, Federal Republic of|
DT- Conference proceeding|
AB- This is the documentation of the Second International TNO/BMFT Congress on Sanitation of Contaminated Soils (11-15 Apr.^1988, Hamburg, West Germany), held by the TNO and the Hamburg Environmental Authority, in cooperation with, or sponsored by, the BMFT, the Federal Environmental Office, the Technical University of Hamburg-Harburg, and the Dutch Minister of Building Construction, Regional Planning, and Environmental Affairs.^Vol.^2 contains

summaries of papers in the following sections: 1. Planning and implementation of sanitation measures (case studies); 2. ground water (behaviour of pollutants, purification measures); 3. excavated materials (sediments, sea mud); 4. industrial safety and health; 5. environmental industries; 6. strategies and programmes, soil protection; 7. legal problems.^(orig./RB).^(Copyright (c) 1990 by FIZ.^Citation no.^90:080511.)|
DE- *Land pollution^*Abandoned sites^*Hazardous materials^*Remedial action^ Pollution control^Ground water^Water pollution^Purification^Wastes^ Excavation^Sludges^Sediments^Safety^Working conditions^Research programs^ Industry^Legal aspects^*Meetings|
ID- *Foreign technology^*Occupational safety and health^NTISTFFIZ|
SH- 68GE (Environmental Pollution and Control_General)^68G (Environmental Pollution and Control_Environmental Health and Safety)^57U (Medicine and Biology_Public Health and Industrial Medicine)||

174 of 207 Complete Record Tagged
AN- DE90005495/HDM|
TI- Environmental assessment of remedial action at the Monument Valley uranium mill tailings site, Monument Valley, Arizona. Final report^Progress rept|
CS- Department of Energy, Albuquerque, NM. Uranium Mill Tailings Remedial Action Project Office.|
RN- DOE/EA-0368|
NT- Portions of this document are illegible in microfiche products. Original copy available until stock is exhausted.|
PY- Jun 89|
PG- 143p|
PC- PC A07/MF A01 |
LA- English|
CP- United States|
AB- This document assesses the environmental impacts of the excavation and transport of the Monument Valley contaminated materials and borrow materials to the Mexican Hat, Utah, disposal site.^Impacts changed as a result of moving the Monument Valley contaminated materials to the Mexican Hat site are reanalyzed in this document.^118 refs., 16 figs., 19 tabs.|
DE- *Daughter Products^*Mill Tailings^*Radioactive Waste Disposal^*Radon 222^ Arizona^Contamination^Environmental Effects^Environmental Exposure Pathway^ Environmental Impacts^Evaluation^Excavation^Ground Disposal^Hazardous Materials^Health Hazards^Hydrology^Low-Level Radioactive Wastes^ Minimization^Mitigation^Progress Report^Radioactive Materials^Remedial Action^Stabilization^Transport^Uranium|
ID- EDB/054000^EDB/053000^EDB/052002^*Monument Valley^*Environmental effects^
Ore processing^NTISDE|
SH- 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^ 68F (Environmental Pollution and Control_Radiation Pollution and Control)||

176 of 207 Complete Record Tagged
AN- PB90-187220/HDM|
TI- Assessing UST Corrective Action Technologies: Site Assessment and Selection of Unsaturated Zone Treatment Technologies^Rept. for Oct 87-Sep 89|
AU- Lyman, W. J. ^Noonan, D. C. |
CS- Camp, Dresser and McKee, Inc., Boston, MA.|

RN- EPA/600/2-90/011|
SP- Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
CN- EPA-68-03-3409|
NT- Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.|
PY- Mar 90|
PG- 119p|
PC- PC A06/MF A01 |
LA- English|
CP- United States|
AB- A methodology is presented for evaluating the likely effectiveness of five soil treatment technologies at sites where petroleum products have contaminated the unsaturated zone.^The five soil treatment technologies are: soil venting, biorestoration, soil flushing, hydraulic barriers, and excavation.^The evaluation consists of a site assessment, selection of a treatment technology, and performance monitoring and follow-up measurements.^ The overall focus of the manual is on making a preliminary screening of what soil treatment technologies would likely be effective at a given underground storage tank site.^Factors that are critical to the successful implementation of each technology are presented and site conditions which are favorable for each factor are discussed.|
DE- *Site surveys^*Petroleum products^*Manuals^*Underground storage^*Storage tanks^*Fuel storage^*Hazardous materials^Performance evaluation^ Physicochemical properties^Water pollution^Air pollution^Barriers^ Hydraulics^State government^Crude oil^Venting^Flushing^Evacuating(Vacuum)^ Excavation^Biodeterioration|
ID- *Land pollution^*Cleanup operations^*Unsaturated zone^Environmental transport^Technology utilization^NTISEPAORD|
SH- 68GE* (Environmental Pollution and Control_General)^43F* (Problem Solving Information for State and Local Governments_Environment)||

190 of 207 Complete Record Tagged
AN- AD-A215 650/3/HDM|
TI- Enhanced Preliminary Assessment Report: Midway Army Housing Units, Kent, Washington^Final rept|
CS- Argonne National Lab., IL. Environmental Research Div.|
RN- CETHA-BC-CR-89034|
CN- W-31-109-ENG-38|
PY- Nov 89|
PG- 27p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The Midway (Nike Manor) housing area located in Kent, Wash., does not present an imminent or substantial threat to human health or the environment.^There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property.^No immediate actions, therefore, are warranted for the site.^This property was originally developed in support of a Nike missile battery.^All available documentation and circumstantial evidence suggest that the housing property was wholly independent of the battery's operational activities.^No Nike-related wastes were delivered to this property for management of disposal.^

Furthermore, since this property was independent of the Nike missile operations with respect to all necessary utilities, there is no possibility of the migration of Nike-related wastes along buried utility lines.^The following action is recommended prior to release of the property: Remove and replace all 32 underground storage tanks; sample soils in the tank excavations for petroleum contamination and remediate any problems encountered.^This recommendation assumes that the property will most likely continue to be used for residential housing.^Washington state; Housing dwellings; Army facilities closures.^(edc)|
DE- *Army facilities^Buried objects^Closures^Contamination^Disposal^Excavation^Hazards^Health^*Housing(Dwellings)^Humans^Launching sites^Management^Petroleum products^*Public health^Public utilities^Release^Residential section^Soils^Storage tanks^Threats^Toxicity^Transmission lines^Underground^Washington(State)|
ID- *Kent(Washington)^*Environmental surveys^*Site surveys^*Land pollution^*Waste disposal^*Hazardous materials^NTISDODXA|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^57U (Medicine and Biology_Public Health and Industrial Medicine)^74E (Military Sciences_Logistics, Military Facilities, and Supplies)||

191 of 207 Complete Record Tagged
AN- PB90-856915/HDM|
TI- Hazardous Materials Waste Disposal. June 1989-January 1990 (Citations from the NTIS Database)^Rept. for Jun 89-Jan 90|
CS- National Technical Information Service, Springfield, VA.|
NT- Supersedes PB89-863518. See also PB90-856907.|
PY- Jan 90|
PG- 45p|
PC- PC N01/MF N01 |
LA- English|
CP- United States|
DT- Bibliography|
AB- This bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^Considerable attention is given to waste disposal sites at military installations and to incineration operations.^Citations pertaining specifically to radioactive waste disposal and state by state toxic release inventories are excluded.^(This updated bibliography contains 59 citations, all of which are new entries to the previous edition.)|
DE- *Bibliographies^*Solid waste disposal^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Earth fills^Excavation^Removal^Military chemical agents^Regulations^Legislation|
ID- Published Searches^Water pollution abatement^NTISNTISN^NTISNERACD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)^43F (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)||

192 of 207 Complete Record Tagged
AN- PB90-856907/HDMl
TI- Hazardous Materials Waste Disposal. June 1987-May 1989 (Citations from the NTIS Database)^Rept. for Jun 87-May 89l
CS- National Technical Information Service, Springfield, VA.l
NT- See also PB90-856915.l
PY- Jan 90l
PG- 168pl
PC- PC N01/MF N01 l
LA- Englishl
CP- United Statesl
DT- Bibliographyl
AB- This bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^Considerable attention is given to waste disposal sites at military installations and to incineration operations.^Citations pertaining specifically to radioactive waste disposal are excluded.^(This updated bibliography contains 310 citations, none of which are new entries to the previous edition.)l
DE- *Bibliographies^*Solid waste disposal^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Earth fills^Excavation^Removal^ Military chemical agents^Regulations^Legislationl
ID- Published Searches^Water pollution abatement^NTISNTISN^NTISNERACDl
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)^43F (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)ll

Below, the government project search results for the years 1983 to 1988 may be found. The search resulted in a list of 101 technical reports. It is important to note that for space reasons all Records of Decision (ROD) have been removed.

9 of 101 Complete Record Tagged
AN- PB89-198683/HDMl
TI- Pipelines and Public Safety: Damage Prevention, Land Use, and Emergency Preparedness^Special reptl
CS- Transportation Research Board, Washington, DC.l
RN- TRB/SR-219^ISBN-0-309-04665-3l
NT- Library of Congress catalog card no. 88-25289.l
PY- 1988l
PG- 209pl
PC- PC A10/MF A01 l
LA- Englishl
CP- United Statesl
AB- The safety performance of transmission pipelines is better than those of most other modes of transportation.^However, because the materials that pipelines carry are flammable, explosive, or toxic, pipelines pose a danger to people or property if these materials are released to the environment as the result of a pipeline failure.^Damage caused by excavation is a leading

cause of pipeline failure.^In response to a recommendation by the National Transportation Safety Board that the adequacy of public policies for land use near pipelines be examined, the Transportation Research Board assembled a study committee of eight members with expertise in pipeline operations, accident analysis, land use planning, and safety program management.^The result of their study is a synthesis of policies and practices used by government and industry to enhance public safety near long-distance transmission pipelines and recommendations for strengthening those policies and practices.|
DE- *Pipeline transportation^*Safety^Hazardous materials^Accident analysis^ Policies^Regulations^Accident prevention^Land use|
ID- Emergency preparedness^NTISNASTRB|
SH- 85E (Transportation_Pipeline Transportation)||

18 of 101 Complete Record Tagged
AN- PB89-863518/HDM|
TI- Hazardous Materials Waste Disposal. June 1987-May 1989 (Citations from the NTIS Database)^Rept. for Jun 87-May 89|
CS- National Technical Information Service, Springfield, VA.|
NT- Supersedes PB88-864111.|
PY- Jun 89|
PG- 168p|
PC- PC N01/MF N01 |
LA- English|
CP- United States|
DT- Bibliography|
AB- This bibliography contains citations concerning the disposal of hazardous industrial and municipal wastes, chemical agents, and a variety of other dangerous substances.^Topics include restoration operations, contamination abatement studies, appropriate regulation and legislation, and remedial response strategies.^Considerable attention is given to waste disposal sites at military installations and to incineration operations.^Citations pertaining specifically to radioactive waste disposal are excluded.^(This updated bibliography contains 310 citations, 194 of which are new entries to the previous edition.)|
DE- *Bibliographies^*Solid waste disposal^*Hazardous materials^Environmental surveys^Industrial wastes^Incinerators^Military chemical agents^Regulations^ Legislation^Removal^Excavation^Earth fills|
ID- Published Searches^Water pollution abatement^NTISNTISN^NTISNERACD|
SH- 68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^91A* (Urban and Regional Technology and Development_Environmental Management and Planning)^43F* (Problem Solving Information for State and Local Governments_Environment)^88E (Library and Information Sciences_Reference Materials)||

34 of 101 Complete Record Tagged
AN- DE88017182/HDM|
TI- Retrieval of Transuranic Waste|
CS- Savannah River Lab., Aiken, SC.|
RN- DPST-88-702|
SP- Department of Energy, Washington, DC.|
CN- AC09-76SR00001|

NT- Portions of this document are illegible in microfiche products.|
PY- 19 Jul 88|
PG- 14p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- Soil removal and drum retrieval equipment are being developed and demonstrated in support of the Transuranic Waste Facility (TWF) program.^ Accomplishments to date include: Soil removal equipment, a telescoping excavator and high velocity vacuum truck were selected for soil removal; Preliminary demonstrations, the capabilities of both the telescoping excavator and vacuum truck were demonstrated by the vendors; Shielding Lifting Canister, Functional parameters were defined and design is 95% complete; and Full-scale demonstration, SRL test mounds were selected for a full-scale drum retrieval demonstration.^Further development will include an integrated full-scale demonstration.^Several drums buried in non-radioactive TRU test mounds will be retrieved.^Planning for the demonstration is underway.^A telescoping excavator is being acquired, the shielded lifting canister will be fabricated and pre-tested, and a vacuum truck will be leased.^5 figs.^(ERA citation 13:053263)|
DE- *Alpha-Bearing Wastes^*Retrieval Systems^*Trucks^Compliance^Containers^ Design^Hazardous Materials^Materials Handling^Radioactive Waste Processing^ *Radioactive Waste Storage^Radiolysis^Regulations^*Removal^*Soils^ *Underground Storage^WIPP|
ID- ERDA/052002^ERDA/053000^ERDA/510300^NTISDE|
SH- 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^ 50C (Civil Engineering_Construction Equipment, Materials, and Supplies)||

37 of 101 Complete Record Tagged
AN- DE88012068/HDM|
TI- Recent Trends in Hazardous Waste Management: Removal Actions|
AU- MacDonell, M. M. ^Peterson, J. M. ^Beskid, N. J. |
CS- Argonne National Lab., IL.|
RN- CONF-8805103-4|
SP- Department of Energy, Washington, DC.|
CN- W-31-109-ENG-38|
NT- Hazardous material spills conference, Chicago, IL, USA, 16 May 1988.^ Portions are illegible in microfiche products.|
PY- 1988|
PG- 12p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- In response to the release or threat of release of hazardous substances from contaminated sites across the United States, there has been a recent trend toward implementing removal actions.^Removal actions may be conducted as part of cleanup activities at waste sites ranging from illegal dump sites to sites on the national Priorities List of the US Environmental Protection Agency (EPA).^The scope of removal actions can range from very limited actions to full-scale excavation and treatment operations, depending on the nature of the needed response.^In all cases, the removal must be consistent with the final remedial action at the site and must

contribute to the efficient performance of that remedial action.^ Historically, removal actions have been carried out in response to time-critical emergencies where it can be shown that there exists an imminent and substantial danger to public health or the environment.^However, recent guidance from the EPA has supported implementation of removal actions at sites that do not pose such an immediate threat.^Non-time-critical actions are being taken, where appropriate, to effect cleanup in a more cost-effective and timely manner than would otherwise be possible (e.g., if tied to the record of decision for the final remedial action).^The increased emphasis on removal actions is reflected in recent legislation, in regulations that are currently being drafted, and in EPA directives.^This paper discusses the relationship of removal actions to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 the Superfund Amendments and Reauthorization Act of 1986, the current and proposed revisions of the National Oil and Hazardous Substances Pollution Contingency Plan, and recent EPA policy and directives.^(ERA citation 13:043856)|

DE- *Hazardous Materials^Legal Aspects^Removal^US EPA^Waste Management|

ID- ERDA/510200^*Waste disposal^Regulations^Site surveys^*Land pollution^NTISDE|

SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

40 of 101 Complete Record Tagged

AN- PB88-189428/HDM|

TI- NIOSH (National Institute for Occupational Safety and Health) Alert Reprints: October 1980-December 1986|

CS- National Inst. for Occupational Safety and Health, Cincinnati, OH.|

RN- DHHS/PUB/NIOSH-87-119|

PY- Sep 87|

PG- 137p|

PC- PC A07/MF A01 |

LA- English|

CP- United States|

AB- A total of 13 NIOSH Alerts published since 1980 were reprinted in the volume.^Hazards dealt with in these Alerts included: 2-nitropropane (79469); benzidine (92875), o-tolidine (119937), and o-dianisidine (119904) based dyes; controlling carbon-monoxide (630080) hazard in aircraft refueling operations; electrocutions of workers in fast food restaurants; injury of workers by robots; electrocutions from contact between cranes and power lines; deaths and injuries from excavation cave ins; hazards in the use of water spray or fog streams to prevent or control ignition of flammable atmospheres; occupational fatalities in confined spaces; grain auger electrocutions; fatalities due to fires and explosions in oxygen limiting silos; electrocutions due to damaged receptacles and connections; and fatalities of workers contacting electrical energy.^These Alerts were reprinted exactly as they first appeared and therefore contained no updated material.|

DE- *Environmental surveys^*Industrial medicine^*Hazards^Exposure^Toxicity^ Hazardous materials^Fire hazards^Electrical shock^Grain elevators^Accident prevention^Accident investigations^Carbon monoxide^Dyes^Silos^Robots^ Confined environments^Environmental health|

ID- *Occupational safety and health^*Toxic substances^Benzidines^NTISHEWOSH^

NTISHEWCDC|
SH- 94D (Industrial and Mechanical Engineering_Job Environment)^44G (Health Planning and Health Services Research_Environmental and Occupational Factors)^57U (Medicine and Biology_Public Health and Industrial Medicine)^ 57Y (Medicine and Biology_Toxicology)^68G (Environmental Pollution and Control_Environmental Health and Safety)||

41 of 101 Complete Record Tagged
AN- PB88-179320/HDM|
TI- Assessment of Risk Caused by Remedial Actions Considered for Vertac Chemical Corporation Site, Jacksonville, Arkansas|
AU- Falco, J. W. ^Schaum, J. L. |
CS- Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.|
RN- EPA/600/6-88/002|
PY- Dec 84|
PG- 40p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- The purpose of the study is to assess the risk caused by dust emissions associated with proposed remedial actions considered for the Vertac Chemical Corporation site in Jacksonville, Arkansas.^Much of the site is contaminated with 2,3,7,8-TCDD as a result of the materials handling, waste disposal, and other operations associated with the pesticide production which has occurred at the site since the 1950's.^The proposed remedial action involves excavation of the contaminated areas and redisposal in a secure landfill.^These actions would disturb the soil, creating the potential for dust emissions.^The study estimates the possible emission rates, uses dispersion models to predict resulting off-site air concentrations, and finally, calculates the exposure/risks caused by these emissions.|
DE- *Hazardous materials^*Emission^*Risk^Earth fill^Pesticides^Waste disposal^ Exposure^Assessments^Industrial wastes^Carcinogens^Dust|
ID- *Solid waste management^*Remedial actions^Jacksonville(Arkansas)^2^3^7^8-TCDD^NTISEPAORD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68G (Environmental Pollution and Control_Environmental Health and Safety)^68A (Environmental Pollution and Control_Air Pollution and Control)^ 57Y (Medicine and Biology_Toxicology)^57U (Medicine and Biology_Public Health and Industrial Medicine)^43F (Problem Solving Information for State and Local Governments_Environment)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)||

44 of 101 Complete Record Tagged
AN- DE88000007/HDM|
TI- Rates of Evaporite Deformation: The Role of Pressure Solution|
AU- Borns, D. J. |
CS- Sandia National Labs., Albuquerque, NM.|
RN- SAND-85-1599|
SP- Department of Energy, Washington, DC.|
CN- AC04-76DP00789|

NT- Portions of this document are illegible in microfiche products. Original copy available until stock is exhausted.l
PY- Jul 87l
PG- 43pl
PC- PC A03/MF A01 l
LA- Englishl
CP- United Statesl
AB- Evaporite sequences were studied for hazardous waste disposal and hydrocarbon development and storage.^Rates of deformation are important in evaluating the long-term performance of different evaporites.^Rates are controlled by temperature, differential stress, and active mechanism of deformation for each specific type of evaporite and setting.^Strain rates are estimated through in-situ measurements and the integration of geometric strain analysis and stratigraphic arguments for the time required for the observed deformation to occur.^An inherent problem in such calculations is the large extrapolation of rates through time.^Specific mechanisms can be determined from petrofabric study, as at the WIPP site, SE New Mexico, where textures indicating that pressure solution was active are observed.^ Calculations based on experimental data are limited by the relatively poor data on diffusion in intergranular fluids.^A variety of grain boundary diffusion models have been used.^For gravity-driven deformation near the WIPP site, geometric-stratigraphic integration predicts a naturally occurring strain rates of 10 sup -14 s sup -1 to 10 sup -16 s sup -1 .^ Strain rates of 10 sup -15 to 10 sup -16 s sup -1 are predicted using models for dislocation creep and pressure solution.^The rates using two approaches, geometric-stratigraphic and constitutive, are basically in agreement.^These rates for the gravity-driven flow structures near WIPP reflect lower temperatures and stresses than salt domes.^At the temperatures and stresses estimated for the WIPP flow structures, pressure solution is probably the dominant mechanism, rather than dislocation creep.^ It remains to be determined where in the transition from transient to steady-state response to an underground excavation in rock-salt pressure solution becomes a major mechanism.^39 refs., 4 figs., 8 tabs.^(ERA citation 12:049429)l
DE- *Evaporites^*Radioactive Waste Storage^Deformation^Hazardous Materials^ Mathematical Models^Pressure Effects^Salt Deposits^Site Characterization^ Solutions^Underground Storage^WIPPl
ID- ERDA/052002^ERDA/053000^ERDA/510300^NTISDEl
SH- 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)ll

45 of 101 Complete Record Tagged
AN- PB88-113295/HDMl
TI- Construction Quality Control and Post-Construction Performance Verification for the Gilson Road Hazardous Waste Site Cutoff Wall^Final rept.l
AU- Barvenik, M. J. ^Ayres, J. E. l
CS- Goldberg-Zoino and Associates, Inc., Newton Upper Falls, MA.l
RN- EPA/600/2-87/065l
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.^New Hampshire Water Supply and Pollution Control Commission, Concord.l
NT- Sponsored by Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab., and New Hampshire Water Supply and Pollution Control Commission, Concord.l

PY- Aug 87|
PG- 258p|
PC- PC A12/MF A01 |
LA- English|
CP- United States|
AB- The report describes assessment activities undertaken to evaluate the effectiveness of a soil/bentonite backfilled cutoff wall (slurry trench) installed for the purpose of hazardous waste containment.^The work includes development and evaluation of field quality control tests, evaluation of electronic piezocone instrumentation for post-construction verification of backfill homogeneity, and evaluation of cutoff wall bulk hydraulic conductivity via hydraulic stress testing.^The information in the report is useful to those involved in the feasibility study, design and/or construction of cutoff walls as a hazardous waste remediation technology.|
DE- *Hazardous materials^*Containment^*Walls^*Water pollution control^ Construction^Design criteria^Soils^Bentonite^Backfills^Field tests^ Hydraulic conductivity^Stress^Evaluation^Trenching^Excavation^Slurries^ Methylene blue^Ground water^Monitoring^Permeameters|
ID- *Cutoff walls^Superfund^NTISEPAORD|
SH- 68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^50B (Civil Engineering_Civil Engineering)^48G (Natural Resources and Earth Sciences_Hydrology and Limnology)||

48 of 101 Complete Record Tagged
AN- PB88-102405/HDM|
TI- Nondestructive Testing (NDT) Techniques to Detect Contained Subsurface Hazardous Waste^Final rept. 19 Oct 80-18 Oct 86|
AU- Lord, A. E. ^Koerner, R. M. |
CS- Drexel Univ., Philadelphia, PA.|
RN- EPA/600/2-87/078|
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
NT- Sponsored by Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
PY- Sep 87|
PG- 99p|
PC- PC A05/MF A01 |
LA- English|
CP- United States|
AB- The project involves the detection of buried containers with NDT (remote-sensing) techniques.^Seventeen techniques were considered and four were ultimately decided upon.^They were: electromagnetic induction (EMI); metal detection (MD); magnetometer (MAG); and ground penetrating radar (GPR).^The containers--both steel and plastic--varying in size from 5 gal to 55 gal were buried in known distributions in a wide variety of soils; also, some were submerged in water.^Five diverse field sites were used.^As a result of the work at the five field sites, a relatively complete picture has emerged concerning the strengths and weaknesses of the four NDT subsurface container location techniques.^Briefly it can be stated: GPR is the only reliable method to detect plastic containers, but it has limitations; GPR, EMI, and MD all suffer severe loss of detection ability when the background electrical conductivity exceeds 40 millimhos/meter; in a dry sandy soil EMI, GPR, and MAG are all capable of picking up a single 55-gal steel drum

to a depth of at least 10 feet; the MAG method works well for steel under all subsurface conditions; and GPR can usually pickup the side walls of the excavations where waste is dumped.^Application of signal enhancement techniques (background suppression) can be expected to enhance NDT utility.|

DE- *Detection^*Hazardous materials^Nondestructive tests^Drums(Containers)^ Electromagnetic induction^Radar^Plastics|

ID- NTISEPAORD|

SH- 68GE* (Environmental Pollution and Control_General)||

49 of 101 Complete Record Tagged

AN- DE87012410/HDM|

TI- Venture Guidance Appraisal Cost Estimates for Groundwater Protection Environmental Impact Statement|

AU- Moyer, R. A. |

CS- Savannah River Lab., Aiken, SC.|

RN- DPSP-87-1008|

SP- Department of Energy, Washington, DC.|

CN- AC09-76SR00001|

NT- Portions of this document are illegible in microfiche products.|

PY- 31 Mar 87|

PG- 166p|

PC- PC A08/MF A01 |

LA- English|

CP- United States|

AB- Cost estimates were prepared for closure options at criteria waste sites and alternatives for new disposal facilities for hazardous wastes, mixed wastes, low level radioactive wastes and slurry from liquid waste treatment facilities.^Because these cost estimates will be used in the Groundwater Protection EIS, the goal was to develop "enveloping" costs, i.e., the alternative or option chosen for execution at a later date should cost no more than the estimate.^This report summarizes scenarios for making detailed cost estimates.^Also included are unit costs for disposition of potential excavations, for operational activities, and for groundwater monitoring and site maintenance after closure of the site.^The cost numbers presented are intended for study purposes only and not for budgetary activities.^(ERA citation 12:038619)|

DE- *Decommissioning^*Low-Level Radioactive Wastes^*Radioactive Waste Facilities^Cost Estimation^Environmental Impact Statements^Ground Water^ Hazardous Materials^Maintenance^Monitoring^Radioactive Waste Disposal^ Savannah River Plant|

ID-
ERDA/052002^ERDA/053000^ERDA/530200^ERDA/290600^ERDA/290300^NTISDE
|

SH- 77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^ 68F (Environmental Pollution and Control_Radiation Pollution and Control)||

61 of 101 Complete Record Tagged

AN- PB87-161238/HDM|

TI- Technology Briefs: Data Requirements for Selecting Remedial Action Technology|

AU- Nunno, T. ^Wilk, L. ^Offenhauer, M. ^Palmer, S. |

CS- Alliance Technologies Corp., Bedford, MA.|

RN- EPA/600/2-87/001|
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
CN- EPA-68-03-3243|
NT- Sponsored by Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
PY- Jan 87|
PG- 174p|
PC- PC A08/MF A01 |
LA- English|
CP- United States|
AB- The report addresses the data requirements needed to screen, evaluate, design, and construct remedial action technology at hazardous waste sites.^ The remedial action technologies include controls for air pollution, surface water, leachate, ground water, gas migration, excavation, in-situ treatment, and land disposal.^The report consists of two-page summaries or 'fact sheets' on remedial technologies that describe the function, description, design considerations, limitations, technology status, associated technologies, and data needs.|
DE- *Hazardous materials^*Waste disposal^Air pollution control^Water pollution control^Ground water|
ID- *Hazardous waste sites^*Remedial action technology^*National contingency plan^Leaching^Chemical treatment^Physical treatment^Biological processes^ Land disposal^Path of pollutants^NTISEPAORD|
SH- 68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^68A (Environmental Pollution and Control_Air Pollution and Control)^43F (Problem Solving Information for State and Local Governments_Environment)^91A (Urban and Regional Technology and Development_Environmental Management and Planning)||

62 of 101 Complete Record Tagged
AN- PB86-244746/HDM|
TI- In-situ Treatment of Hazardous Waste Contaminated Soils|
AU- Sims, R. ^Wagner, K. |
CS- JRB Associates, Inc., McLean, VA.|
RN- EPA/600/D-86/196|
SP- Utah Water Research Lab., Logan.^Environmental Protection Agency, Cincinnati, OH. Water Engineering Research Lab.|
CN- EPA-68-03-3113|
NT- Prepared in cooperation with Utah Water Research Lab., Logan. Sponsored by Environmental Protection Agency, Cincinnati, OH. Water Engineering Research Lab.|
PY- Aug 86|
PG- 26p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- Techniques were investigated for in-situ treatment of hazardous wastes that could be applied to contaminated soils.^Included were chemical treatment methods, biological treatment, photochemical transformations and combination methods.^Techniques were developed based on fundamental principles of soil science and hazardous waste management.|

DE- *Hazardous materials^*Solid waste disposal^*Water pollution control^Soils^
Excavation^Industrial wastes^Soil properties^Microorganisms^Protection^
Ground water^Surface waters^Regulations^Manuals|
ID- NTISEPAORD|
SH- 08H (Earth Sciences and Oceanography_Hydrology and Limnology)^08M (Earth Sciences and Oceanography_Soil Mechanics)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)^48G (Natural Resources and Earth Sciences_Hydrology and Limnology)^48E (Natural Resources and Earth Sciences_Soil Sciences)||

63 of 101 Complete Record Tagged
AN- DE86004626/HDM|
TI- Savannah River Plant Hazardous Waste Characterization|
AU- Weber, D. A. |
CS- Du Pont de Nemours (E.I.) and Co., Aiken, SC. Savannah River Plant.|
RN- DP-MS-85-113^CONF-8510321-1|
SP- Department of Energy, Washington, DC.|
CN- AC09-76SR00001|
NT- Waste disposal by incineration symposium, Wilmington, DE, USA, 22 Oct 1985.^ Portions of this document are illegible in microfiche products.|
PY- 1985|
PG- 21p|
PC- PC A02/MF A01 |
LA- English|
CP- United States|
DT- Conference proceeding|
AB- Approximately 1780 tons of containerized hazardous waste are being stored in three buildings at the Savannah River Plant (SRP).^The total amount of waste stored includes 1495 tons (84%) of organics contaminated soil from a 1984 excavation of a closed hazardous-waste landfill.^To establish a database for development and design of a hazardous waste incinerator to detoxify these wastes, a waste characterization program has been developed and implemented.^Approximately 1400 55-gallon drums containing hazardous waste were sampled during a three-week period in January 1985.^Samples were analyzed to determine information necessary for developing an onsite waste detoxification treatment program that focuses on incineration and stabilization.^Phase I analytical work was concluded in April 1985, and focused on determination of parameters such as percent, ash chemical composition and Btu content.^Phase II analytical work is scheduled to be completed by November 1985 and includes: material compatibility testing, ash composition soil fusibility testing, waste detoxification testing, and Appendix VIII analyses.^The total cost for both sampling and analytical work (Phase I and II) is estimated at $180,000.00.^(ERA citation 11:037604)|
DE- *Hazardous Materials^*Savannah River Plant^Chemical Composition^Combustion^
Experimental Data^Sampling^Soils^Waste Processing|
ID- ERDA/052001^NTISDE|
SH- 18G (Nuclear Science and Technology_Radioactive Wastes and Fission Products)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)||

65 of 101 Complete Record Tagged

AN- PB86-224862/HDMl
TI- Superfund Enforcement Decision Document (EPA Region 4): Pepper's Steel and Alloys, Inc. Site, Medley, Dade County, Florida, March 1986^Final reptl
CS- Environmental Protection Agency, Washington, DC.l
RN- EPA/ROD/R04-86/008l
PY- 12 Mar 86l
PG- 42pl
PC- PC A03/MF A01 l
LA- Englishl
CP- United Statesl
AB- The Pepper's Steel and Alloys site occupies 30 acres known as Tracts 44, 45, and 46 in the Town of Medley, Florida.^Since the mid-1960s the Pepper's Steel site has been the location of several businesses, many of which are still operating onsite.^Operations have included the manufacture of batteries, pre-cast concrete products and fiberglass boats, as well as the repair and service of trucks and heavy equipment.^Also, sandblasting and painting services, a concrete batching plant and an automobile scrap operation have been or are located on the site.^The contaminants that have been identified within the soil, sediments, and ground water in and around the site include PCBs, organic compounds and heavy metals such as: lead, arsenic, cadmium, chromium, copper, maganese, mercury, zinc, and antimony.^ The selected remedial action for this site includes: collection and offsite disposal of all free oil according to TSCA regulations; excavation of soils.l
DE- *Hazardous materials^*Solid waste disposal^Organic compounds^Soils^Arsenic^ Chromium^Lead(Metal)^Mercury(Metal)^Transformers^Collecting methods^ Excavation^Chlorine organic compounds^Biphenyll
ID- *Superfund^Heavy metals^Polychlorinated biphenyls^Biphenyl/chloro^ NTISEPAERRl
SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)ll

68 of 101 Complete Record Tagged
AN- PB86-165362/HDMl
TI- Drum Handling Practices at Hazardous Waste Sites^Final rept. Nov 81-Feb 83l
AU- Wagner, K. ^Wetzel, R. ^Bryson, H. ^Furman, C. ^Wickline, A. l
CS- JRB Associates, Inc., McLean, VA.l
RN- EPA/600/2-86/013l
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.l
CN- EPA-68-03-3113l
NT- Sponsored by Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.l
PY- Jan 86l
PG- 191pl
PC- PC A09/MF A01 l
LA- Englishl
CP- United Statesl
AB- The purpose of the research effort was to provide technical guidance on planning and implementing safe and cost-effective response actions applicable to hazardous waste sites containing drums.^The manual provides

detailed technical guidance on methods, procedures, and equipment suitable for removing drummed wastes.^Information is included on locating buried drum; excavation and onsite transfer; drum staging, opening, and sampling; waste consolidation; and temporary storage and shipping.^Each of these operations is discussed in terms of the equipment and procedures used in carrying out specific activities; health and safety procedures; measures for protecting the environment and public welfare; and factors affecting costs.^Information is also included on the applications and limitations of the following remedial measures for controlling or containing migration of wastes: surface capping, surface water controls, groundwater pumping, subsurface drains, slurry walls, and in-situ treatment techniques.|

DE- *Hazardous materials^*Solid waste disposal^*Handling^Manuals^Cost effectiveness^Planning^Implementation^Safety|

ID- Drums^*Waste management^Land disposal^*Liquid waste disposal^NTISEPAORD|

SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)^68D (Environmental Pollution and Control_Water Pollution and Control)||

73 of 101 Complete Record Tagged

AN- DE85017071/HDM|

TI- Remedial Action Work Plan for the Colonie Site. Revision 1|

CS- Department of Energy, Oak Ridge, TN. Oak Ridge Operations Office.|

RN- ORO-847-REV.1|

SP- Department of Energy, Washington, DC.|

PY- Aug 85|

PG- 44p|

PC- PC A03/MF A01 |

LA- English|

CP- United States|

AB- The Colonie site is a DOE Formerly Utilized Sites Remedial Action Program (FUSRAP) site located in the Town of Colonie, New York, and consisting of an interim storage site and several vicinity properties.^The Colonie Interim Storage Site (CISS) is the former National Lead (NL) Industries plant located at 1130 Central Avenue.^There are 11 vicinity properties that received remedial action in 1984: 7 located south of the site on Yardboro and Palmer Avenues just across the Colonie-Albany town limits in Albany, and 4 located northwest of the site along Central Avenue in Colonie.^Of these properties, nine are residences and two are commercial properties.^ This document describes the engineering design, construction, and associated plans for remedial action on the vicinity properties and the interim storage site.^These plans include both radiological and chemical work.^Radiological work includes: excavating the above-guideline radioactive wastes on the vicinity properties; designing required facilities for the interim storage site; preparing the interim storage site to receive these contaminated materials; transporting the contaminated materials to the interim waste storage stockpile; and preparing necessary schedules for accomplishing the remedial actions.^Chemical work involves: developing the Resource Conservation and Recovery Act (RCRA) closure plans; neutralizing chemical hazards associated with plating solutions; inventorying on-site chemicals; and disposal of chemicals and/or residues.^ 17 refs., 5 figs., 1 tab.^(ERA citation 10:046220)|

DE- New York^*Remedial Action^*Storage Facilities^Abandoned Sites^Construction^

Contamination^Cost Estimation^Decontamination^Design^Engineering^Excavation^ Hazardous Materials^Planning^Radioactive Waste Storage^*Radioactive Wastes^ Soils^Waste Disposal|
ID- ERDA/054000^ERDA/052002^NTISDE|
SH- 18G (Nuclear Science and Technology_Radioactive Wastes and Fission Products)^77G (Nuclear Science and Technology_Radioactive Wastes and Radioactivity)^68F (Environmental Pollution and Control_Radiation Pollution and Control)||

97 of 101 Complete Record Tagged
AN- PB85-184182/HDM|
TI- Health Hazard Evaluation Report HETA 82-284-1456, Port Authority of New York and New Jersey, Elizabeth Industrial Park Site, Elizabeth, New Jersey|
AU- Costello, R. ^Melius, J. |
CS- National Inst. for Occupational Safety and Health, Cincinnati, OH.|
RN- HETA-82-284-1456|
PY- Apr 84|
PG- 47p|
PC- PC A03/MF A01 |
LA- English|
CP- United States|
AB- In June 1982 the National Institute for Occupational Safety and Health (NIOSH) was requested by the Port Authority of New York and New Jersey to evaluate potential occupational exposures to polychlorinated biphenyls (PCBs).^NIOSH monitored worker inhalation exposure and collected area air samples at the site periphery.^Between September 13, 1983 and October 6, 1983 NIOSH conducted 16 days of on-site sampling.^NIOSH noted no overexposures to chemical substances during the test trench excavation.^ Exposures to all toxic agents were at least a hundred fold less than any recommended occupational criteria.^Personal protective equipment and work practices further reduced the exposures.^The absence of PCB exposure during the handling of potentially contaminated materials and the low level of emission of volatile organic vapors, strongly suggest minimal potential health consequences during construction and industrial occupancy of this site.^Recommendations for control of occupational exposures during construction at this site are included in Section VIII.|
DE- *Environmental surveys^*Industrial medicine^*Construction^Exposure^Toxicity^ Inspection^Hazardous materials^Protective clothing^Earth fills^New York^New Jersey^Air pollution|
ID- *Toxic substances^*Occupational safety and health^Polychlorinated biphenyls^ Volatile organic compounds^SIC 1623^NTISHEWOSH|
SH- 06J (Biological and Medical Sciences_Industrial (Occupational) Medicine)^ 06T (Biological and Medical Sciences_Toxicology)^57U (Medicine and Biology_Public Health and Industrial Medicine)^57Y (Medicine and Biology_Toxicology)^94D (Industrial and Mechanical Engineering_Job Environment)^68G (Environmental Pollution and Control_Environmental Health and Safety)^68A (Environmental Pollution and Control_Air Pollution and Control)||

98 of 101 Complete Record Tagged
AN- PB85-177129/HDM|
TI- Using Mined Space for Long-Term Retention of Nonradioactive Hazardous

Waste. Volume 2. Solution Mined Salt Caverns^Final rept. Aug 83-Jan 85|
AU- Stone, R. B. ^Covell, K. A. ^Weyand, L. W. |
CS- Fenix and Scisson, Inc., Tulsa, OK.|
RN- EPA/600/2-85/021B|
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
CN- EPA-68-03-3191|
NT- See also PB85-177111.|
PY- Mar 85|
PG- 66p|
PC- PC A04/MF A01 |
LA- English|
CP- United States|
AB- This two-volume report assesses the current status of using mined-space for long-term retention of nonradioactive hazardous waste.^Volume 2 expands the definition of mined space to include that created by solution mining of salt.^This report examines the extent of salt deposits in the continental United States, relates the salt deposits to waste generating regions, examines the variances in salt chemistry for the various deposits, describes the methods for creating solution mined caverns, discusses design and operation considerations, discusses projects proposed by industry, discusses advantages of the concept, and discusses needed research.|
DE- *Hazardous materials^*Mines(Excavations)^*Industrial wastes^*Solid waste disposal^*Solution mining^Chemistry^Design criteria^Performance evaluation^ United States|
ID- *Underground storage^*Liquid waste disposal^*Salt deposits^Land disposal^ Underground space^NTISEPAORD|
SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^08I (Earth Sciences and Oceanography_Mining Engineering)^68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^ 48A (Natural Resources and Earth Sciences_Mineral Industries)||

99 of 101 Complete Record Tagged
AN- PB85-177111/HDM|
TI- Using Mined Space for Long-Term Retention of Nonradioactive Hazardous Waste. Volume 1. Conventional Mines^Final rept. Aug 83-Jan 85|
AU- Stone, R. B. ^Moran, T. R. ^Weyand, L. W. ^Sparkman, C. U. |
CS- Fenix and Scisson, Inc., Tulsa, OK.|
RN- EPA/600/2-85/021A|
SP- Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.|
CN- EPA-68-03-3191|
NT- See also PB85-177129.|
PY- Mar 85|
PG- 108p|
PC- PC A06/MF A01 |
LA- English|
CP- United States|
AB- This two-volume report assesses the current status of using mined-space for long-term retention of nonradioactive hazardous waste.^Volume 1 updates previous studies conducted in 1974 and 1975 and examines published literature, determines involvement of government agencies, reviews regulatory and permitting requirements, and identifies existing mines for a

potential demonstration project.|
DE- *Hazardous materials^*Mines(Excavations)^*Industrial wastes^*Solid waste disposal^Assessments^National government^Regulations^Licenses^State government|
ID- *Underground storage^*Liquid waste disposal^Underground space^Land disposal^ NTISEPAORD|
SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^08I (Earth Sciences and Oceanography_Mining Engineering)^68C* (Environmental Pollution and Control_Solid Wastes Pollution and Control)^ 43F* (Problem Solving Information for State and Local Governments_Environment)^48A (Natural Resources and Earth Sciences_Mineral Industries)||

100 of 101 Complete Record Tagged
AN- NTN85-0051/HDM|
TI- In Situ Vitrification - Technology for Waste Treatment: Responsible management of hazardous waste burial sites often involves extensive and costly cleanup measures - excavating, transporting, treatment and reburial^ NTIS Tech Note|
CS- Department of Energy, Washington, DC.|
NT- Write NTIS for information about Tech Notes subscriptions and back issue packages available.|
PY- Jan 85
PG- 1p|
PC- Not available individually |
LA- English|
CP- United States|
AB- This citation summarizes a one-page announcement of technology available for utilization.^At Battelle's Pacific Northwest Division scientists and engineers have developed this concept into a practical and effective technology.^The process uses an electric current passed between electrodes placed in the ground to convert soil/permafrost and buried hazardous waste to a stable glass material.^The heat generated by the electric current melts the waste, soil and rock, decomposes organic materials and dissolves or encapsulates inorganic materials.^This advanced technology has a number of commercial applications: immediate disposal and treatment of radioactive and hazardous chemical wastes, remedial action for hazardous waste disposal sites and accidental leaks or spills, soil stabilization, barrier construction, and footings and foundations construction -- particularly suitable for remote areas.^...FOR ADDITIONAL INFORMATION: Contact: Mr. Vincent Fitzpatrick, Battelle Pacific Northwest Laboratory, U.S.^DOE, P.O.^ Box 999, Richland, WA 99352; (509) 376-0023.|
DE- *Hazardous materials^*Solid waste disposal^*Waste treatment^*Vitrification|
ID- NTN/D^NTISNTND|
SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

101 of 101 Complete Record Tagged
AN- AD-F004 145/9/HDM|
TI- Applying an Innovative Approach to Field Investigations at a Remedial Action Site|

AU- Coia, M. F. ^Corbin, M. H. |
CS- Weston (Roy F.), Inc., West Chester, PA.|
NT- This article is from 'Proceedings of the Environmental Systems Symposium (13th) Held at Bethesda, Maryland on 20-22 March 1984,' AD-A148 194. p164-173.|
PY- 22 Mar 84|
PG- 10p|
PC- PC A02/MF A01 |
LA- English|
CP- United States|
AB- This paper describes an approach that can be applied to a hazardous waste site where known groundwater contamination exists are remedial action is necessary to mitigate the environmental concerns.^The sampling program is conducted to locate, as accurately as possible, the position, extent and depth of contaminant source areas, and to identify the potential contaminants present as well as the potential extent of contaminant migration in the soil and groundwater.^These sampling procedures utilize the maximum number of backhoe trench excavations (to locate the apparent boundary of contaminant source areas and obtain composite soil samples along a prescribed coordinate grid system) and field-implemented analytical techniques (to screen soil samples and eliminate those of little or no contamination).^Laboratory analytical procedures are used to characterize the waste constituents found in the source areas and contaminated soils, and to provide the necessary level of quality assurance.^In all, the sampling program described herein maximizes the use of field-implemented analytical techniques which reduces the overall cost of laboratory analytical procedures.|
DE- *Water pollution abatement^*Environmental protection^*Waste management^ Wastes^Hazardous materials^Waste disposal^Water pollution^Contaminants^ Migration^Ground water^Soils^Sampling^Field tests^Soil tests|
ID- Component Reports^NTISDODXA|
SH- 13B (Mechanical, Industrial, Civil, and Marine Engineering_Civil Engineering)^68D (Environmental Pollution and Control_Water Pollution and Control)^68C (Environmental Pollution and Control_Solid Wastes Pollution and Control)||

9.3 Appendix C - Patent Search

Listed below are the patent search results. The results include both the patent title and the patent number listed under the key words which it was found. The key words are centered, bolded, and alphabetized. The key words listed are as follows:

- Dust Control
- Fugitive Dust
- Toxic Waste Storage

Dust Control

5203050 Wiper device for a motor vehicle rear view mirror

5194174 Methods for suppressing fugitive dust emissions

5186311 Hold-down device for articles on a conveyor

5182833	Vacuum cleaner
5186311	Dust control and ore handling aid for bauxite ore
5180333	Ventilation device adjusted and controlled automatically with movement of human body
5172638	Dust suppression system for railroad track ballast cleaning apparatus
5170761	Apparatus for controlling idling revolution speed of internal combustion engine
5170726	Dust control mat with improved cleat
5168850	Load adjustment device
5167931	SO.sub.2 control using moving granular beds
5167189	Cylinder impurity remover apparatus
5163983	Electronic air cleaner
5152028	Upright vacuum cleaner
5150729	Control spear for use in a passage for conducting dust-containing hot gases
5134546	Vehicle control unit structure
5131334	Flame stabilizer for solid fuel burner
5131192	Dust arrester for a sanding machine
5129508	Dust controlling system
5122346	Distributor for multistage fluidized beds
5116395	Dust collection with programmable cleaning air control
5111854	Particle movement system with control of dust
5105585	Dust emissions control mechanism for hand sanders
5099542	Honeycomb core dust removal system
5097136	Apparatus for curing photosensitive coatings
5093955	Combined sweeper and scrubber
5088151	Collection system for a floor polishing machine
5086206	Support Arm
5081738	Motor speed signal transmitter for a vacuum cleaner

5076303	Bottle duster
5067040	Expandable refrigerated enclosure for computer boards
5066474	Method for sulfur dioxide production from calcium sulfate by entrained high-temperature slagging reduction
5052451	Dust control apparatus
5042604	Working vehicle
5039317	Radial inflow particle separation method and apparatus
5033238	Dental technician's work station
5033151	Control and/or indication device for the operation of vacuum cleaners
5029292	Silicone/zirconium ball for use in a cursor control device
5025126	Articulated support arm
5024868	Dust control mat and method of manufacture same
5018585	Safety device to relieve explosive pressures
5013333	Unattended air cleaning system for surface maintenance machine
5011366	Ultraclean robotic material transfer method
4993838	Dust monitor
4991879	Method and apparatus for joining two relatively movable members
4987702	Surfacing machine
4986703	Auxiliary control technology for routers
4985845	Modular electrical control distribution system
4984397	Abrasive blasting apparatus
4977638	Dust collection apparatus
4977397	Touch-control computer house
4974494	Knocking device with autocontrol
4966204	Carbon filter tray filling machine and method
4932163	Dust control system for an abrasive sander
4902465	Process for forming dust control mat with non-cleated borders

4886692	Dust control mat with non-cleated borders
4875398	Retractable dust control hood and guard for rotary table saw
4824259	Dust seal assembly for use in a closed type mixer and its control mechanism
4801635	Composition and method for dust control
4784755	Dust control
4769895	Interlocking dust control mats
4746543	Composition and method for dust control
4741065	Interlocking dust control mats
4727913	Dust control loading device
4723150	Dust control method and apparatus
4714293	Dust control fluids spray arm
4699187	Dust control in hoppers
4690166	Pressure dependent dust control filter compressed air reversed flushing control system
4650598	Method and emulsions for the control of dust
4594268	Method for the control of dust using methacrylate containing emulsions and compositions
4592931	Method for soil stabilization and fugitive dust control
4497641	Apparatus and method for dust control by condensation enlargement
448704	Control device for an electrostatic dust separator
4483238	Dust control in longwall mining
4417992	Dust control
438474	Dust control apparatus with cleaning control circuit
4381628	Dust control system for surface treating machine
4380353	Dust control system and method of operation
4371477	Dust control unit
4369121	Method and composition for the control of dust
4358160	Air diversion and dust control system for longwall shearers

4335419	Insulated dust control apparatus for use in an explosive
4312388	Dust control apparatus and method of transferring dust laden discrete solid particles
4306895	Coal stacking tower dust control system
4252493	Method and apparatus for receiving bulk particulate materials involving dust control and reduced air contamination
4169170	Control of dust during coal transportation
4095625	Dust control system for grain loading
4087882	Apparatus for plucking and delivering fiber to a feeder with automatic dust control
4068802	Spraying system to control air-borne coal dust
3993460	Dust control system
3979789	Dust control for power floor treating apparatus
3977039	Air blast sweeper with dust control system
3965998	Dust control hood and dust control system
3963461	Humidity control system with apparatus for removing combustible dust particles
3963419	Antibacterial laundry oil and dust control composition
3961891	Antibacterial laundry oil and dust control oil composition
3961752	Method and apparatus for dust control treatment
3915877	Antibacterial laundry oil and dust control composition
3908720	Control of dust during discharge of materials into hoppers
3882598	Dust control cutting assembly for cutting sheet material
3868238	Dust control system for batch plant charging of transit mixers
3867969	Control of dust during handling of materials
3853354	Dust suppression spray valve control to longwall mining
3838064	Process for dust control
3814624	Method for preparing dust control fabrics
3812889	Dust control system utilizing temporarily stored aggregates

3800890	Dust control system
3784256	Dust control in longwall mining
3780392	Micro-organism control composition and dust cloth therewith
3743354	Starting control lock by dust suppression control in mining machine
3740191	Antibacterial laundry oil and dust control oil composition
3740190	antibacterial laundry oil and dust control oil composition
3719031	Electric field directed control of dust in electrostatic precipitators
3698874	Dust control apparatus for fluidized bed reactors
3695926	Flame retardant dust control fabric
3632018	Feed rate control in a cement kiln incorporating dust return
3518814	Airflow control for a dust-free bench
3494107	Dust-fume control system
3488675	Method and apparatus for control of high voltage corona discharge in electrostatic dust separator
3453678	Foam generating mechanism for dust control
D265347	Dust-control room
H001154	Covert lighting adapter
H000023	Dust control on long wall shearing machines
RE33970	Cushioning device for remote control television equipment, and assembly thereof
RE30480	Electric field directed control of dust in electrostatic precipitators

Fugitive Dust

5194174	Methods for suppressing fugitive dust emissions
5128178	Method for suppressing dust emissions from bulk solids
4610897	Recovery of fugitive dust
4592931	Method for soil stabilization and fugitive dust control

Toxic Waste Storage

5145061	Safe-T-Sand

5120165	Excavation system with pneumatic conveyance and separation of excavated material
5037286	Incineration residue treatment apparatus
5008045	Method and apparatus for centrifugally casting hazardous waste
4875805	Toxic waste storage facility
4139488	Method of preparing solid radioactive or toxic waste for long-term storage
4131563	Process of preparing substantially solid waste containing radioactive or toxic substances for safe, non-pollutive handling, transportation and permanent storage
4009116	Process of preparing substantially organic waste liquids containing radioactive or toxic substances for safe, non-pollutive handling, transportation and permanent storage

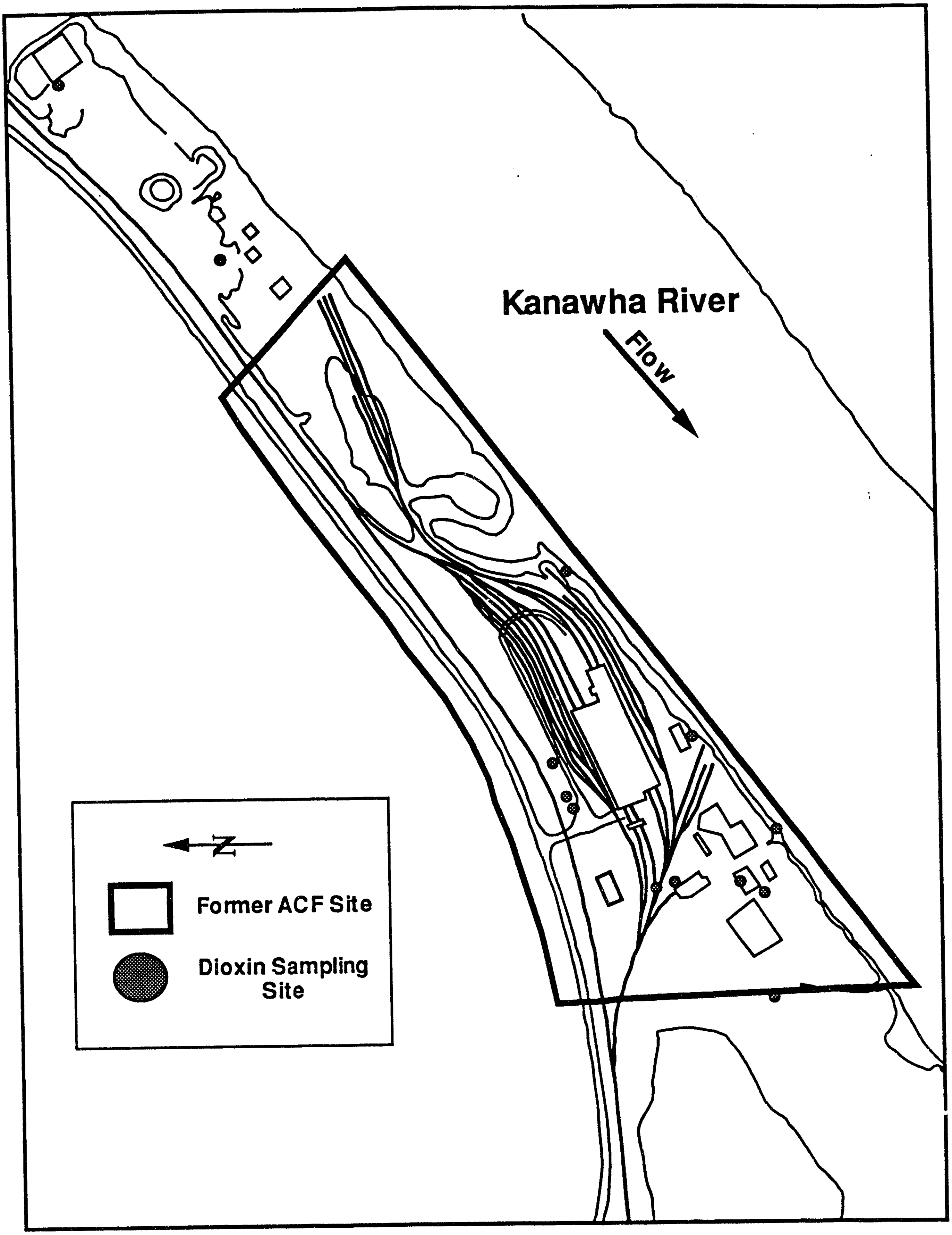
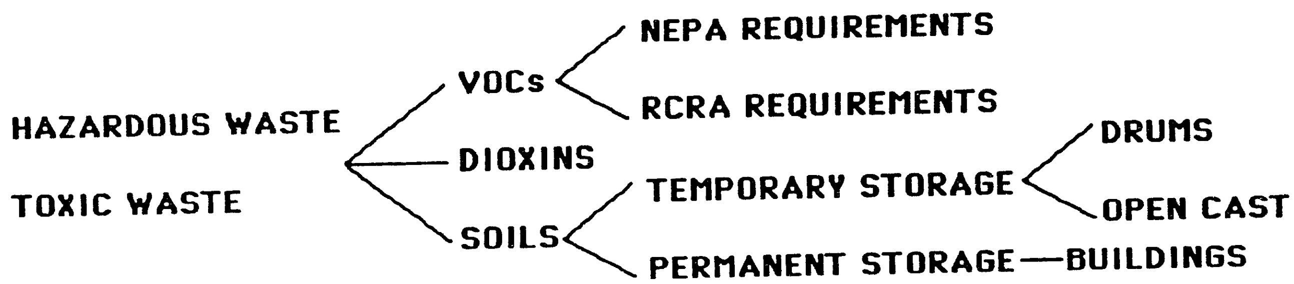


Figure 2.1 - Former ACF Site Location Map

FIGURE 2.2: KEYWORD DEVELOPMENT SCHEME



Technology	1	2	3	4	5
Performance (H)	H	H	H	M	M
Reliability (H)	H	M	M	L	L
Implementability (M)	H	L	M	L	L
Environmental Safety (H)	M	L	H	M	M
Public Health (H)	M	L	H	M	M
Legal Compliance (M)	H	M	H	M	H
Cost (L)	H	M	M	L	L
Interferences (M)	H	L	H	L	M
Totals	306	144	336	106	130

KEY

●,H = High ◍,M= Medium ○,L= Low

1 - Bulk-Pit Excavation
2 - Bulk Wide-Area Excavation
3 - Loose Bulk Excavation
4 - Limited-Arear, Vertical Excavation
5 - Trench Excavation

Figure 4.1 - Functional Criteria Ranking

ASSESSMENT OF TECHNOLOGIES FOR HAZARDOUS WASTE SITE REMEDIATION: NON-TREATMENT TECHNOLOGIES AND PILOT SCALE FACILITY IMPLEMENTATION STORAGE TECHNOLOGY

Final Report

Work Performed Under Contract
No.: DE-FC21-92MC29467

For
Raymond J. Lovett, Principal Investigator
Environmental Technology Division
West Virginia University
National Research Center For Coal And Energy
P.O. Box 6084
Morgantown, West Virginia 26506

And
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Harry R. Johnson, Project Manager
William K. Overbey Jr.
Paul J. Componation
BDM Federal Inc.
1199 Van Voorhis Rd. Suite 4
Morgantown, West Virginia 26505

February 1994

DISCLAIMER

TABLE OF CONTENTS

Section — Page No.

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

PROJECT 1 REPORT

ASSESSMENT OF ENVIRONMENTAL REMEDIATION STORAGE TECHNOLOGY

1.0 EXECUTIVE SUMMARY

The objective of this research is to examine the body of literature available on hazardous and toxic waste storage technology to determine that which would be applicable to the Winfield Site located in Putnam County, West Virginia. This information will then be made available to the WVU resource group for examining problems at the Winfield Site for planning purposes and as they occur during the actual remediation operations.

Three projects were established to examine key aspects of the remediation operation at any site, but which should have application to Winfield. These activities are excavation, monitoring, and storage technologies. This report examines only the storage technologies.

The published Characterization Report prepared by the U. S. Army Corps of Engineers was examined in detail to determine the types and location of hazardous chemicals and materials present at the site. A list of the most hazardous chemicals was prepared and those found at the Winfield site identified in Tables 2 and 3. A review of the open literature was conducted and revealed very few published reports on storage technologies. Published Patents were also examined with identical results. Published reports documenting Government projects were the largest source of literature available.

A functional analysis was conducted to identify storage technology requirements based on site characterization results and remediation plans or options. A set of criteria was developed based on the functional analysis results these were used to prioritize the identified storage technologies. A list of key words was developed to search the literature.

Only one temporary-storage technology was found in the literature that could have applicability to the Winfield site. BDM developed four additional possible storage-technology scenarios that could be applicable to the Winfield site. Because of the nature of the toxic chemicals found at Winfield (Dioxins) all the proposed solutions required liners to prevent migration of the chemicals downward toward the groundwater that is found at a depth of only 60 feet. A patent description of a permanent building that could be used for temporary storage made up the total of six technologies identified. The most secure technology, from a public health and safety perspective, would be the utilization of a permanent storage building, as revealed by the functional analysis. A building provides an easier method of monitoring and controlling the VOC's that present the most prominent hazardous chemical contaminant at Winfield. If the level of VOC's present does not justify the building of a large permanent building, then technology Number Four (4), a Temporary Storage Building with containerized storage of the toxic materials (Dioxins) and covered storage of excavated soils, would be an alternative. This method was ranked almost as high as temporary storage in a permanent building.

Storage technologies become important when there are delays in selecting the remediation technology because of problems, perceived or real, that may exist at the site, or in adjacent populated areas. A suggested area to consider for future study is the possibility of conducting some remediation operations on the stored material for some or most of the contaminant species. For example, stored soil from Winfield could be inoculated with bacteria and provided nutrients that could remediate many or most of the hydrocarbon compounds contained in the soil. Another problem to consider for further study is the potential for remediation during the storing process during storage operations. If conveyor belt systems are used for storing operations inside a storage building, dehalogenation, using multiple "Lark" units, could be employed to initiate remediation of VOC's. Another suggested area for research is the development of blocks of soil with strength enough to allow them to be stacked as high as 20 feet but still retaining porosity and permeability so that bioremediation could be promoted within the blocks.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE

The purpose of this study is to asses the state-of-the-art of storage technology as related to environmental remediation applications. A further purpose is to determine which of the storage technologies reviewed would be applicable to the Winfield site of the U. S. Corps of Engineers for use in remediating contaminated soils when excavated in the near future for construction of a new Lock and Dam at the site. The scope of the studies is to review the results of characterization studies to identify storage methodologies and equipment that can be used at any environmental remediation site but more specifically at the Winfield site on the Kanawha River in Putnam County, West Virginia. The project is to provide fundamental information to the WVU Hazardous Waste Site Remediation Resource Group to address questions and concerns that may be encountered during the actual remediation project at the Winfield Lock and Dam.

2.2 BACKGROUND

The U. S. Army Corps of Engineers (Corps) is responsible for construction projects which control traffic on the navigable inland waterway systems in the U. S. Territories and possessions. The Corps has determined that new or improved facilities were required to service traffic at the Winfield Lock and Dam site in Putnam County, West Virginia. Acreage adjacent to the present site was acquired by "Declaration of Taking" from American Car and Foundry (ACF) which had operated the 21.81 acre facility from 1952 until March of 1986. The facility was used to service and repair a fleet of tank cars and covered gondola cars used to transport liquid and solid chemical materials.

The Corps discovered that a colored liquid leaking into an excavation pit left after earlier (1989) remediation operations by ACF contained contaminants that were supposed to have been removed. Sampling and analysis indicated that the land was still contaminated with several hazardous chemicals including volatile organic compounds (VOC's), polychlorinated biphenyl's (PCB's) and dioxins. A detailed characterization study was conducted and a remediation plan prepared and submitted for public comment. The local population did not approve of the remediation plan and research into alternative supporting technologies was commissioned by the Department of Energy (DOE) at the request of Senator Byrd. A contract to conduct such research was given to West Virginia University (WVU) and BDM in turn was contracted to provide support to WVU. BDM was requested to provide support in examining recent developments in excavation, storage, and monitoring technologies that might have potential application at the Winfield site.

2.3 STUDY TECHNICAL APPROACH

Three projects were established to examine storage, extraction, and monitoring technologies. This project report is concerned with temporary storage of soils until remediation activities can be conducted and completed.

The approach for this study is to review the site characterization studies that provide indications of the types of operations that will have to be conducted to comply with federal regulations during remediation. A functional analysis will reveal the types of technologies that can be utilized for generic sites and the Winfield site. Once the technologies have been identified, then key word descriptors will be identified to support conducting a literature search that will review the S-O-A for the selected technology. A detailed analysis will determine the advantage and disadvantages for the selected technologies. A list of potential problems that have not been resolved relative to the technology will be prepared for consideration for future research projects.

3.0 HAZARDOUS MATERIALS WHICH MAY REQUIRE STORAGE

3.1 REVIEW OF EPA LISTS

.As requested by the statement of work, a review was made of the EPA lists of hazardous materials and chemical compounds. This list identified compounds, substances, and mixtures which if spilled in the environment required immediate notification of State and Federal authorities. BDM reviewed the list and compiled a list that we believe contains the most significant compounds that are those which must be reported if 100 lbs or less are spilled. Those compounds with reporting requirements of 1000 to 5000 lbs were not included on the list. There were only 30 compounds not included on the list. This list of extremely hazardous substances if found in soils would require remediation and/or storage until remediation could be performed.

The list presented in table A-1 (Found in APPENDIX A), was obtained from EPA publication "The Emergency Planning and Community Right-to- Know Act of 1986, List of Extremely Hazardous Substances," 40 C.F.R. Part 355 (Sections 302 and 304), dated March 1, 1988.

3.2 VOLATILE ORGANIC COMPOUNDS

From the same EPA source, a list of volatile organic compounds was compiled and is presented in table A-2 (APPENDIX A). Also listed and marked with an asterisk are the contaminant compounds found at the Winfield site as reported by the Corps report.

3.3 SEMI-VOLATILE ORGANIC COMPOUNDS

Table A-3 (APPENDIX A) presents a list of semi-volatile organic compounds that may require remediation and/or storage for later remediation operations. Those compounds found at the Winfield site are indicated by an asterisk.

3.4 PESTICIDES

Table A-4 presents a list of chemical pesticides that may require remediation and/or storage for future remediation operations.

Few listed pesticides have reportedly been detected at the Winfield Site. Those detected during analysis are indicated with an asterisk.

4.0 FUNCTIONAL ANALYSIS OF STORAGE TECHNOLOGY

Functional analysis is a method of determining if a planned project will perform all of the functions that are required to accomplish the goals and objectives established by the planning operation. In the case of storage technology, the specific character of the site must be determined to identify storage technology needs. A review of the Winfield Site characterization studies was performed to satisfy this requirement.

4.1 WINFIELD CHARACTERIZATION STUDIES

The Winfield site is a 21.81 acre tract of land adjacent to the right descending bank of the Kanawha River in Putnam county, West Virginia. It is immediately upstream of the Winfield Locks and Dam. The site is currently controlled by the United States Corps of Engineers. It was acquired from its prior owner, American Car and Foundry Industries, Inc., (ACF), in preparation for the planned expansion of the Winfield Locks.

4.1.1 Background

The former American Car and Foundry Industries, Inc. 21.81 acre tract is located near Red House, WV, which is approximately 20 miles northwest of Charleston, WV. The site is adjacent to the right descending bank of the Kanawha River immediately upstream of the Winfield Locks and Dam. Prior to 1952 the site was prime agricultural land. From 1952 until the facility closed in March 1986, ACF used the property to repair and service a fleet of tank and covered hopper railcars. At the height of operations, ACF maintained over 47,000 railcars that were leased to various companies for hauling liquid and solid chemical commodities.[1]

On December 8, 1989, the U.S. Army Corps of Engineers filed a Declaration of Taking in U.S. District Court for the tract of land then owned by ACF. Property acquisition was initiated to support proposed construction of an expanded lock and gate bay at the Winfield Locks and Dam. Following a limited excavation and removal activity administered by ACF, the Corps took possession of the property on May 1, 1990.

In May 1990, Corps representatives observed discolored water seeping from excavation pit walls in the area of the ACF removal activity. The soil in this area was also observed to be discolored and was characterized by a phenolic odor. This discovery was followed by sampling activity to define the limits and nature of the suspected contamination.

Water samples collected from the seeps exiting the excavation pit walls confirmed the presence of contaminants, including volatile organics and base, neutral, and acid extractables. Subsequent investigations confirmed the presence of pesticides, polychlorinated biphenyl's (PCBs), and dioxins in this area.

In September 1990, the Corps planned an initial site investigation. This site investigation was designed to include soil gas surveys, soil sampling, and any necessary ground water monitoring. Due to the nature of the contaminants identified the confirmation activities were expanded to include a total site characterization. Samples for all environmental site investigations administered by the Corps were analyzed using appropriate EPA SW-846 methods and utilized a quality assurance/quality control (QA/QC) program in an effort to provide legally defensible data.

Soil gas surveys indicated that Volatile Organic (VOC) and semi-volatile organic (SVOC) contamination was present over a large portion of the site. Soil-sampling data were relatively consistent with the soil gas results, i.e., high concentrations of VOC's and SVOC's were detected in several areas of the site. In addition to these contaminants, pesticides, PCBs, and dioxins were detected. Given the number and concentrations of contaminants found in the soil matrices, it was evident that groundwater contamination was possible and must be investigated. Due to the environmental significance of dioxin, additional sampling was required to determine if dioxin contamination was localized or widespread.

Initial groundwater monitoring at this site was accomplished by the installation of four groundwater monitoring wells, sampling each of these wells and three existing water supply wells in the area. Three of the monitoring wells were installed at the top of rock (approximate depth of 60 feet), and one was installed in shallow perched water (approximate depth of 15 feet). Low concentrations of VOC's were detected in the shallow perched water, while no contaminants were detected in the deeper aquifer, which is the drinking water supply source.

A draft EPA procedure (SOW 1290) was used for the analysis of the additional soil samples selected to be analyzed for dioxin. This procedure is similar to SW 846 method 8280 but requires more strict laboratory quality control. The Tetrachlorodibenzodioxin (TCDD) toxicity equivalence values calculated indicated over 50% of the samples were identified with dioxin contamination at a significant level. This confirmed that dioxin contamination was widespread and present in concentrations of sufficient level to be a major concern. Due to the disposal problems associated with dioxin contaminated soils, it was necessary to perform a total site characterization.

4.1.2 Current Status

Currently another round of sampling and analysis has taken place and the results are being discussed by the Corps, ACF, and the general public concerning the amount and severity of the contamination of the site.

4.1.3 Contaminants

The contaminants found at the site as reported by the Corps of Engineers are indicated with an asterisk (*) in Tables 2,3 and 4. The presence of Dioxins, as reported by the Corps, adds considerable complexity to all remediation operations and supporting functions such as monitoring to protect the health and safety of workers on site and the general public, and storage operations.

4.2 SCOPE

The scope of the functional analysis of storage technology is to determine the basic functions that must be performed by any EPA acceptable technology that will provide for storage of contaminated soils until remediation is initiated while protecting the public and the environment.

4.3 OBJECTIVES

The objective is to identify functions, requirements, issues, concerns, and uncertainties relative to identifying and qualifying a suitable storage technology.

4.4 REQUIREMENTS

4.4.1 Federal Government Regulatory Requirements

The following federal government regulations are deemed to be applicable to the Corps Winfield Site:

- Resource Conservation Recovery Act (RCRA)
- Air Quality Standards (AQS)
- National Pollutant Discharge Elimination System (NPDES)
- Clean Water Act - Section 404 (CWA)
- Safe Drinking Water Act (SDWA)
- National Environmental Protection Act (NEPA)
- Fish and Wildlife Conservation Act (FWCA)
- Executive Order # 11988

4.4.2 State Government Regulatory Requirements

The State of West Virginia has several parallel environmental protection and control acts which are believed to be applicable to the Winfield Site. These are listed below:

- Air Pollution Control Act
- Clean Water Act
- Toxic and Hazardous Materials Control Act

4.5 INTERFACES

The Temporary Storage Plan will have to be consistent and interface with the Excavation Plan, Remediation Plan and the Site Closure Plan. The Storage Plan may or may not contain provisions for monitoring operations, depending upon remediation activities that may remove some of the contaminants such as VOC's. Special provisions may need to taken for separate storage in special containers of dioxin laden soils. A careful review of the interfacing activities of the various plans will need to be made prior to implementation of any of them.

4.6 ISSUES AND CONCERNS

A primary issue relative to worker and public safety is the rate of liberation of VOC's during excavation and storage operations. A high rate of emission could result in a class B operation at the site.

A further concern is that if VOC's are not vented by drilling vent holes prior to excavation operations, will there be a need for a monitoring system that will provide the public with a warning when high levels are emitted during the storage operation that can affect public health.

4.7 ASSUMPTIONS

It is assumed that a leachate collection system will be installed for operation with which-ever storage technology is deemed acceptable in accordance with the applicable regulations and the contaminant conditions encountered during the excavation operations.

VOC levels in the soil will be monitored during excavation and the appropriate action taken when regulatory limits are exceeded.

Venting of VOC's from storage facilities will only be allowed as long as the rates are in compliance with EPA and WV clean air regulations.

Waste minimization plans will be prepared and implemented whenever possible and allowable by the regulations.

Cost benefit analysis will be an important aspect of selection of storage technology to be implemented at the Winfield Site.

4.8 INTERFERENCES

Care should be taken to locate storage facilities in a position on site (required for dioxin) which will not be disturbed by, or interfere with, excavation or remediation activities.

4.9 UNKNOWNS / UNCERTAINTIES

Does project schedule impact the storage and/or remediation technology selected or recommended for the site?

Does the VOC content of the soil require treatment before being vented from the facility?

What effect will weather have on the release of VOC's from the soils stored in the storage facility?

Will there be adequate facilities (fencing) to protect the public and wildlife in the area during storage operations?

4.10 EVALUATION CRITERIA FOR STORAGE TECHNOLOGY

The development of criteria to evaluate alternative storage technologies is derived from several different sources. Primary among these are the Federal and State guidelines. Of particular importance are the Resource Conservation Recovery Act (RCRA), Clean Water Act (CWA), and the Safe Water Drinking Act (SDWA). Functional criteria on environmental protection, as well as health and safety were developed with guidance from these and other related sources (attachment 1).

Important aspects of each technology to be evaluated for application to a generic site or the Winfield Site is to determine how well they meet the basic functional requirements, and how well they meet the evaluation criteria. The following discussion considers the functional analysis criteria for storage technology considerations.

4.10.1 Performance

Temporary storage technologies are evaluated in terms of their ability to inhibit the migration of contaminants from existing hazardous materials to the surrounding ecosystem. This evaluation includes, but is not limited to, contamination of associated surface water systems, ground-water systems, uncontaminated soils, and air emissions. Specific criteria include:

Associated ground-water and surface-water systems must be protected from migration of contaminants from the temporary storage site.

Temporary storage technology must exhibit positive control of contaminant migration generated by associated run-on and runoff.

Specification of storage technology, to include but not limited to containers, tanks, surface impoundments, and/or waste piles, will comply with existing government regulations.

The storage facility will be equipped with a control location of center for monitoring of gas vapors, water pressure, and/or leakage as required.

The temporary storage facility must be constructed in such a way as to minimize the potential contaminant migration through wind dispersion.

Temporary storage site will require an impervious liner and/or associated containment system compatible with known site contaminants.

4.10.2 Reliability

Effectiveness and reliability of the temporary storage technology to control contaminant migration to the surrounding ecosystems. Specific criteria include:

Storage technology controls contaminant migration to limit associated containment levels of off-site ecosystems at or below EPA limits for contaminants contained with-in the storage site.

Monitoring and treatment of gas emissions is provided to prevent VOC migration to surrounding ecosystem.

Temporary storage facility will provide positive control of associated run-on and run-off, as well as monitoring, and treatment of leachate from the site.

Temporary storage facility will provide positive control of dust emissions through either a suitable cover system or by treatment of associated contaminated materials.

Reliability of the storage technology will be maintainable for the duration of remediation activities at the site.

4.10.3 Implementability

Temporary storage facility may be procured and introduced to the site within existing time and economic limitations. Specific criteria include:

Temporary storage technology is currently available and has been demonstrated as effective in controlling contaminant migration at sites containing similar contaminant profiles.

Technology may be procured and introduced to the site within allowable time constraints.

Technology will not hinder associated site activities.

4.10.4 Environmental Safety and Health Considerations

The temporary storage technology must minimize both the short-term and long-term health and safety risks to both personnel associated with site activities as well as the general populous. Specific criteria include:

Configuration of the storage facility must prohibit physical contact with waste materials by persons (unknowing or unauthorized) or livestock. Isolation methods may include, but will not be limited to, surveillance, barriers, controlled entry and/or posted warnings.

Allowances must be made for the separation of ignitable, reactive or incompatible waste materials.

Facility must allow for the control of collection, processing, release and monitoring of water and gas emissions.

Materials and construction techniques must minimize possibility of fire, explosion, or unplanned release of hazardous waste contaminants.

Storage site is able to support the development and maintenance of contingency plans and emergency procedures to include fire fighting, spill control, decontamination, and routine movement of work crews and equipment.

Site configuration supports flow and monitoring of the hazardous waste stream.

Temporary storage facility will have a minimal visual impact, to include dust, noise and litter.

Transportation to and from the facility will have a minimal impact on existing traffic patterns and construction activities at the site.

Temporary storage facility will be visually unobtrusive.

4.10.5 Legal and Regulatory Compliance

Temporary storage technology supports remediation of contaminated materials and site-closure procedures. Technology supports excavation and storage of all contaminated materials, including, but not limited to, soils, above-ground structures, vertical construction, underground utilities and storage structures. Specific criteria include:

The storage technology must comply with existing Federal and State legal and regulatory guidelines regarding air standards, water standards, noise standards, and land use and planning.

Configuration of temporary storage facility supports efficient storage, handling and processing of contaminated materials.

Storage configuration supports monitoring of materials prior to, during and after remediation activities.

Storage system configuration will allow for the unobstructed movement of vehicles and personnel during storage and remediation activities.

Contaminated materials are configured in a form that supports site storage, handling, and remediation.

4.10.6 Economics

Temporary storage technology fulfills environmental, health and safety, and remediation criteria with minimized capital expenditures. Specific criteria include:

Temporary storage technology allows for expedient construction, remediation and site closure.

Facility will minimize impact on associated site construction activities.

Temporary storage facility will minimize requirements for associated support systems such as but not limited to barriers, monitors, roadways, utilities, drainage, and treatment.

4.10.7 Interferences

The storage technology selected should pose the least problems in the form of interferences with planned operations. The storage system configuration should allow for the unobstructed movement of vehicles and personnel during storage and remediation operations

4.11 STORAGE TECHNOLOGIES

4.11.1 Background

Storage technologies related to hazardous wastes had their beginning in the early 1940's when the various Atomic Weapons plants were manufacturing uranium and plutonium. Radioactive and other types of liquid wasted were stored in large concrete and steel lined tanks that were usually buried several feet underground similar to the single shell tanks located at the Hanford Facility near Richland, Washington.

The need for storage space for more conventional hazardous and toxic wastes did not become apparent until the initiation of the Super Fund program where large sites with extensive lists of chemical had been disposed of and now had to be cleaned up. During these early years the material was simply piled up until it could be hauled off for remediation activities.

As EPA procedures have become more stringent, the need, or potential need, for temporary storage options for toxic chemicals and contaminated materials has become apparent. Most of the activities relative to the development of storage technologies have occurred in the last five years. During this period, the EPA has required excavators of soils to store the excavant on rubber or plastic liners that can prevent contaminated liquids and leachate fluids from escaping and getting into groundwater supplies. The details of liner design, construction, and manufacture, and the type of liner materials used have come to have considerable interest when considering the concept of storage technology, either temporary or permanent. Thus, the following discussion of liners was considered important by BDM investigators.

4.11.2 Liner Technologies

The success of almost any hazardous/toxic waste storage technology is dependents on its ability to reduce the potential for spread of contaminants. The use of an effective liner system is common among many of the successful storage technologies. The function of a liner system at a waste storage site is to prevent the movement of polluting constituents that are contained in the waste from entering the associated ground water or surface water systems. This function is accomplished in two ways.

First, the liner system impedes the flow of polluting constituents into deep-water aquifers and/or surface water systems, and;

Second, it absorbs or reduces suspended or dissolved pollutants, both organic and inorganic, so that concentrations in the deep-water aquifers and/or surface water systems remain within EPA guidelines.

Most liners perform both of these tasks, dependent on the composition of the liner and the waste constituent at the site. Liners may be classified by various methodologies. For the purposes of this summary the following classes will be utilized.

CLASSES	*TECHNOLOGIES*
Soil Liner	Soils and clays
Engineered Liner	Admixes
Manufactured Liner	Polymeric membranes
Engineered Liner	Sprayed-on materials
Engineered Liner	Soil sealants
Chemical Liner	Chemisorptive materials

4.11.2.1 Review and Discussion

Compacted Soils and Clays are the first alternative considered for liners because of their availability and low cost. Effective liners of this class contain a relatively large portion of fines (smaller than 2 μm). These clay-sized particles are required in the soil to limit permeability. A good soil liner will be comprised of approximately 25-28% clay by weight.

Although soil and clay liners have a large absorption capability, their permeability is higher than other man-made liners. While some sites have existing natural clay deposits that function as a liner and limit movement of the contaminants into the ground-water system, increased activity at a site can fracture this clay layer. The increased potential for ground-water contamination caused by load stress at the Winfield

Site mandates the monitoring of water quality prior to, during and after excavation and construction activity. Any storage at the site will require additional liners to control the potential for migration of any contaminants.

Admixed Liners include asphalt, concrete, soil cement and soil asphalt, all of which are hard-surface materials that are formed in-place at the waste site. The EPA has done some exposure testing[1], but there is limited experience with these lining technologies.

Hydraulic Asphalt Concrete (HAC) is a mixture of hot asphalt cement and high quality mineral aggregate. It is usually of a harder grade (6.5-9.5) than paving asphalt. Desirable characteristics include resistivity to water damage and to stresses caused by temperature extremes. It is stable on slopes, flexible and may be applied with conventional paving equipment. Due to the effects on liner permeability, inconsistencies in mixing and compaction, a 4-inch thickness may be required[2], although a 2-inch thickness has been successful[3] in some applications. Asphalt's are water resistant. They are also resistant to acids, bases, inorganic salts (with up to 30% concentrations) and to some organic compounds commonly found in industrial wastes. They are not resistant to organic solvents and certain chemicals (particularly hydrocarbons), so they do not make an effective liner technology for sites containing petroleum-derived wastes.

Soil Cement is a compacted mixture of Portland Cement, water, and selected in-place soils. They form a low-strength Portland-Cement-like concrete, with greater stability than natural soils. Permeability varies, based on soil type, but may be enhanced through application of an epoxy asphalt or epoxy coal-tar coating. The preferable soil type will have a clay content of 35%[4]. Higher clay contents will reduce the ability of the cement to produce a homogeneous layer and increase its permeability. A Soil Cement liner has excellent aging and weathering characteristics. It resists the degradation effects produced with wet-dry and freeze-thaw cycles. Degradation has been observed in highly acidic environments[5]. Soil Cements do resist moderate amounts of alkali, organic matter, and inorganic salts. This liner technology does exhibit a tendency to crack and shrink on drying.

Soil Asphalt is a mixture of liquid asphalt and available on-site soil. The best soils have 10-25% silky fines, with a low plasticity. Permeability of this liner will be variable, based on the degree of compaction. Soil Asphalts made with asphalt emulsion do not exhibit sufficient impermeability characteristics. They usually require a water-proof seal, such as a hydrocarbon-resistant or bituminous seal[6].

Polymeric Membranes exhibit extremely, low permeability. They have been used successfully in water impoundments, sanitary landfills and various waste disposal facilities. The technologies associated with polymeric membranes are varied. Materials can be modified so that their physical and chemical properties are ideally customized to the individual site. The general classification of these polymers includes:

Rubbers (elastomers) which are generally vulcanized.
Plastics, such as PVC.
High-crystalline plastics, such as polyolefins.
Thermoplastic elastomers, which are not generally vulcanized.

Butyl rubber was first used for potable water impoundments[7]. The liner material is composed of isobutylene (97%) and a small amount of isoprene. It performs well as either a liner or top cover, exhibiting low gas/water vapor permeability, thermal stability, and chemical resistance. It is swollen by hydrocarbon solvents and other petroleum oils, but is only slightly affected by oxygenated solvents. Butyl is highly resistant to mineral acids. After 13 weeks of immersion in 70% sulfuric acid, a butyl compound showed little loss in tensile strength or elongation[8]. These liners have a high tolerance to temperature extremes, and exhibit good tensile-strength and elongation qualities. Application is limited, however, due to the difficulty in seaming and repair.

Chlorinated Polyethylene (CPE) is produced by a chemical reaction between chlorine and high-density polyethylene. It is not susceptible to ozone, and weathers well, making it a suitable top cover. It also has good tensile and elongation strength, and is resistant to many corrosive and toxic chemicals. These liners may be formulated to withstand intermittent contact with aliphatic hydrocarbons and oils. CPE will swell in the presence of high concentrations of aromatic hydrocarbons and oils, so they are not recommended for these contaminants. This compound is suitable as a base material for a broad spectrum of liners because it can be bounded with other polymers. It is easier to seal using solvent welding or dielectric heat sealing[9].

Chlorosulfonated Polyethylene (CSPE) forms the basis for a family of polymers prepared by reacting polyethylene in solution with chlorine and sulfur dioxide. Generally tougher than other thermoplastics commonly used as elastomers, CSPE will soften more rapidly as temperatures are increased[10]. CSPE is characterized by ozone resistance, good weatherability and resistance to deterioration from acids and alkalis. Usually it is reinforced to improve its tear-resistance when used on sloops. It can be seamed by heat sealing, dielectric heat sealing, solvent welding, or by using bodied-solvent adhesives. It does exhibit a low tensile strength and will shrink from exposure to sunlight. It has a poor resistance to oils.

Elasticized Polyolefin is a blend of rubbery and crystalline polyolefins. It is highly resistant to weathering, alkalis, and acids[11]. Difficulties have been encountered in low temperature and high winds, in oily environments, and with adhesion to structures.

Epichlorohydrin Rubbers (CO and ECO) are saturated, high-molecular-weight, aliphatic polyethers with chloromethyl side chains. They are resistant to hydrocarbon solvents, fuels, and oils. They exhibit good weathering, and low rates of gas and vapor permeability. Homopolymers perform well at a temperature range of 0 to 325°F.

Ethylene Propylene Rubber (EPDM) is a vulcanized compound that has excellent resistance to weather and ultraviolet exposure. It may be configured to improve its resistance to abrasion and tears. Because of its excellent weatherability and resistance to ozone, minor amounts of EPDM are sometimes added to butyl liners to improve their weather resistance characteristics. EPDM liners are resistant to dilute concentrations of acid, alkalis, silicates, phosphates, and brine, but are not recommended for petroleum solvents (hydrocarbons) or for aromatic or halogenated solvents. Vulcanized EPDM membranes require the use of special cements for seaming.

Neoprene is a generic name for synthetic rubber. It parallels natural rubber in mechanical properties, but is superior in its resistance to oils, weathering, ozone, and ultraviolet radiation. Neoprene is satisfactory for the containment of waste-containing hydrocarbons. Vulcanizing cements and adhesives must be used for seaming.

Polyethylene can take the for of either a low-density or high-density liner. Polyethylene liners can degrade quickly when exposed to the elements, but this can be corrected by the addition of 2-3% Carbon Black. They exhibit superior resistance to oils, solvents, and permeation by water vapor and gases. Membranes of low-density polyethylene have been used for years[12], but have proven to be hard to handle. They puncture easily under impact, such as when being loaded with waste materials. Buried polyethylene membrane linings exhibit good serviceability. Linings of high-density polyethylene are more resistant to damage, but are very stiff when compared to most alternative materials. Special equipment is required for field seaming.

Polyvinyl Chloride is produced from vinyl chloride monomer (VCM). It may be modified to alter its physical characteristics. These modifications may be necessary to prevent liner degradation due to plasticizer loss through volatilization, extraction and microbiological attack. The PVC polymer itself is not affected by these conditions, but can degrade due to ultraviolet exposure. It is not recommended for a surface cover. PVC membranes are the most widely-used of all polymeric membranes for waste impoundments, since they exhibit resistance to many inorganic chemicals[13]. They are susceptible to degradation when exposed to certain organic compounds, particularly hydrocarbons, solvents and oils. Special compounds of PVC are available that possess higher resistance to oil.

Thermoplastic Elastomers (TPE) form a class of rubbery materials that range from highly polar materials, such as polyester elastomers, to nonpolar materials, such as ethylene-propylene block polymers. They generally behave in a manner similar to vulcanized rubber. Some blends have excellent oil, fuel, and water resistance with high tensile strength. They also weather well. Their durability in various chemical environments remains to be tested.

Sprayed-on liners are liquids that are sprayed onto a prepared surface where they solidify. Air-blown asphalt is widely used. It will provide a seam-free liner that will retain its flexibility indefinitely when properly covered and protected from mechanical damage[14]. The addition of 3-5% rubber improves the characteristics of the liner. Surface preparation is required, and in soils with irregular rocks, a layer of fine sand is desirable to improve the ease of liner application.

Membranes of Emulsified Asphalt may be applied at ambient temperatures, which makes them easier to apply, but they are not as resilient as hot air-blown asphalt membranes. Toughness and dimensional stability can be achieved by spraying the emulsion onto a supporting fabric such as jute or synthetic fibers. The supporting fabric seams must be secured prior to application of the emulsified asphalt.

Urethane-modified Asphalt may be manually spread or sprayed into place, and must cure for 24 hours before use. The liner exhibits good weatherability and low temperature ductility. It is not recommended for prolonged exposure to hydrocarbons or organic solvents. Care must also be taken in proper preparation of the surface prior to application.

Rubber and plastic latex's may also be used as spray-on liners. They result in a fairly resilient film with good soil-sealing capabilities.

Soil sealants as a class of liners, exhibit high permeability, but this permeability can be significantly reduced by the application of various chemicals or latex's. The sealing effect is limited to the upper few centimeters of soil, and will degrade under continued wet-dry or freeze-thaw cycles.

Chemical absorptive liners are efficient in the removal of contaminants from the seepage as it moves through the liner. Various mixtures of absorptive agents may be required to control the migration of pollutants at sites containing chemical mixes. Some chemicals may also function to stabilize the soil contaminants. When hydrophobized quicklime (DCR Lime) is mixed with water and oil contaminated materials the hydrocarbons are absorbed and fixed. The mixture hardens on exposure to air. It can be compacted to form a low permeability liner that is chemically and physically stabile The process has been used overseas since 1975, but has not been used extensively here in the United States.

4.11.2.2 Analysis of Liner Technologies

Based on the danger that the current equilibrium and natural clay barriers will become fractured during excavation and construction activities at the Winfield Site, a man-made liner technology will be required to control pollutant migration into the ground water. Technology selection will be influenced by the cover system selected (i.e., permanent or temporary structure, liner material to control VOC gases and dust, etc.). Pretreatment of contaminated materials will also influence liner requirements.

Independent of the top cover, and pretreatment technologies, polymeric membranes appear to present the most favorable combination of low permeability and ability to contain site specific contaminants.

Monitoring of air and ground-water pollutants must be conducted prior to, during and after operations at the site are underway. This includes the extraction, storage and remediation of the waste materials and the construction and subsequent operation of the expanded Winfield lock and dam.

5.0 LITERATURE REVIEW

5.01 OBJECTIVE

The objective of the literature review was to compile a body of literature that describes the current S-O-A of technology that deals with the storage of hazardous or toxic chemical, and materials.

5.02 PURPOSE

The purpose of this review is to evaluate the currently available technologies for storage of toxic and hazardous materials, and to evaluate those technologies to determine which may be applicable to the Winfield site as is, or which may be modified by additional research for application to Winfield and similar sites.

5.03 PROCEDURES:

A list of Key words was compiled to initiate the literature search with. The search was started by using the key words on periodicals published since 1983 (a ten year period to insure current technology). The search was then expanded to include published patents and books.

Finally, government publication lists such as NTIS, GPO, and EPA were included in the search.

5.03.1 Key Words

The controlling Key words were listed first in the hierarchy and the focus continued to zoom in based on the functional analysis results. (See Figure 5.1)

5.03.2 Sources

The data was gleaned from a computer searching of a list of journals compiled at the Evansdale Branch of the WVU Library (see table B-5.1 in APPENDIX B). A computerized database containing a list and abstracts of published patents was another source of material for review. The same key words were used to compile a list of abstracts for the selection of patents to review in a more detailed study.

Books were more difficult to deal with in the search. Books on these topics often contain a wide variety of associated topics. A number of books of the most recent publication date were examined and reviewed. On the subject of storage technology, few books are available that discuss this topic in any detail. Most of the data was found in journal articles.

5.03.3 Results

Several hundred documents were examined to compile notes on the various storage technologies currently in use by the remediation industry. This material is contained in APPENDIX B of this report.

5.1 STORAGE FACILITY LITERATURE

Literature specifically discussing storage facilities, either drums, tanks, or buildings is somewhat limited. A total of only (9) articles discussing buildings or other storage facilities with particular potential application to the Winfield site were located and reviewed for discussion. There are more numerous articles written about the use of underground tanks for storage of hydrocarbons, and radioactive wastes but there were no real parallels to the requirements at the Winfield site.

5.1.1 Portable Buildings

Temporary storage of relative small volumes of toxic or hazardous materials can be accomplished by utilizing small portable buildings made of steel[15] which can hold 55 gallon drums for safe storage of many hazardous wastes. The use of steel as a building material provides some security and safety relative to explosion hazards. The portable nature allows the movement to isolate it from the general public during storage.

There is a potential for some type of portable storage building at Winfield to house Dioxin-contaminated soils, possibly in fiber glass or epoxy-resin drums. Portable buildings are being used to store hazardous materials and chemicals at State owned and operated landfills[16] in Florida and California. A firm named Safety Storage of Cupertino, CA, manufactures the buildings in several sizes, but 8 ft. by 22 ft. seems to be a standard size.

Temporary buildings can also be constructed of thermoplastics and lighter cross laminated vinyl plastics (PVC) attached to tent like wooden or aluminum frames. These buildings (Sprung Instant Structures for example) could be used to cover excavation operations as reported at the McColl Site[17], or to cover part of an open cast storage facility built on a constructed or manufactured liner to provide temporary storage for contaminated or VOC laden soils.

5.1.2 Permanent Buildings

Permanent buildings have been suggested as a solution to the long time storage requirements for dioxin contaminated soils which generally have to be incinerated as the only acceptable remediation technology. This method is now receiving strong disapproval by locals in the Winfield area that may lead to need for utilization of a permanent type storage building. One invention, U. S. Patent 4,875,805, "Toxic Waste Storage Facility," is a shell building that is lined with blocks constructed of clay and earth containing the contaminates. This type of building would have a potential application at the Winfield Site for temporary or permanent Storage operations. Figure 5.1 is a reproduction of one of the drawings from the patent description.

Permanent buildings when coupled with a remediation process that could be researched at the Winfield Site could lead to a less costly solution to the remediation activities there.

5.2 STORAGE FACILITY ATMOSPHERE MONITORING

The activity of excavating transporting, and stowing soil materials can generate significant contamination of the air from fugitive dust and gaseous vapors. To protect the health of site workers, monitoring of the atmosphere on the site and inside temporary or permanent storage buildings will be necessary, if only to determine that monitoring may not be necessary on a continuing basis.

5.3 CONTAINMENT MATERIAL MONITORING

The soils that will be stored will need to be sampled and monitored to determine the level of contaminants that workers will be exposed to during stowing operations. Conventional sampling and monitoring techniques should suffice for these operations until experience is gained in storage operations to determine other wise.

6.0 STORAGE TECHNOLOGY - REVIEW AND PRIORITIZATION

6.1 CRITERIA

Federal and state laws and regulations stipulate requirements for the protection of the public based on the results of specific site-characteristic studies. The Corps has administered site analyses using

U.S. Patent Oct. 24, 1989 Sheet 4 of 6 4,875,805

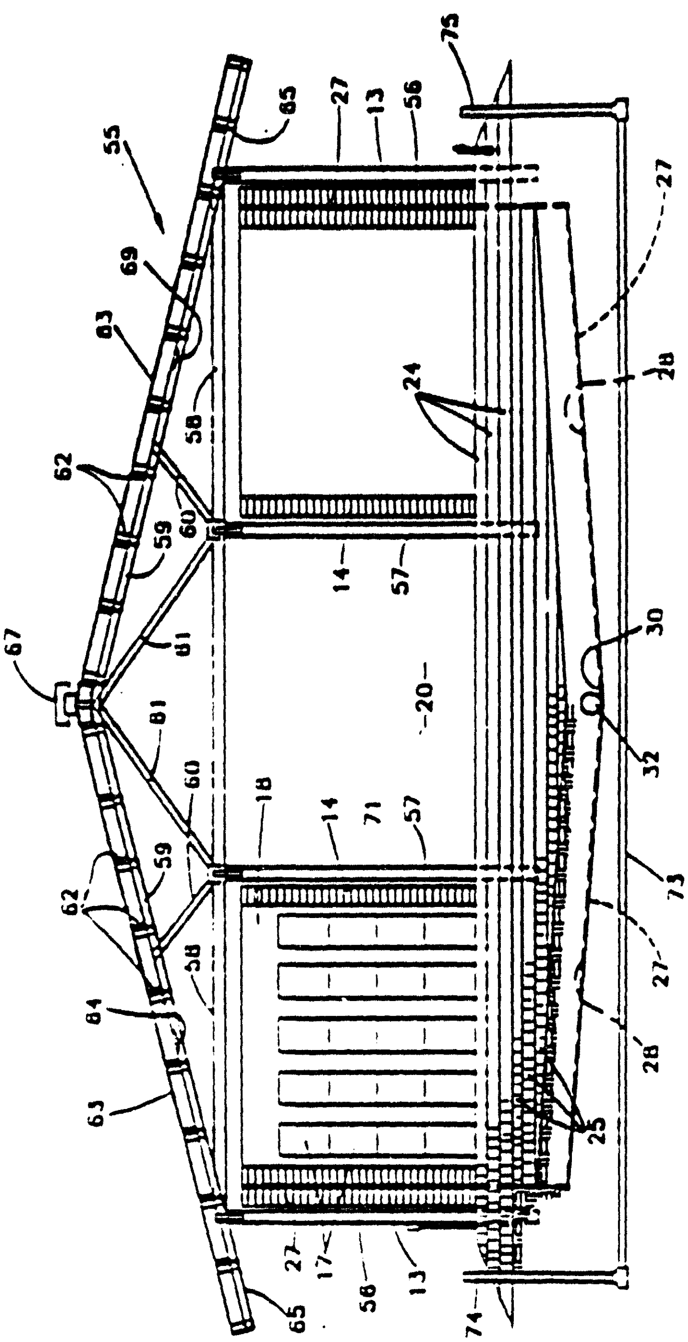


Fig.6

Figure 5.1 - Example of a Storage Facility as Documented in a Patent Award Publication

appropriate EPA SW-846 methods. The following drivers for material excavation, storage, monitoring, and remediation were identified; dioxins, VOC's and semi-VOC's. The primary driver is the dioxins.

6.2 PROCEDURES

Initial inquiries into the available storage technologies for storage of hazardous and toxic wastes yielded information in the areas of permanent storage and temporary storage at a waste generating site. Permanent storage of contaminated materials is an option at some locations, but is precluded at the Winfield site due to the projected construction efforts and the presence of dioxins in the soils. For these reasons most of the materials available in peer-reviewed publications is not applicable. EPA research in the area of storage is also focused on long term disposal. Additional materials were found in the area of temporary site storage at sites where contaminated materials are stored. Limitations on quantity of material and duration of the storage prior to removal precluded application of these technologies to the Winfield site.

Investigation of general classes of temporary storage technologies yielded more promising results. Specific storage systems were grouped into specific classes based on their life-span (temporary or permanent) and their ability to handle contaminated materials. These classes were then evaluated based on the previously discussed functional analysis criteria.

6.3 TEMPORARY STORAGE TECHNOLOGY CONCEPTS:

6.3.1 Open Storage

Existing contaminated materials have stabilized at the site. The increased activity at the site increases the potential for contamination migration to the surrounding environmental systems. Specific concerns center around migration of contaminants to the ground and surface water systems, and the release of VOC's and semi-VOC's.

Additional protection against spread of contaminants may be offered through utilization of an open storage (figure 6.1) area that includes both a plastic or rubber liner to contain leachate and a plastic top cover to contain dust and exclude water. This open storage area would be located at the site, but away from the planned construction for the expanded Winfield Locks and Dam. This storage system would be considered a viable candidate for temporary storage operation with a planned duration of a few months. The chance for bad weather conditions that could compromise the top cover would be very strong beyond six months. Previsions could be made to monitor for gases liberated by the soils beneath the top cover.

Temporary Storage Technology #1:
Open Storage

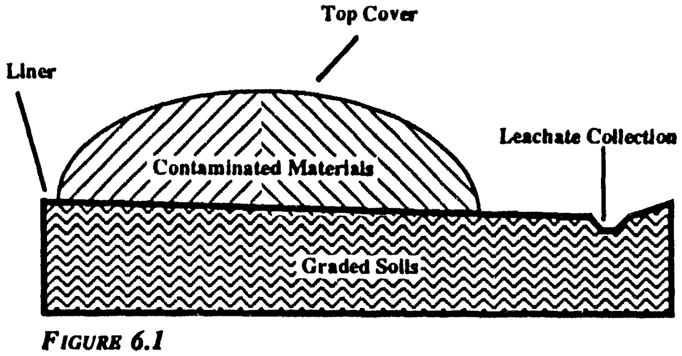


FIGURE 6.1

6.3.2 Open Storage With Constructed Base

When longer term storage is a requirement, then construction of a more efficient and serviceable facility can be accomplished as shown in figure 6.2. This storage facility has a dual liner system (constructed and manufactured elastomer) and leachate collection system. The top cover (plastic) can be anchored to insure integrity over a longer period of time than the open storage facility. Special arrangements could be made to install plastic conduit pipe under the top cover to collect gas for monitoring for VOC's.

Temporary Storage Technology #2:
Open Storage w/ Constructed Base

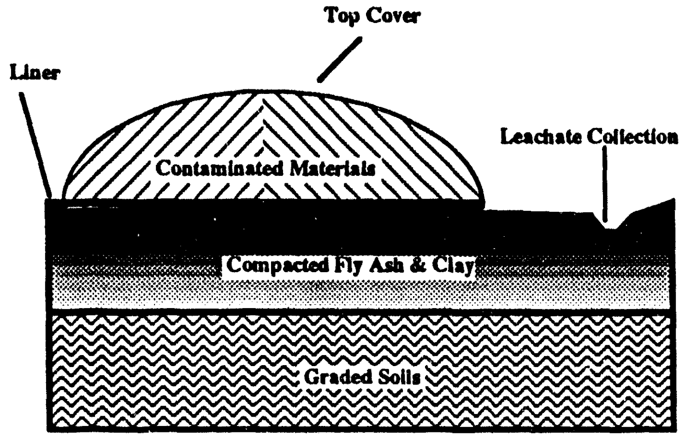


FIGURE 6.2

6.3.3 Open Storage With Constructed Base and Cover

Disturbing the contaminated materials may result in an increase in emissions of VOC's. For control of emissions during short term storage, a capping liner may be installed over a metal frame extending a very short distance above the soil pile to collect and ventilate (or treat) VOC's (figure 6.3). A temporary containment wall may be required to support the frame for capping the contaminated materials.

Temporary Storage Technology #3:
Constructed Top Cover and Base

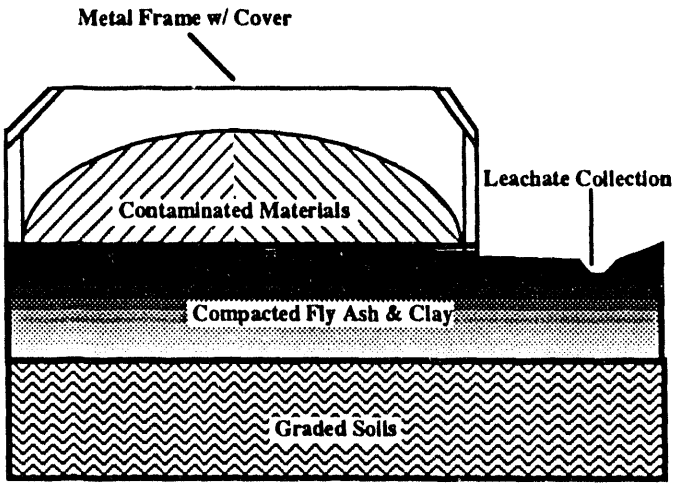


FIGURE 6.3

6.3.4 Storage in a Temporary Building

When a longer term of storage estimated to be several years in duration is required, then construction of a temporary building may meet all of the requirements. The nature of the site contaminants may also require the separation of soils to insure safe handling during storage and remediation. All or some of the materials may be stored in impermeable containers (figure 6.4). A combination of storage technologies may also be used. Highly toxic materials, such as Dioxins, may be containerized, while the remaining less-toxic waste materials are stored in bulk under a temporary cover.

Temporary Storage Technology #4:
Containerized Storage

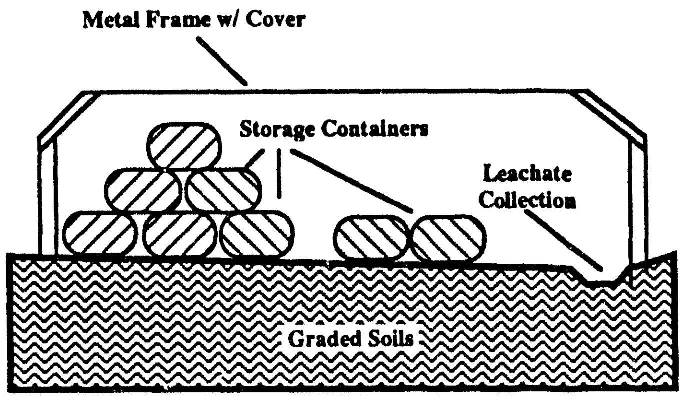


FIGURE 6.4

6.3.5 Open Storage in a Landfill

Open storage in a landfill type of construction has been shown to be a viable option for permanent disposal of hazardous materials. Even though long-term plans are for the remediation of all site materials, a landfill system (figure 6.5) can be utilized. The system would include a constructed liner and leachate collection system, and a constructed cover to reduce water influx.

Temporary Storage Technology #5:
Landfill

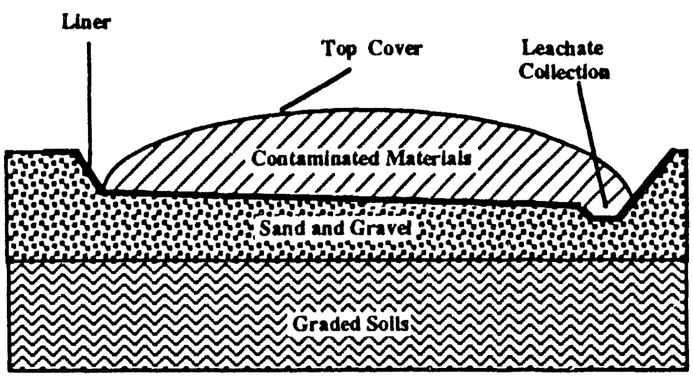


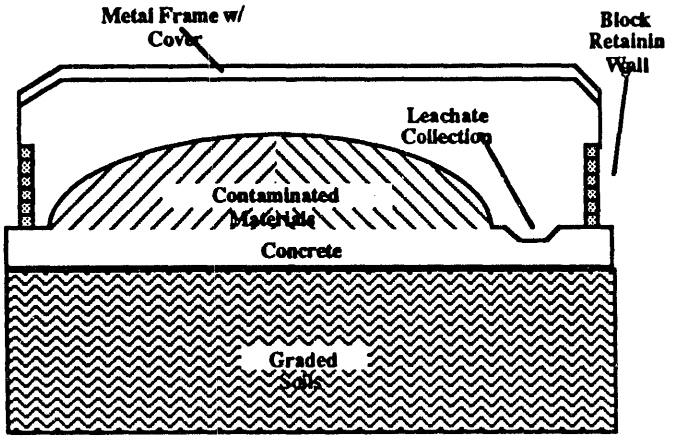
FIGURE 6.5

6.3.6 Storage in a Permanent Building

The most involved storage technology would be the construction of a permanent building to contain soils and confine leachate (figure 6.6). Most likely materials include a concrete pad, block retaining walls and a metal or metal frame roof. The structure would be constructed to handle monitoring and treatment of VOC's as well as future remediation activities

.

Temporary Storage Technology
Permanent
Building



FIGURE

6.4 Evaluation of Storage Technologies:

Each of the storage technologies identified was evaluated based on the previously discussed functional criteria (ref. 4.10). The technology was judged as High, Medium, or Low based on its ability to meet the requirements of each functional criterion. A technology was judged to be High in relation to a specific functional criterion if all the criterion requirements could be meet with existing technology, and with moderate cost and time expenditure. A grade of Medium was given if the technology was able to meet the functional criteria, but would require greater investment in either cost or time A grading of Low was given when there was a reasonable degree of doubt as to the ability of the technology to fully meet the functional criteria.

Point values were assigned to each level. "High" equated to a point value of 9, "Medium" to 3, and "Low" to 1. The point value for each technology, along with the point value of the specific functional criterion (again given as High, Medium and Low) were multiplied together to arrive at a numerical representation of the technology's ability to meet the specific functional requirements. For example (figure 6.7), we can see that storage technology 1, Open Storage was rated as Low in relationship to the functional criteria of environmental protection. The numerical value for this interaction will be calculated at a Low for the ability of an open storage technology to meet environmental requirements, multiplied by a High for the importance of this specific functional category. This will equal 1 times 9 for a total of 9 points. This multiplication of technology interaction ratings times the functional criteria rank continues for each functional criteria category. The calculated values are then summed to arrive at a total score for the technology. In the case of Open Storage the score is equal to 60. A given storage technology's score will depend on its ability to meet all the functional criteria requirements, with emphasis placed on the functional criteria judged to be High in importance (i.e., High ranking on chart).

Evaluation of Temporary Storage Technologies

Functional Criteria	Rank	Technologies 1	2	3	4	5	6
Environmental Prɾtection	H	○	○	◍	●	○	●
Health and Safety	H	○	○	◍	●	○	●
Technology Performance and Reliability	H	○	◍	◍	●	◍	●
Implementation	M	●	◍	◍	○	◍	◍
Interferences and Remediation	M	○	◍	◍	●	○	●
Economics	L	◍	●	◍	○	●	●
		60	72	102	274	66	288

Storage Technology Key

1 Open Storage
2 Open Storage w/ Constructed Base
3 Constructed Top Cover and Base
4 Containerized Storage
5 Landfill
6 Permanent Building

○ Technology vs functional criteria interaction is LOW

◍ Interaction is MEDIUM

● Interaction in HIGH

FIGURE 6.7

The general storage technology that performed the best in relationship to the other technologies was the use of a permanent building. It received a total of 288 points. Also, the concept of using some type of containerized storage performed well, with a score of 274. The primary advantage of the permanent building concept over containerized storage is the reduced cost and ease of implementation. A combination of these two storage technologies may be possible. Highly contaminated soils could be storage and controlled by use of containers, while the bulk of less contaminated materials could be stored using a permanent building.

7.0 IDENTIFIED PROBLEM FOR FUTURE R & D

7.1 GENERIC PROBLEMS

The primary focus of research activities in the management of hazardous and toxic materials has been in remediation and monitoring. Minimal work has been done on temporary storage technologies.

Federal regulations identify when and what materials may be placed in temporary storage prior to final disposal. Generally the guidance is focused on storage of contaminated materials as the generation site until transportation to a final disposal site. Most industrial concerns may file for a permit to maintain a 90 day temporary storage facility to house site generated contaminants. Only materials generated on that site may be stored and only for a maximum of 90 days.

Other developments in hazardous waste storage have been geared towards long-term storage at a disposal site. Research in this area has been focused on methods of storage that minimize the potential for contaminant migration into the surrounding ecosystem.

Temporary storage facilities that have been developed are usually a semi-permanent or permanent structure that has an associated top cover and leachate monitoring and collection system. Specific characteristics of the facility are driven by the specific contaminants found in the materials.

7.2 WINFIELD SITE

Specific problems identified relating to the Winfield site storage operations are few. The excavated material will have to be transported a few hundred feet to the location of the storage facility If no prior attempts to remove VOC's have been made then WVU should take the opportunity to plan and exercise one or more research projects that would examine the rate of evolution of VOC's when stored in either a permanent or a temporary building, and the facilities to trap or collect gases are available.

Such an experiment could use a scanning FTIR unit to record the spectra of all of the contaminants moving across a five-foot section of a conveyor belt to record evolution of VOC's. Storage air ventilation rates required to remove and extract the VOC's in a scrubber unit could be calculated based on readings from the FTIR unit in an attempt to maximize efficiency of operation. That is, use only the required fan throughput to optimize recovery and provide safe ventilation for workers.

Another set of experiments would be to conduct controlled remediation experiments with stowing methods inside the storage facility. Stowing should be attempted to provide even density distribution of the soils so that bacteria and nutrients can be inoculated into the soil for remediation in storage. Another storage experiment would be centered around constructing blocks of soil with a designed porosity and permeability to allow or promote while in storage.

Experiments could be conducted with different kinds of binders that would promote the remediation process. One such material with special properties is hydrophobized lime which reacts with the contaminating hydrocarbons to create a binder like material which isolates and confines the contaminant.[18] This process could also be examined as a method of dehalogenating PCB's and other volatile organic compounds.[19] Literature reports that the resulting material passes EPA TCLP requirements.

8.0 SUMMARY AND ANALYSIS

As a technology class, a permanent or semi-permanent structure with associated top cover and leachate monitoring and collection system is the most effective. This technology provides the maximum protection to the environment, as well as insures the health and safety of individuals working at the site and living in the surrounding community. It also provided an effective method of handling materials ranging from contaminated soils, to barrels, broken pavements and underground utilities. Although the economics associated with erection of the structure are poor, maintenance and repair costs in relationship to other temporary storage technologies should be low.

Additional work should be done to tailor the structure to match site contaminants. Requirements generated by the presence's of VOC's and semi-VOC's may require the addition of an air handling and processing system. At a minimum the structure will require the installation of a monitoring system to continually check for gaseous emissions. A leachate monitoring and collection system will also be required. The top cover should preclude the introduction of precipitation, however, the stored materials will include some level of moisture.

An additional advantage of this system is the longevity. If remediation activities required an extended period of time the storage facility will be able to continue to provide service with minimal cost. Performance is not expected to degrade significantly with age.

9.0 APPENDICES

APPENDIX A

TABLE A-1 - ALPHABETICAL LIST OF EPA IDENTIFIED HAZARDOUS MATERIALS[1] WHICH HAVE A REPORTABLE QUANTITY THRESHOLD OF 100 POUNDS OR LESS.

CHEMICAL NAME	CAS #
Acetone Cyanohydrin	75-86-5
Acetone Thiosemicarbazide	1752-30-3
Acrolein	107-02-8
Acrylonitrile	107-13-1
Acrylyl Chloride	814-68-6
Adiponitrile	111-69-3
Aldicarb	116-06-3
Aldrin	309-00-2
Allyl Alcohol	107-18-6
Allylamine	107-11-9
Alluminum Phosphide *	20859-73-8
Aminopterin	54-62-6
Amiton	78-53-5
Amiton Oxalate	3734-97-2
Ammonia	7664-41-7
Amphetamine	300-62-9[1]
Aniline,2,4,6-Trimethyl	88-05-1
Antimony Pentafluoride	7783-70-2
Antimycin A	1397-94-0
ANTU	86-88-4
Arsine	7784-42-1
Azinphos-Ethyl	2642-71-9
Azinphos-Methyl	86-50-0
Benzenamine, 3-(Trifluoromethyl)-	98-16-8
Benzene,1-(Chloromethyl)-4-Nitro-	100-14-1
Benzenenearsonic Acid	98-05-5
Benzimidazole,4,5-Dichloro-2-(Trifluoromethyl)-	3615-21-2
Benzothrichloride	98-07-7
Benzyl Chloride	100-44-7
Benzyl Cyanide	140-29-4
Bicyclo[2.2.1]Heptane-2-Cabonitrile,5-Chloro-6-((((Methylamino)Carbonyl)Oxy)Imino)-,(1S-(1-alpha,2-beta,4-alpha,5-alpha,6E))-	15271-41-7
Bis(Chloromethyl)Ketone	534-07-6
Bitoscanate	4044-65-9
Boron Trichloride	10294-34-5
Boron Trifluoride	7637-07-2
Boron Trifluoride Compound With Methyl Ether (1:1)	353-42-2
Bromadiolone	28772-56-7
Bromine	7726-95-6

Cadmium Oxide	1306-19-0
Cadmium Stearate	2223-93-0
Camphechlor	8001-35-2
Cantharidin	56-25-7
Carbachol Chloride	51-83-2
Carbamic Acid, Methyl-,O-(((2, 4-Dimethyl-1,3 Dithiolan-2-Y1) Methylene)Amino)-	26419-73-8
Carbofuran	1563-66-2
Carbon Disulfide	75-15-0
Carbonphenothion	786-19-6
Chlordane	57-74-9
Chlorfenvinfos	470-90-6
Chlorine	7782-50-5
Chlormephos	24934-91-6
Chlormequat Chloride	999-81-5
Chloroacetic Acid	79-11-8
Chloroethanol	107-07-3
Chloroethyl Chloroformate	627-11-2
Chloromethyl Ether	542-88-1
Chloromethyl Methyl Ether	107-30-2
Chlorophacinone	3691-35-8
Chloroxuron	1982-47-4
Chlorthiophos	21923-23-9
Chromic Chloride	10025-73-7
Cobalt, ((2,2'-(1,2-Ethanediylbis (Nitrilomethylidyne)) Bis(6-Fluorophenolato))(2-) -N,N',O,O')-	62207-76-5
Cobalt Carbonyl	10210-68-1
Colchicine	64-86-8
Coumaphos	56-72-4
Coumatetralyl	5836-29-3
Crimidine-	535-89-7
Crotonaldehyde	4170-30-3
Crotonaldeyde,(E)-	123-73-9
Cyanogen Iodide	506-78-5
Cyanophos	2636-26-2
Cyanuric Fluoride	675-14-9
Cycloheximide	66-81-9
Cyclohexylamine	108-91-8
Decaborane(14)	17702-41-9
Demeton	8065-48-3
Demeton-S-Methyl	919-86-8
Dialifor	10311-84-9
Diborane	19287-45-7
Dichloroethyl Ether	111-44-4
Dichloromethylphenylsilane	149-74-6
Dichlorvos	62-73-7
Dicrotophos	141-66-2
Diepoxybutane	1464-53-5
Diethyl Chlorophosphate	814-49-3
Diethylcarbamazine Citrate	1642-54-2
Digitoxin	71-63-6
Diglycidyl Ether	2238-07-5
Digoxin	20830-75-5
Dimefox	115-26-4

Dimethoate	60-51-5
Dimethyl Phosphorochloridothioate	2524-03-0
Dimethyl Sulfate	77-78-1
Dimethyl Sulfide	75-18-3
Dimethyldichlorosilane	75-78-5
Dimethylhydrazine	57-14-7
Dimethyl-p-Phenylenedianmine	99-98-9
Dimetilan	644-64-4
Dinitrocresol	534-52-1
Dinoterb	1420-07-1
Dioxathion	78-34-2
Diphacinone	82-66-6
Diphosphoramide, Octamethyl-	152-16-9
Disulfoton	298-04-4
Dithiazanine Iodide	514-73-8
Dithiobiuret	541-53-7
Emetine, Dihydrochloride	316-42-7
Endosulfan	115-29-7
Endothion	2778-04-3
Endrin	72-20-8
EPN	2104-64-5
Ergocalciferol	50-14-6
Ergotamine Tartrate	379-79-3
Ethanesulfonyl Chloride,2-Chloro-	1622-32-8
Ethanol,1,2-Dichloro-,Acetate	10140-87-1
Ethion	563-12-2
Ethoprophos	13194-48-4
Ethylbis(2-Chloroethyl)Amine	538-07-8
Ethylene Fluorohydrin	371-62-0
Ethylene Oxide	75-21-8
Ethyleneimine	151-56-4
Ethylthiocyanate	542-90-5
Fenamiphos	22224-92-6
Fenitrothion	122-14-5
Fensulfothion	115-90-2
Fluenetil	4301-50-2
Fluorine	7782-41-4
Fluoroacetamide	640-19-7
Fluoroacetic Acid	144-49-0
Fluoroacetyl Chloride	359-06-8
Fluorouracil	51-21-8
Fonofos	944-22-9
Formaldehyde Cyanohydrin	107-16-4
Formetanate Hydrochloride	23422-53-9
Formothion	2540-82-1
Formparanate	17702-57-7
Fosthietan	21548-32-3
Fuberidazole	3878-19-1
Furan	110-00-9
Gallium Trichloride	13450-90-3
Hexachlorocyclopentadiene	77-47-4
Hexamethylenediamine, N,N'-Dibutyl-	4835-11-4
Hydrazine	302-01-2
Hydrocyanic Acid	74-90-8
Hydrogen Chloride (Gas Only)	7647-01-0
Hydrogen Fluoride	7664-39-3

Hydrogen Peroxide (Conc>52%)	7722-84-1
Hydrogen Selenide	7783-07-5
Hydrogen Sulfide	7783-06-4
Hydroquinone	123-31-9
Iron, Pentacarbonyl-	13463-40-6
Isobenzan	297-78-9
Isobutyronitrile	78-82-0
Isocyanic Acid,3,4-Dichlorophyenyl Ester	102-36-3
Isodrin	465-73-6
Isofluorphate	55-91-4
Isophorone Diisocyanate *	4098-71-9
Isopropyl Chloroformate	108-23-6
Isopropyl Formate	625-55-8
Isopropylmethylpyrazolyl Dimethylcarbamate	119-38-0
Laconitrile	78-97-7
Leptophos	21609-90-5
Lewisite	541-25-3
Lindane	58-89-9
Lithium Hydride *	7580-67-8
Manganese, Tricarbonyl	12108-13-3
Mechlorethamine	51-75-2
Mephosfolan	950-10-7
Mercuric Acetate	1600-27-7
Mercuric Chloride	7487-94-7
Mercuric Oxide	21908-53-2
Methacrolein Diacetate	10476-95-6
Methacrylic Anhydride	760-93-0
Methacrylonitrile	126-98-7
Methacryloyl Chloride	920-46-7
Methacryloyloxyethyl Isocyanate *	30674-80-7
Methamidophos	10265-92-6
Methanesulfonyl Fluoride	558-25-8
Methidathion	950-37-8
Methiocarb	2032-65-7
Methomyl	16752-77-5
Methoxyethylmercuric Acetate	151-38-2
Methyl 2-Chloroacrylate	80-63-7
Methyl Disulfide	624-92-0
Methyl Hydrazine	60-34-4
Methyl Isocyanate	624-83-9
Methyl Isothiocyanate	556-61-6
Methyl Mercaptan	74-93-1
Methyl Phenkapton	3735-23-7
Methyl Phosphonic Dichloride *	676-97-1
Methyl Thiocyanate	556-64-9
Methyl Vinyl Ketone	78-94-4
Methylmercuric Dicyanamide	502-39-6
Methyltrichlorosilane	75-79-6
Metolcarb	1129-41-5
Mevinphos	7786-34-7
Mitomycin C	50-07-7
Monocrotophos	6923-22-4
Mustard Gas	505-60-2
Nickel Carbonyl	13463-39-3
Nicotine	54-11-5

Nicotine Sulfate	65-30-5
Nitric Oxide	10102-43-9
Nitrocyclohexane	1122-60-7
Nitrogen Dioxide	10102-44-0
Nitrosodimethylamine	62-75-9
Norbormide	991-42-4
Organorhodium Complex (PMN-82-147)	0
Ouabain	630-60-4
Oxamyl	23135-22-0
Oxetane,3,3-Bis(Chloromethyl)-	78-71-7
Phorate	298-02-2
Phosacetim	4104-14-7
Phosfolan	947-02-4
Phosgene	75-44-5
Phosmet	732-11-6
Phosphamidon	13171-21-6
Phosphine	7803-51-2
Phosphonothioic Acid, Methyl-, O-Ethyl O-(4-(Methylthio) Phenyl)Ester	2703-13-1
Phosphonothioic Acid, Methyl-,O-(4-Nitrophenyl)O-Phenyl Ester	50782-69-9
Phosphorothioic Acid O,O-Dimethyl-S-(2-Methylthio) Ethyl Ester	2665-30-7
Phosphorus	7723-14-0
Phosphorus Pentachloride *	10026-13-8
Phosphorus Pentoxide *	1314-56-3
Physostigmine	57-47-6
Physostigmine, Salicylate (1:1)	57-64-7
Picrotoxin	124-87-8
Piperidine	110-89-4
Piprotal	5281-13-0
Pirimifos-Ethyl	23505-41-1
Potassium Cyanide *	151-50-8
Potassium Silver Cyanide *	506-61-6
Promecarb	2631-37-0
Propargyl Bromide	106-96-7
Propiolactone, Beta-	57-57-8
Propionitrile	107-12-0
Propiophenone, 4-Amino-	70-69-9
Propyl Chloroformate	109-61-5
Propylene Oxide	75-56-9
Propyleneimine	75-55-8
Prothoate	2275-18-5
Pyridine, 2-Methyl-5-Vinyl-	140-76-1
Pyridine, 4-Nitro-, 1-Oxide	1124-33-0
Pyriminil	53558-25-1
Salcomine	14167-18-1
Sarin	107-44-8
Selenious Acid	7783-00-8
Selenium Oxychloride	7791-23-3
Semicarbazide Hydrochloride	563-41-7
Silane, (4-Aminobutyl) Diethoxymethyl-	3037-72-7

Sodium Cacodylate	124-65-2
Sodium Cyanide (Na(CN))	143-33-9
Sodium Fluoroacetate	62-74-8
Sodium Pentachlorophenate	131-52-2
Sodium Selenate	13410-01-0
Sodium Selenite	10102-18-8
Sodium Tellurite	10102-20-2
Stannane, Acetoxytriphyenyl-	900-95-8
Strychnine	57-24-9
Strychnine, Sulfate	60-41-3
Sulfotep	3689-24-5
Sulfoxide,3-Chloropropyl Octyl	3569-57-1
Sulfur Dioxide	7446-09-5
Sulfur Tetrafluoride	7783-60-0
Sulfur Trioxide *	7446-11-9
Tabun	77-81-6
Tellurium	13494-80-9
Tellurium Hexafluoride	7783- 80-4
TEPP	107-49-3
Terbufos	13071-79-9
Tetraethyllead	78-00-2
Tetraethyltin	597-64-8
Tetramethyllead	75-74-1
Tetranitromethane	509-14-8
Thallium Sulfate	10031-59-1
Thallous Carbonate	6533-73-9
Thallous Chloride	7791-12-0
Thallous Malonate	2757-18-8
Thallous Sulfate	7446-18-6
Thiocarbazide	2231-57-4
Thiofanox	39196-18-4
Thionazin	297-97-2
Thiophenol	108-98-5
Thiosemicarbazide	79-19-6
Thiourea, (2-Chlorophyenyl)-	5344-82-1
Thiourea, (2-Methylphenyl)-	614-78-8
Titanium Tetrachloride	7550-45-0
Toluene 2,4-Diisocyanate	584-84-9
Toluene 2,6-Diisocyanate	91-08-7
Trans-1,4-Dichlorobutene	110-57-6
Triamiphos	1031-47-6
Triazofos	24017-47-8
Trichloroacetyl Chloride	76-02-8
Trichloroethylsilane	115-21-9
Trichloronate	327-98-0
Trichlorophynylsilane	98-13-5
Trichloro(Chloromethyl)Silane	1558-25-4
Trichloro(Dichlorophenyl)Silane	27137-85-5
Triethoxysilane	998-30-1
Trimethylchlorosilane	75-77-4
Trimethylolpropane Phosphite	824-11-3
Trimethyltin Chloride	1066-45-1
Triphenyltin Chloride	639-58-7
Tris(2-Chloroethyl)Amine	555-77-1
Valinomycin	2001-95-8
Warfarin	81-81-2
Warfain Sodium	129-06-6

Xylylene Dichloride	28347-13-9
Zinc, Dichloro(4,4-Dimethyl-5 ((((Methylamino) Carbonyl Oxy)Imino) Pentanenitrile)-,(T-4)-	58270-08-9
Zinc Phosphide *	1314-84-7

TABLE A-2 - LIST OF VOLATILE ORGANIC COMPOUNDS WHICH MAY REQUIRE STORAGE AND/OR REMEDIATION WHEN FOUND IN SOIL

ORGANIC COMPOUND	CAS NO.
Chloromethane	74-87-3
Bromomethane	74-83-9
Vinyl Chloride	75-01-4
Chloromethane	75-00-3
Methylene Chloride*	75-09-2
Acetone	67-64-1
Carbon Disulfide	75-15-0
1,1-Dichlorethene*	75-35-4
1,1-Dichlorethane	75-34-3
1,2-Dichloroethene*	540-59-0
Chloroform*	67-66-3
1,2-Dichlorethane*	107-06-2
2-Butanone	78-93-3
1,1,1-Trichlorethane	71-56-6
Carbon Tetrachloride	56-23-5
Bromodichloromethane	75-27-4
1,2-Dichloropropane	78-87-5
cis-1,3-Dichloropropene	10061-01-5
Trichloroethene*	79-01-6
Dibromochloromethane	124-48-1
1,1,2-Trichloroethane*	79-00-5
Benzene*	71-46-2
trans-1,3-Dichloropropene	10061-02-6
Bromoform	75-25-2
4-Methyl-2-Pentanone	108-10-1
Hexanone	591-78
Tetrachloroethene*	127-18-4
1,1,2,2-Tetrachloroethane*	79-34-5
Toluene*	108-88-3
Chlorobenzene*	108-90-7
Ethylbenzene*	100-41-4
Styrene	100-42-5
Xylene	1330-20-7

* - Organic compounds detected at Winfield Site

TABLE A-3 - LIST OF SEMI-VOLATILE ORGANIC COMPOUNDS WHICH MAY REQUIRE STORAGE AND/OR REMEDIATION

ORGANIC COMPOUND	CAS NO.
Phenol	108-95-2
bis(2-Chloroethyl)ether	111-44-4
2-Chlorophenol	95-57-8
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
2-Methylphenol	95-48-7
2,2'-oxybis(1-Chloropropane)	108-60-1
4-Methylphenol	106-44-5
N-Nitroso-di-n-propylamine	621-64-7
Hexachloroethane	62-72-1
Nitrobenzene	98-95-3
Isophorone	78-59-1
2-Nitrophenol	88-75-5
2,4-Dimethylphenol	105-67-9
bis(2-Chloroethoxy)methane	111-91-1
2,4-Dichlorophenol	120-83-2
1,2,4-Trichlorobenzene	120-82-1
Napthalene	91-20-3
4-Chromoaniline	106-47-8
Hexachlorobutadiene	87-68-3
4-Chloro-3-methylphenol	59-50-7
2-Methylnapthalene	91-57-6
Hexachlorocyclopentadiene	77-47-4
2,4,6-Trichlorophenol	88-06-2
2,4,5-Trichlorophenol	95-95-4
2-Chloronapthalene	91-58-7
2-Nitroaniline	88-74-4
Dimethylpthalate	131-11-3
Acenapthylene	208-96-8
2,6-Dinitrotoluene	606-20-2
3-Nitroaniline	99-09-2
Acenapthene	83-32-9
2,4-Dinitrophenol	51-28-5
4-Nitrophenol	100-02-7
Dibenzofuran*	132-64-9
2,4-Dinitrotoluene	121-14-2
Diethylpthalate	84-66-2
4-Chlorophenyl-phenylether	7005-72-3
Flourene	86-73-7
4-Nitroaniline	100-01-6
4,6-Dinitro-2-Methylphenol	534-52-1
N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl-phenylether	101-55-3
Hexachlorobenzene	118-74-1
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8

* Organic Compounds Found at the Winfield W. V. Site

Anthracene	120-12-7
Carbozole	86-74-8
Di-n-butylpthalate	84-74-2
Fluoranthene	206-44-0
Pyrene	129-00-0
Butylbenzylpthalate	85-68-7
3,3-Dichlorobenzidine	91-94-1
Benzo(a)anthracene	56-55-3
Chrysene	218-01-9
bis(2-Ethylhexyl)pthalate	117-81-7
Di-n-Octylpthalate	117-84-0
Benzo(b)fluoranthene	205-99-2
Benzo(k)fluoranthene	207-08-9
Benzo(a)pyrene	50-32-8
Indeno(1,2,3-cd)pyrene	193-39-5
Dibenz(a,H)anthracene	53-70-3
Benzo(g,h,i)perylene	191-24-2

* Organic Compounds Found at the Winfield W. V. Site

TABLE A-4 - LIST OF ORGANIC PESTICIDES WHICH MAY REQUIRE STORAGE/OR REMEDIATION WHEN FOUND IN SOIL

COMPOUND	CAS NO.
alpha-BHC	319-84-6
beta-BHC	319-85-7
delta-BHC	319-86-8
gamma-BHC	58-89-9
Heptachlor	76-44-8
Aldrin	309-00-2
Heptachlor epoxide	1024-57-3
Endosulfan	959-98-8
Dieldrin *	60-57-1
4,4' -DDE	72-55-9
Endrin *	72-20-8
Endosulfan II	33213-65-9
4,4' -DDD	72-54-8
Endosulfan Sulfate	1031-07-8
4,4' -DDT	50-29-3
Methoxychlor	72-43-5
Endrin Ketone	53494-70-5
Endrin aldehyde	7421-36-3
alpha Chlordane	5103-71-9
gamma Chlordane	5103-74-2
Toxaphene	8001-35-2
Arochlor-1016	12674-11-2
Arochlor-1221	11104-28-2
Arochlor-1232	11141-16-5
Arochlor-1242	53469-21-9
Arochlor-1248 *	12672-29-6
Arochlor-1254	11097-69-1
Arochlor-1260	11096-82-5

* Organic Compounds Found at the Winfield W. V. Site

APPENDIX B

Table B - 1 - Literature Search, Journal Codes and Locations

TITLE	LOCATION	CODE
American Industrial Hygene Assoc.	Health Sciences	0022MF
American Waterworks Assoc. Journal	Evansdale	T1.AM37J
Analytical Chemistry	Evansdale	T1.AN13
Aviation Week & Space Technology	Evansdale	098 MF
Chemical & Engineering News		
Chemical Engineering	Evansdale	814 MF
Chemical Engineering Progress	Evansdale	1248 MF
Chemistry & Industry	Evansdale (to 1982)	TI.C419
Civil Engineering	Evansdale	344 MF
Combustion Science & Technology	METC	
Critical Reviews Environmental Control		
Energy (Oxford England)	Evansdale	T1.EN15
Environmental Science & Technology	Evansdale	T1.EN13
Industrial Finishing		
J A P C A	Evansdale	Ti.J115
Journal of Environmental Engineering	Evansdale	T1.J824705
Journal of Environmental Health	Evansdale	T1.J82471
Journal of Geotechnical Engineering	Evansdale	T1.J82486
Journal of Hazardous Materials	NIOSH Library	
Journal of Microwave Power & Electr.	Evansdale	T1.J82623
Journal of Air & Waste Management	Evansdale	T1.S8295
Journal of Air Pollution Control Assoc.		
Machine Design	Evansdale	S1.N473
Nuclear & Chemical Waste Managem.		
Nuclear Engineering International		
Photogrametric Engineering & Remote		
Pollution Engineering	Evansdale	T1.P767
The Chemical Engineer		
Water Environment & Technology	Evansdale	T1.W29135
Water Environment Research		

* Reactive Solid

[1] Engineering Evaluation / Cost Analysis for Removal of Contaminated Soil at the Former ACF Industries Site Red House, West Virginia, U.S. Army Corp of Engineers , Nashville TN, May 5, 1992

[2]Haxo, H., Haxo, R., and White R. 1977. Liner Materials Exposed to Hazardous and Toxic Sludges - First Interim Report. EPA-600/2-77-081. U. S. Environmental Protection Agency, Cincinnati, Ohio. 63 pp. PB 271-013/AS.

[3] Styron, C.R.III., and Fry, Z.B. 1979. Flue Gas Cleaning Sludge Leachate/Liner Compatibility Investigation - Interim Report. EPA-600/2-79-136, U.S. Environmental Protection Agency, Cincinnati, Ohio. 78 pp. PB 80-100480.

[4] Stewart, W.S. 1980. Butyl - The Original Water Saver Elastomer. Presented at the H.C. Remsberg Memorial Educational Symposium, "The Role of Rubber in Water Conservation and Pollution Control" during the 117th Meeting of the Rubber Division, ACS., Las Vegas, Nevada.

[5] Stewart, W.S. 1978. State-of-the-Art Study of Land Impoundment Techniques. EPA 600/2-78-196, U.S. Environmental Protection Agency, Cincinnati, Ohio. 76 pp. PB 291-881.

[6] The Asphalt Institute. 1974. Specification for Paving and Industrial Asphalt. (SS-22). College Park, Maryland.

[7] Smith, W.S. 1980. Butyl - The Original Water Saver Elastomer. Presented at H.C. Remsberg Memorial Educational Symposium, "The Role of Rubber in Water Conservation and Pollution Control" during the 117th Meeting of Rubber Division, ACS., Las Vegas, Nevada.

[8] Morton, M., ed. 1973. Rubber Technology. 2nd ed. Van Nostrand Reinhold company, New York. 603 pp.

[9] Stewart, W.S. 1978. State-of-the-Art Study of Land Impoundment Techniques. EPA 600/2-78-196, U.S. Environmental Protection Agency, Cincinnati, Ohio. 76 pp. PB 291-881.

[10] Morton, M., ed. 1973. Rubber Technology. 2nd ed. Van Nostrand Reinhold Company, New York. 603 pp.

[11] Haxo, H., and White, R. 1976. Evaluation of Liner Materials Exposed to Leachate - Second Interim Report. EPA-600/2-76-255. U.S. Environmental Protection Agency, Cincinnati, Ohio. 53 pp. PB 259-913/AS.

[12] Hickey, M.E. 1969. Investigation of Plastic Films for Canal Linings. Research Report No. 19. Bureau of Reclamation, U.S. Department of the Interior, Washing ton, D.C. 35 pp.

[13] Chan, P., et al. 1978. Sorbents for Fluoride, Metal Finishing and Petroleum Sludge Leachate Contaminatiant control. EPA-6--/2-78-024. U.S. Environmental Protection Agency, Cincinnati, Ohio. 83 pp. PB 280-696/AS.

[14] The Asphalt Institute. 1976. Asphalt in Hydraulics. (MS-12). College Park, Maryland. 65 pp.

[15] Valkenburgh, Gary Van, "Storing Hazardous Wastes Safely", Chemical Engineering, September 1991, pp 203-204.

[16] "Prefab Buildings Answer Need For Storing Household Hazardous Wastes", Public Works, September 1988, pp 112-113.

[17] "Demonstration of a Trial Excavation at the McColl Site", EPA/540/AR-92/015, October 1992.

[18] Payne, J.R., R.W. McManus, and F. Boilsing (1992). "DCR-Mediated Dehalogenateion of PCB's in Clay Soils From a California Superfund Site, October 1992.

[19] Sound Environmental Services, Inc., "DCR-Mediated Dehalogenation of PCB's in Clay Soils From a California Superfund Site, Oct. 1992.

[20] EPA publication "The Emergency Planning and Community Right-to-Know Act of 1986, List of Extremely Hazardous Substances", 40 C.F.R. Part 355, Mar. 1,1988.

ASSESSMENT OF TECHNOLOGIES FOR HAZARDOUS WASTE SITE REMEDIATION: NON-TREATMENT TECHNOLOGIES AND PILOT SCALE FACILITY IMPEMENTATION-- SAFETY ANALYSIS AND REVIEW STATEMENT

Final Report

Work Performed Under Contract
No.: DE-FC21-92MC29467

For
Raymond J. Lovett, Principal Investigator
Environmental Technology Division
West Virginia University
National Research Center For Coal And Energy
PO Box 6064
Morgantown, WV 26506-6064

And
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Harry R. Johnson, Project Manager
William K. Overbey, Jr.
George J. Koperna, Jr.
BDM Federal, Inc.
1199 Van Voorhis Road, Suite 4
Morgantown, WV 26505

FEBRUARY 1994

TABLE OF CONTENTS:

Section 1

Construction Permit Cover Sheet

METC UNITED STATES DEPARTMENT OF ENERGY

CONSTRUCTION PERMIT COVER SHEET

****

PROJECT NAME: Insitu Barrier Formation & Evaluation

TYPE OF PERMIT: [x] CONSTRUCTION [ ] OPERATING

The following documentation is attached:

[x] Construction Permit Request Form
[x] Project Operating Plan
[x] Other Supporting Documentation
[ ] Operating Procedure
[x] Process Drawings

Responsible Person: ______________________ ______________
Signature Date

Branch Chief or Cluster Leader: ______________________ ______________
Signature Date

Persons to attend safety review in addition to committee members:

Lead Technician ______________________ **M/S** ____________

Contractor ______________________ **M/S** ____________

Other ______________________ **M/S** ____________

Review: [x] Process Safety Committee
[ ] Facility Safety Committee
[ ] Laboratory Safety Committee
[ ] No Review Required

Date of Review: ____________ ______________________
Secretary

Section 2

Construction Permit Request

METC UNITED STATES DEPARTMENT OF ENERGY
CONSTRUCTION PERMIT REQUEST

****

1. Project information:

A. New Construction [x]
Project Restart [ ]
Existing Project [ ]

B. Date of Request ________________

C. Responsible Person Duane H. Smith Phone 291-4069

D. Project Title Insitu Barrier Formation & Evaluation

E. Construction Start Date ________ Duration __________

F. Brief Description of Project or Modification to the Project (attach Project Operating Test Plan): Material is injected into porous media to reduce the porosity of the porous media.

2. Operating Conditions:

A. Scale of Operation:
[ ] Laboratory [ ] Bench Scale [ ] Pilot Scale [x] PDU

B. Operating Parameters:
Physical Parameters:
Pressure Range (psig): 0 min 200 max
Temperature Range (°F): 32 min 150 max
Voltage: 110/220 DC/AC Current: _____ amps
Flow Rate (if continuous) _______ (SCFH)

Laser Parameters (if used): [ ] yes [x] No
Intensity ______________
Wave Length __________
Periodicity: _____ Constant ___ Pulsed
Laser Medium ____________
Voltage __________________
Power ___________________

C. **Equipment Used:**

Name	Description	Origin
See equipment		
list in		
operational plan		

D. **Describe the physical/chemical processes taking place:**

Polyurethane monomers are injected into the porous media and cures to polyurethane polymer to reduce the permeability of the porous media.

Describe any other operating conditions that are pertinent to ES&H:

This process will operate at mild temperatures and pressures with minimum exposure to chemicals.

3. Environmental, Safety and Health Conditions:

A. Potential Hazards:

[ ] **Explosion** [ ] **Corrosion** [ ] **Health Hazard**
[x] **Dust** [ ] **Carcinogen** [x] **Noise**
[x] **Flammable** [x] **Elec. shock** [ ] **Toxic**
[ ] **Burns** [ ] **Cryogenics** [x] **Injury**
[ ] **Chemical Incompatibility** [ ] **Vibration** [ ] **Other** ______________

[ ] **Radiation**

___ **UV** **Frequency:** ______
___ **IR** **Wavelength:** ______
___ **Magnetic** **Duration of Exposure:** ______
___ **RF**
___ **Ultrasonic**

B. List all waste materials, including product, exhaust, left-over input, etc. (use continuation sheet if needed):

Name	**Form**	**Expected Quantity/day (lbs-gas; gal-liquid)**	**Disposal Method**
Polyurethane	Solid	50 lbs	According to METC procedures
Soil & Sand	Sand	1000 lbs	
Polyurethane monomers	Liquid	50 Gal.	
Process water	Liquid		

C. Actual Personnel Exposure (use continuation sheet if needed):

Name	**Title**
Harry R. Johnson	Program Manager (BDM)
William K. Overbey	Proposed Deputy Manager (BDM)
C. David Locke	Proposed Facility Support Manager (BDM)
Walter K. Sawyer	Reservoir Simulation Consultant (BDM)
S. Phillip Salamy	Modeling Task Leader (BDM)
Gregory K. Johnson	Proposed Facility Support (BDM)
Thomas K. Reeves	Proposed Facility Support (BDM)
Paul F. ZiemKieWicz	Proposed Project Support Manager (WVU)
Raymond Joseph Lovett	Proposed Project Support Assistant (WVU)
Mohamed (Mo) A. Gabr	Proposed Materials Task Leader (WVU)
John J. Bowders	Proposed Materials Research Support (WVU)
Samuel Ameri	Proposed Engineering Task Leader (WVU)
Khashayar Aminian	Proposed Engineering Research Support (WVU)
Shahab Mohaghegh	Proposed Engineering Research Support (WVU)
Daman S. Walia	Proposed Biodegradation Task Leader (ARCTECH)
Kailash C. Srivastava	Proposed Director of Bio-processing Research (ARCTECH)
Lawrence C. Murdoch	Proposed Field Validation Task Leader (U. of Cinc.)
Kevin M. Savage	Proposed Geologic Field Validation Support (U. of Cinc.)
William W. Slack	Proposed Engineering Field Validation Support (U. of Cinc.)
Others	Graduate Assistants (Since they constantly change, their names will be given when the project is up and operable).

Note that these personnel may change. A note will be given if any change was experienced.

D. Actual Exposure times/limits (use continuation sheet if needed):

Hazard Name	**Minimum Expected Exposure Time/shift**	**Maximum Expected Exposure level (without PPE)**

All exposures will be determined when the project is in a contract agreement form.

E. Safety Precautions (Use continuation sheet if needed):

(1) Ventilation Building ventilation should be sufficient to operate this process.

(2) Ignition source Operation of this process requires no open flame.

(3) Hazardous Material Exposure Up to this point, there is no hazardous material exposure identified.

(4) Avoidance of Contamination There will be a collecting tank to contain any possible rupture of the rubber bladder to prevent contamination.

(5) "Fail-Safe" Contingency The "Fail-Safe" measure of this process is the hold tank for discharge fluid which would contain un-reacted (uncured) monomers should the rubber bladder rupture.

(6) Protective measures See Safety Precautions number 5.

(7) Emergency Procedures Emergency shutdown procedures are described in the operating plan.

(8) Personnel protective measures No special PPE beyond Safety Glasses, Steel-Toed shoes, and Gloves are required.

(9) Grounding All electrical components will be grounded to NEC 250

(10) Guarding of live/moving parts The only moving machinery will be the pumps which will be appropriately guarded.

(11) Warning signs, alarms, monitors Warning signs, alarms, and monitors will all be determined when the project is on contract form.

(12) Chemical/Hazardous Material Storage Polyurethane monomers will be stored away from heat in excess of 200 ^{0}F, all other waste materials will be stored in tanks until disposed of according to METC procedures.

(13) Other ______

4. Facilities and Utilities:

A. Facilities:

Square Footage Required: ____________ ft^2
Ceiling Height Required: ____________ ft
Ambient Temperature (^0C): _____ min _____ max
Humidity (% RH): _____ min _____ max
Ventilation: Type: [ ] Canopy [ ] Chemical [ ] Gas bottle
[ ] Special Explain Regular building ventilation should be adequate.

SCFM Required: ____________
Security: [ ] Interlocks [ ] Limited access room
Other requirements ____________

B. Utilities:

(1) Water:

Type	Quantity Peak (gal/day)	Daily average (gal/day)
Potable	_____	_____
Cooling	1,500	12,000
Steam (High Pressure)	_____	_____
Steam (Low Pressure)	_____	_____

Other Note that no steam will be needed in the process.

(2) Electricity:

Type
[x] 110 VAC [x] 220 VAC [ ] 480 VAC Phase ____________
[ ] Emergency Explain ____________

Other ____________

(3) Building Gases:

Type	**Quantity**	
	Peak (gal/day)	**Daily average (gal/day)**
Air (pressure)	______	________
Air (Instrument)	______	________
Nitrogen (High Pressure)	______	________
Nitrogen (Low Pressure)	______	________
Natural Gas	______	________
Carbon Dioxide	______	________
Oxygen	______	________

Other This process will not require the use of building gases.

C. Proposed:

Location/Justification B-17, as part of the "WVU CRADA", will be used. All pre-existing equipment and objects will not be moved out from the building. The existing empty space will be used.

Section 3

Project Operating Plan

INSITU BARRIER FORMATION AND EVALUATION

Operational Plan

RESPONSIBLE PERSON: DUANE SMITH

DATE: ----/----/------

Objective: The purpose of this project is to form pilot-scale barriers insitu in porous media and evaluate the barriers' effectiveness at reducing the permeability of the porous media.

Background: Insitu formed barriers are a promising technology to halt or stabilize the movement of hazardous materials in contaminated soils. In many cases, the barrier will prevent movement while insitu remediation methods can be researched, tested, and installed thus preventing any further exposure of the public to some potentially very harmful materials. The DOE operates a number of facilities that are or have been involved in the production of nuclear materials. Engineered barriers should be developed in most of the former DOE weapons sites where contamination of aquifers has occurred and the contaminant materials will ultimately find their way into the biosphere. This project is intended to develop barrier test protocols and evaluate various barrier materials for use at such DOE facilities.

Description of the Project: During the 3 years of operation the Testing of Insitu Formed Barriers Project will likely test several different materials for effectiveness at reducing the permeability of different soil and rock types. Barriers will be formed insitu in porous media with various injection pressures (up to 150 psig), various water saturations in the porous media, and various porosities. The project description provided below discusses the configuration of the barrier formation apparatus and testing equipment.

Overview: A rubber bladder will be placed in a pressure vessel which will be designed and constructed to comply with all of METC's design related procedures. The bladder will be approximately 12 inches in diameter and 10 feet long and will be contained inside a nominal 18 inch diameter pressure vessel. The pressure vessel will be assembled from pipe and flanges and mounted horizontally on a stand. The pressure vessel will be designed according to ASME Pressure Vessel Code (Section VIII, Division 1 and B31) for a maximum allowable pressure and wall temperature of 200 psig and 150 deg F, respectively. A burst diaphragm (rated at 200 psig) located near the one end of the vessel will be used for over pressure protection. Porous media will be packed into the rubber bladder to simulate soil. Barrier material will be injected into the porous media to reduce the permeability of the porous material. Samples of the barrier will then be cored and characterized by traditional core analysis techniques. The permeability of the barrier will then be tested by pumping water against the barrier at controlled pressures and measuring the flow rate of water through the barrier.

BARRIER FORMATION

Equipment: The equipment list consists of: a packed media vessel, 2 barrier fluid tanks and pumps, a water tank and pump for testing the formed barrier, an air tank and compressor to measure the porosity of the packed bed, and a water tank and pump to regulate the temperature of the packed bed.

The packed media vessel consists of a carbon steel pressure vessel nominally 10 feet long and 18 inches in diameter. The vessel is designed to operate between 32 F and 150 F and atmospheric pressure to 200 psia. The porous media is contained in a rubber bladder nominally 12 inches in diameter. The bladder is supported by a rigid, open-walled frame. This arrangement allows overburden pressure to be simulated. The bladder is held in place by clamping its ends to the ends of the open-walled, rigid frame. The bladder and frame are encased in the carbon steel pressure vessel. Rings are threaded into the ends of the pressure vessel to hold the bladder and frame in place. Porous end plugs are inserted into the ends of the bladder. End cap flanges cover the porous plugs and are bolted to the pressure vessel to hold the plugs in place. The overall vessel length will be approximately 10 feet.

The barrier fluid tanks and barrier testing water tank are designed to be covered but will not be pressurized. The tanks are 55 gal drums. The barrier fluid injection pumps and barrier testing water pump are Itek piston pumps. Pressure relief valves on the discharge lines of these pumps regulate the injection pressure to the porous media vessel.

The circulation water tank is designed to be covered but not pressurized and is a 55 gal drum. The water circulation pump has a pressure capacity of 200 psig and a flow capacity of 10 gpm. A pressure relief regulates the circulation water pressure in the porous media vessel.

The hold tank for discharge is a non pressurized 100 gal tank or 2 55 gal drums. It's purpose is to collect discharged liquids from the porous media vessel and need to be sufficiently large to collect the circulation water should the rubber bladder rupture.

The air tank is designed to hold 100 pounds of pressure and contain 25 gal of air. A pressure relief valve prevents the tank from being over pressurized.

Barrier Formation: The porous media vessel is placed in a horizontal position and connected to a water pump to pressurize the annular space between the bladder and pressure vessel wall. The pumps for injecting the barrier material are connected to nozzles on one of the end caps. The annular space is pressurized with water from a temperature regulated water bath. After the porous media reaches thermostatic equilibrium, the barrier fluids are injected in to the media. When it is no longer possible to maintain the desired injection rate with the injection pressure, the barrier pumps are shut off and the barrier allowed to cure. The barrier fluid injection pressure is less than or equal to the pressure setting on the water circulation pump.

Barrier Evaluation: After the barrier has cured, water via the barrier test pump is pumped against the barrier to test the barrier's permeability to water. The testing pressure is less or equal to the pressure from the water circulation pump.

Flow Consumption: The rubber bladder's volume will be approximately 60 gallons. A representative porosity of 25% leaves 15 gallons of pore volume to be filled with barrier material. The water flow rate in the annulus is expected to be 10 gallons per minute or less. Utility cooling water will be approximately 25 gpm.

Process Control and Safety System: The process and flow drawing includes the location of the pressure relief devices. The drawings included show the project P&ID. The barrier material injection pumps and the water circulation pumps will be fitted with safety relief valves to recirculate the respective fluids at to maintain pressures at the desired injection and annular pressures. The water circulating through the annular space will be a closed loop circulation path. This water will be cooled to operating temperature by passing it through a heat exchanger where facility cooling water is used to cool the circulation water. This arrangement prevents the discharge of barrier material into facility drains should the rubber bladder rupture.

Overall Operation: Before injection of barrier material begins, the annular water pump will be started and allowed to run until the porous media reaches the desired temperature, typically 55 deg F). At this point, the annular pressure will be set. The barrier injection pumps will then be started and injection initiated at desired injection pressure. Flow rate of the barrier material will be measured. Fluid flow rate from the non injection end of the vessel will also be monitored and measured. When the injection rate of the barrier material drops below a set point the injection pumps will be shut down. The water circulation pumps will be allowed to run until the barrier material has cured for the time period specified by the material's manufacturer.

Planned Shut-Down: A planned shut down will be accomplished by turning off the barrier injection pumps and the water circulation pump.

Non-Planned Shut-Down: The most likely event requiring a non-planned shut-down is a rupture of the rubber bladder. This rupturing of the bladder would result in either circulation water flowing from the production end of the porous media or barrier material being discharged into the circulation water or both. In the event of this occurrence, all pumps would be shut down.

Barrier Characterization: The effectiveness of the barrier at reducing the porous media's permeability will be determined by injecting water under pressure (up to 200 psig) through the end of the opposite end of the vessel than was used to inject the barrier material. The flow rate of water through the barrier will be measured by collecting produced water and measuring its volume as a function of time.

Personnel: The packing of the bed will require 2 people to be present. Normal operation of the process can be done safely with one operator since this is a low mechanical energy process which does not produce toxic gases. When operating or preparing this project for operation, operators will need to wear safety glasses and steel toed shoes. Protective gloves should be worn when handling organic chemicals. No other PPE is required for this project.

Section 4

NEPA Documentation

NEPA DOCUMENT CONCURRENCE

NEPA # 535 Contract # TBD

Project Title: In-Situ Barrier Formation and Evaluation

****

Env. Proj. Mgr.(EPM) Cindy Mullens

Proj. Mgr.(PM) Duane Smith

PM's Immed. Supvr. (Sup.) R. Romanosky

****

INITIALS & DATE REQUIRED

Approval to send to HQ		Date	Comments
EPM			
PM			
PM/OM			
PM/Sup			
ESH/OM			
ESH Dir			
NCO			
DIR			

****

DOCUMENTS INCLUDED

SSI ______ Cx-A Form ______ Cx-B Checklist x

Checklist x Cx-B Memo ______

****

+date started through the concurrence chain

NEPA CHECKLIST

1. Date: April 1, 1994 NEPA #: 535

2. Activity/Project Name/Contract #: In-Situ Barrier Formation and Evaluation.

3. Project Manager/Branch/Division: Duane Smith/Technology Support Projects Division

4. Project/Activity Description: As part of a Cooperative Research and Development Agreement (CRADA), West Virginia University is allowed to use the B-17 facility which exists on the Morgantown Energy Technology Center premises. The proposed pilot scale project is to test certain materials' ability to reduce the permeability of soil by injecting the material into soil, and then leaving it to cure. The proposed project would use Polyurethane. The soil would be placed in a tube 10 feet long and about 1 foot in diameter. Water would then be injected from one end into the cured mixture of soil and Polyurethane. The amount of water that can escape from the other end would indicate the permeability of the material used. Holding tanks would be available to hold the escaping water. Other tanks would be available to contain any leakage from the whole assembly. The uncontaminated soil material would be shipped in from selected construction locations in West Virginia, and then returned to the site of origin or otherwise disposed in an acceptable manner depending on the results of a TCLP test that would be performed on the waste soil to determine it would be categorized as a hazardous waste. If the waste soil was found to be hazardous, it would be disposed accordance with Federal, state, and local laws and regulations, or else it would be disposed to a landfill.

The size of equipment to be used is not yet determined in this proposal stage. However, a rough estimate may be given. There will be 4 pumps, 3 feet^3 each; a compressor (3 feet^3); the porous media vessel (a tube 10 feet long and 1 foot in diameter); 2 barrier fluid tanks, and a water tank (not more than 5 feet^3); and a holding tank (55 gallon capacity).

The chemicals that would be used are the following:

Silicon-base Urethane or Polyurethane (Monomer)	10 Gallon
Cement	10 Gallon
Regular Soil	1,000 Gallon
Water	300 Gallon

The process will not produce toxic gases.

The proposed project would operate for approximately three years. The materials used in the experiment in the amounts listed above would be used for 8 months then disposed and replaced with a fresh supply. The water supply would be recycled for 8 months. The total amount of water used in an 8 month period would be 300 gallons. In the 3 years, the total amount of waste water would be 1000 gallons. The total amount of waste cement would be 10 gallons. The total amount of waste soil would be 1000 gallons, and the total amount of waste polyurethane would be 10 gallons.

When cured, polyurethane polymer will not react with anything. However, uncured polyurethane monomer will react with water to produce Carbon Dioxide (CO_2), which can be dispersed by regular ventilation. Polyurethane would be stored in sealed containers. It has not yet been determined whether CO_2 monitors would be necessary.

Waste products would be the soil after being injected with the barrier material and discharge water. There would be a holding tank to collect the discharge fluid from the vessel. The tank will be either a one hundred gallon drum or two fifty-five gallon drums. These drums are also designed to be large enough to collect the circulating water should the rubber bladder used in the process rupture. All discharge products will be disposed in accordance with Federal, state and local laws and regulations.

5. Brief Description of Affected Environment: The project would be enclosed in B-17 which is an existing facility in a developed research and development facility at the Morgantown Energy Technology Center, Morgantown, WV.

6. Environmental Concerns: No construction or modification is needed to the environment surrounding the B-17 area.

6.1 Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health requirements of DOE orders? YES _ NO x UNKNOWN _

6.2 Siting and construction or major expansion of waste storage, disposal recovery, or treatment facilities?
YES _ NO x UNKNOWN _

6.3 Uncontrolled or unpermitted releases resulting from hazardous substances, pollutants or CERCLA-excluded petroleum and natural gas products that preexist in the environment?
YES _ NO x UNKNOWN _

6.4 Adversely affect environmentally sensitive resources, including:

6.4.a Threatened/Endangered Species or Critical Habitat Areas YES _ NO x UNKNOWN _

6.4.b Flood Plains/Wetlands YES _ NO x UNKNOWN _

6.4.c Archaeological/Cultural Resources YES _ NO x UNKNOWN _

6.4.d Prime, Unique or Important Farmland YES _ NO x UNKNOWN _

6.4.e Special sources of Groundwater (sole source aquifer, etc.) YES _ NO x UNKNOWN _

6.4.f Tundra, Coral Reefs, Rain Forests, Coastal Zones YES _ NO x UNKNOWN _

6.4.h National Parks, Wild and Scenic Rivers, Waters of the State, etc. YES _ NO x UNKNOWN _

6.4.i Clean Air Act Criteria Pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, particulates (PM_{10}) lead, acid mist) YES _ NO x UNKNOWN _

7. ADDITIONAL INFORMATION Will the project/activity ...

7.1 Affect water use and quality, including sedimentation, and discharge of point/nonpoint source pollutants to surface or groundwater? YES _ NO x UNKNOWN _

7.2 Control or modify the waters, stream-bed, or shoreline of any stream or water body? YES _ NO x UNKNOWN _

7.3 Result in the generation, transportation, and disposal of any hazardous or toxic materials as defined by Federal or applicable state regulations? YES _ NO x UNKNOWN _

7.4 Affect any aspect of the human environment besides those mentioned above either directly or indirectly (e.g., visibility, noise, aesthetic and socioeconomic impacts; public facilities and services or exposure to toxic and hazardous material)?
YES _ NO x UNKNOWN _

7.5 Generate public controversy? YES _ NO x UNKNOWN _

Please write all explanations of any "yes" answer(s) on attached page.

7.6 Cumulative Impacts: None.

8. Recommended NEPA Determination: Cx-A __ Cx-B x EA __

EIS __ B3.10 Small-scale research and development/small-scale pilot facility, preceding demonstration. None needed __

9. Type of Project Class: __ GSC __ CG __ HE

__ OSTS __ FBC __ FC __ WM/FE __ UGR __ WM/EM

__ CCT

______________________________	______________
Duane Smith, Project Manager	Date
______________________________	______________
Cindy Mullens, Environmental Project Manager	Date
______________________________	______________
John Ganz, NEPA Compliance Officer	Date

Cx-B

This form is typically a two-page description of the proposed project, a recommendation signed by the NCO, and a determination signed by the METC Director.⌂

CATEGORICAL EXCLUSION (Cx-B) DETERMINATION
⌂IN-SITU BARRIER FORMATION & EVALUATION⌂

NEPA # ⌂ 535 ⌂ **Contract #** ⌂ TBD ⌂

Proposed Action:
⌂The proposed action involves the testing of certain materials' ability to reduce the permeability of soil by injecting the material into soil and then leaving it to cure.⌂

Location:
⌂At building B-17 of The Morgantown Energy Technology Center, Morgantown, West Virginia.⌂

Proposed By:
Morgantown Energy Technology Center, Department of Energy (DOE).

Description of the Proposed Action:
⌂This project will not have any impact what so ever on the environment. A brief description of the proposed action activities includes the following:

- Materials that will go into the project per run: Soil -- about 50 gallons, water -- about 300 gallons, polyurethane monomer -- about 10 gallons.
- Materials that will be generated: Water -- about 300 gallons, cement wastes -- about 10 gallons, soil waste -- 1000 gallons, polyurethane waste -- about 10 gallons. These waste products will be shipped back to the site of origin, or disposed of according to the results of the TCLP tests.
- During a 3 year period, the project is assumed to run about 3 to 5 times.
- The project will run for a period of about 3 years.
- The project will be conducted in building B-17.
- To run the project, a construction and an operating permits must be obtained first.
- This project will have no impact on any other project that will be running at the same time in the same facility.⌂

Cx To Be Applied: The proposed action is within the threshold limits of the DOE National Environmental Policy Act (NEPA) Implementing Procedures, 10 CFR 1021, effective date May 26, 1992, Subpart D, Appendix B. ⌂site number of classification (i.e. B.1.16)⌂ "⌂site the Cx-B classification as found in the partial list of Cx's in this file or the section of the regulations noted above⌂". This action meets all of the eligibility requirements for categorical exclusions as set forth in 10 CFR 1021, Section 410, and all of the integral elements of the Classes of Actions in Appendix B.

CATEGORICAL EXCLUSION (Cx-B) DETERMINATION

⌂IN-SITU BARRIER FORMATION & EVALUATION⌂

NEPA # ⌂ 535 ⌂ **Contract #** ⌂ TBD ⌂

Determination: I have determined that the proposed action meets the requirements for an Appendix B categorical exclusion (Cx-B) as defined in Section D of the DOE National Environmental Policy Act (NEPA) Implementing Procedures. Therefore, I approve the categorical exclusion of the proposed action from further NEPA review and documentation.

Recommendation:

Date: ____________ Signature: ______________________________

John R. Ganz
NEPA Compliance Officer

Approval:

Date: ____________ Signature: ______________________________

Thomas F. Bechtel
Director, METC

4 of 4

Section 5

Supporting Documentation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
RISK REDUCTION ENGINEERING LABORATORY
CINCINNATI, OHIO 45268

May 12, 1993

Dr. Paul F. Ziemkiewicz
Director, Env. Technology Division
West Virginia University
P.O. Box 6064
Morgantown, West Virginia 26506-6064

Dear Dr. Ziemkiewicz:

The U.S. Environmental Protection Agency's R&D laboratories in Cincinnati have conducted work on in situ containment via clay and synthetic liners, slurry walls, and vertical and horizontal grouting. There is no longer support for this kind of work, but a number of technical questions have not been completely answered:

- Hydraulic performance of field installations. How closely does this conform to the design performance?
- Non-destructing and non-intrusive methods for monitoring performance of the installation as a whole and methods for locating areas of substandard hydraulic performance (leaks).
- Quality assurance procedures and the effect of construction procedures on the uniformity and physical/hydraulic properties of the installation.
- Changes in hydraulic performance resulting from long-term exposure to low-strength leachate or contaminated groundwater; data are available on changes due to pure chemicals and high-strength leachates.

Investigations of these questions are encouraged; in particular, development of comparative test protocols would help in the evaluation of alternative confinement systems. The results would be useful in both the Superfund and RCRA Corrective Action programs. Our group is not in a position to offer financial support but we certainly can offer technical assistance in locating information about past work and in reviewing plans for future work.

Sincerely,

Janet M. Houthoofd

for Michael H. Roulier
Chief, Soils and Residuals Section
Municipal Solid Waste and Residuals Management Branch

PREAMBLE

Whereas, the Morgantown Energy Technology Center (METC) has determined that it wishes to perform R&D activities with West Virginia University relating to (a) heat engines and (b) waste treatment and amelioration of problems associated with process wastes; and

Whereas, METC is conducting research to enhance the supply of natural gas as well as the conversion of coal into alternate fuels (SNG), and is also interested in the utilization of natural gas; and

Whereas, METC wants to develop and demonstrate new methods and designs for vehicle engines with superior performance; and

Whereas, METC can accomplish this purpose by entering a Cooperative Research and Development Agreement with West Virginia University Research Corporation on behalf of WVU; and

Whereas, the Laboratory Director, acting within his authority under P.L. 9a 502 Technology Transfer Act of 1986 and P.L. 101-189 National Competitiveness Transfer Act of 1989, desires to enter into such Agreement; and

Whereas, West Virginia University Research Corporation has determined that it wishes to enter into such agreement with Morgantown Energy Technology Center; and the undersigned certifies that it has the legal authority to enter into the CRADA; and

Whereas, the Participants have agreed to participate in the combined Research and Development activities to be carried out under said Agreement under the terms expressly set forth herein.

Therefore, the Parties agree to enter into this agreement in accordance with the terms and conditions set forth herein.

COOPERATIVE RESEARCH AND DEVELOPMENT
AGREEMENT NO. 92-002 (hereinafter CRADA)

BETWEEN

MORGANTOWN ENERGY TECHNOLOGY CENTER
U.S. DEPARTMENT OF ENERGY (hereinafter "METC")

AND

WEST VIRGINIA UNIVERSITY RESEARCH CORPORATION
on behalf of West Virginia University (hereinafter "WVU")
both being hereinafter jointly referred to as the "Parties"

The Parties agree to enter into this CRADA as authorized by the Stevenson-Wydler Technology Innovation Act of 1980, as amended by the Federal Technology Transfer Act of 1986 (15 USC 3710); as amended by the Federal Technology Act of 1989 (15 USC 3710a) and in accordance with the following terms and conditions:

ARTICLE II. DEFINITIONS USED IN THIS CRADA

A. "Government" means the United States of America and agencies thereof specifically the Morgantown Energy Technology Center (METC).

B. "DOE" means the Department of Energy, an agency of the United States of America.

C. "METC" is a Government-owned and operated facility located in Morgantown, West Virginia and is engaged in the conduct of fossil energy research and development.

D. "Laboratory Director" means the Director of the Morgantown Energy Technology Center, acting in accordance with and under the general and enumerated authority of P.L. 99-502 and P.L. 101-189.

E. "Cooperative Research and Development Agreement" (CRADA) means an agreement as defined in and which conforms to the requirements of P.L. 99-502, the "Federal Technology Transfer Act of 1986," as amended by P.L. 101-189, the "National Technology Transfer Competitiveness Act of 1989."

F. "Generated Information" means information first produced in the performance of this CRADA.

G. "Proprietary Information" means information other than Generated Information embodying trade secrets, commercial or financial information which is privileged or confidential within the meaning of 5 USC 552 (B) (4) and which is identified as being Proprietary Information.

H. "Protected CRADA Information" means Generated Information that would be a trade secret or commercial or financial information that is privileged or confidential if the information had been obtained from a non-Federal party and which is protected from dissemination by mutual agreement of the Parties under the provision of the National Technology Transfer Competitiveness Act of 1989.

I. "Unlimited Rights" means the right of the Government to use, disclose, reproduce, and prepare derivative works distributed to the public, and perform publicly or display publicly in any manner or for any purpose or to permit others to do so.

J. "Subject invention" means any invention or discovery of the Parties conceived or first actually reduced to practice in the course of or under this CRADA.

K. "Intellectual Property" means all Subject Inventions made and copyrighted works first produced under this CRADA.

L. "Participant" means West Virginia Research Corporation on behalf of WVU as authorized by West Virginia Code 18b-12-3 which authorized State Boards of higher education to enter into agreements and other contractual relationships under said article.

M. "NG Fuel" means compressed natural gas to be used as alternative fuel for vehicles.

N. "B-17" means an existing building located on the METC site (see Attachments 02 and 03).

O. "Protocol Agreement" means stipulated terms and conditions, including ES&H matters, of the research and development efforts under this CRADA (see Appendix B).

ARTICLE II. STATEMENT OF WORK AND PROTOCOL AGREEMENT

Appendix A, Statement of Work, is hereby incorporated into this CRADA by reference and made part of this CRADA.

Appendix B, Protocol Agreement, is also incorporated into and made a part of this CRADA.

ARTICLE III. FUNDING AND COSTS

A. The monetary value of the Participant's estimated contribution is undetermined at this time. The estimated contribution includes the value of the NG fuel provided by WVU, and the costs associated with providing faculty and students for conducting research and development in the B-17 facility in accordance with the Statement of Work. The Participant will provide technical support and consultation on NG-fuel conversion, donation of NG-fuel, and the use of their NG-fueling station for METC vehicles. METC and WVU shall review the amounts of NG-fuel used and fueling station use every 6 months to monitor costs incurred and any operational issues. The Government's contribution is the provision of access to the B-17 building and contents on the METC site. No money will flow to the Participant from METC under this agreement in accordance with 15 USC 3710a.

B. Neither Party shall have an obligation to continue or complete performance of its work at a cost in excess of its estimated cost as contained in Article III A above, including any subsequent amendment.

C. Each Party agrees to provide at least 30 days notice to the other Party if the actual cost to complete performance will exceed its estimated cost.

D. Additional space for offices within B-17, or in an adjacent modular office building of nominally 1100 ft. (T-28) may be provided to WVU.

ARTICLE IV. PROPERTY

All tangible personal property acquired or produced under this CRADA shall become the property of the Participant or the government depending upon whose funds were used to obtain it. Personal Property shall be disposed of as directed by the owner at the owner's expense. All jointly funded property shall be owned by the Government.

ARTICLE V. DISCLAIMER

Any liability of the Participant to the Government, the DOE, or persons acting on their behalf, and to third parties for the negligence of the Participant and its employees is subject to the provisions of Article X, Section 6 of the West Virginia Constitution, such provision providing for the State's responsibility for debts or liabilities and the limitations on the State's ability to enter into financial obligations to be met in the future. Any liability of the Participant for any damages, losses, or costs arising out of or related to acts performed by WVU or its employees under this CRADA is governed by said provisions as interpreted by courts of competent jurisdiction.

ARTICLE VI. OBLIGATIONS AS TO PROPRIETARY INFORMATION

The provisions of this Article apply to the extent that the Participant identifies and introduces Proprietary information into the work to be performed under this CRADA.

A. **If Proprietary Information is orally disclosed to a Party, it shall be identified as such, orally, at the time of disclosure and confirmed in a written summary thereof within 10 days as being Proprietary Information.**

B. **The Parties agree to not disclose Proprietary Information provided them to anyone, other than the CRADA participants and METC, without written approval of the providing party, except to Government employees who are subject to 18 USC 1905.**

C. All Proprietary Information shall be returned to the provider thereof at the conclusion of the CRADA at the provider's expense.

D. All Proprietary Information shall be protected, unless and until such shall become publicly known without the fault of the recipient, shall come into recipient's possession without breach of any of the obligations set forth herein by the recipient, or shall be independently developed by recipient's employees who did not have access to Proprietary Information.

ARTICLE VII. OBLIGATIONS AS TO PROTECTED CRADA INFORMATION

A. Each Party may mark as Protected CRADA Information, as defined in Article I, any Generated Information produced by its employees, and with the agreement of the other Party, mark any Generated Information produced by the other Party's employees. The Parties will mark Protected CRADA Information with the following legend: "PROTECTED CRADA INFORMATION NOT AVAILABLE FOR DISSEMINATION."

B. For a period of five years from the date Protected CRADA Information is produced, Parties agree not to further disclose such Information except:

1. As necessary to perform this CRADA;

2. As requested by the LABORATORY DIRECTOR to be provided to other DOE facilities for use only at those DOE facilities with the same protection in place;

3. As mutually agreed by the Parties in advance; or

4. As required by a Court of competent jurisdiction.

C. The obligations of (B) above shall end sooner for any Protected CRADA Information which shall become publicly known without fault of either Party, shall come into a Party's possession without breach by that Party of the obligations of (B) above, or shall be independently developed by a Party's employees who did not have access to the protected CRADA Information.

ARTICLE VIII. RIGHTS IN GENERATED INFORMATION

The Parties understand that the Government shall have unlimited rights in all Generated Information or information provided to the Parties under this CRADA which is not marked as being copyrighted or as Protected CRADA Information or Proprietary Information.

A. Right to Use. Unless otherwise agreed to by the Parties herein, the Government and the Participant shall have unlimited rights in all Generated Information or information provided in this CRADA which is not marked as "Protected CRADA Information" or "Proprietary Information".

B. Copyrighted Works. The Government retains for itself a royalty-free, nonexclusive, irrevocable, worldwide copyright license to prepare derivative works or compilations, and to reproduce, distribute, publish, use, and dispose of and authorize others to do so, all copyrighted works (including computer software) produced in the performance of this CRADA by the Participant with the right in the Government to grant sublicenses to others, subject to any restrictions placed in this CRADA on publication of proprietary information or protected CRADA information.

ARTICLE IX. EXPORT CONTROL

THE PARTIES UNDERSTAND THAT MATERIALS RESULTING FROM THE PERFORMANCE OF THIS CRADA MAY BE SUBJECT TO EXPORT CONTROL LAWS AND THAT EACH PARTY IS RESPONSIBLE FOR ITS OWN COMPLIANCE WITH SUCH LAWS.

ARTICLE X. REPORTS AND ABSTRACTS

WVU agrees to provide reports and abstracts to DOE on an as-needed basis where the nature of research and magnitude or importance justify and as may be required by the Laboratory Director, including (1) a nonproprietary abstract, (2) a final report, and (3) other topical/periodical reports. The Participant shall furnish the abstract to the DOE Office of Science and Technical Information. The abstract will be submitted at the time the CRADA is submitted to the Laboratory Director. Further abstracts may be required, for example, where a substantial change in scope or dollars occurs. Any reports properly marked with a restrictive legend identifying the agreed to period of withholding from public disclosure shall be used by the DOE for Department use only and be exempt from the Freedom of Information Act as set forth at 5 USC 552.

ARTICLE XI. PRE-PUBLICATION REVIEW

A. The Parties agree to waive mandatory pre-publication approval with each other but will secure pre-publication approval from each other when the Government shall deem such approval is not unreasonable in light of academic freedom policies.

B. The Parties agree that neither will use the name of the other Party or its employees in any promotional activity, such as advertisements, with reference to any product or service resulting from this CRADA, without prior written approval of the other Party.

ARTICLE XII. REPORTING INVENTIONS

A. The Parties agree to disclose each and every invention which is conceived or first actually reduced to practice in the performance of this CRADA, to each other and within 2 months after the inventor discloses it to personnel responsible for patent matters.

B. The Parties agree to require, by written agreement that their employees promptly disclose each subject invention made under this CRADA in writing to personnel responsible for patent matters. Further, the Parties will require their employees to execute and promptly deliver all instruments necessary to filing and obtaining of patent protection for subject inventions.

C. Disclosure shall be in such detail as to enable teaching one skilled in the art how to make the invention (see 35 USC 112). The disclosure should identify any statutory bar that occurs or describe an invention disclosed but for which a patent has not been filed. All invention disclosures will be withheld from public disclosure for a reasonable time to allow patent applications to be filed in the U.S. Trademark Office.

ARTICLE XIII. PATENT RIGHTS

Disposition and allocation of rights in any invention conceived or first reduced to practice by any employee of the Parties to this CRADA shall be subject to the patent policy of Section 9 of the Federal Non-nuclear Energy Research and Development Act of 1974, 42 USC 5908 and other appropriate laws, regulations or policy, and shall, to the extent permitted by law, be subject to negotiations between the Parties as a modification of this CRADA. Allocation of rights in and obligations for such inventions shall be made in accordance with the following minimum principles.

A. Participant Subject Inventions. The Laboratory Director, on behalf of the U.S. Government, can waive, assign, or license any ownership rights the U.S. Government may have in any Subject Invention made by the Participant or its employees under this CRADA. The Participant shall have the option to request the Laboratory Director for a non-exclusive or exclusive license in or a right to elect to retain title to any such Subject Invention.

   1. Participant Waived Subject Invention (Waiver). If Participant elects to take title to a waived Subject Invention under this section, the Participant shall promptly notify the Laboratory Director upon making the election and shall file patent application(s) on such at its own expense and in a timely fashion. The Participant electing to take title to a waived Subject Invention under this option agrees to grant to the Government a nonexclusive, irrevocable, paid-up license in any patent covering a Subject Invention to practice the invention, or to have it practiced, throughout the world by or on behalf of the U.S. Government and such other rights as may be appropriate. Such nonexclusive license shall be evidenced by a confirmatory license agreement in a form satisfactory to the Laboratory Director.

   2. Participant Subject Invention. (Title in Government). The Participant agrees to assign to the Government the entire right, title, and interest throughout the world in and to each subject invention conceived or first actually reduced to practice in the performance of this CRADA subject to the retention of the Participant of a nonexclusive, paid-up license in each subject invention.

B. METC Employee Inventions. The Laboratory Director, on behalf of the U.S. Government, shall have the initial option to retain title to each Subject Invention made by its employees and in each Subject Invention made jointly by a Participant employee and a METC employee in the course of this or under this CRADA. In the event that the Laboratory

Director informs the Participant that it elects to retain title to such joint Subject Invention, right, title, and interest it has in and to such joint Subject Invention, the Participant agrees to assign or to obtain assignment of the invention.

C. Filing of Patent Applications. The Party having the right to retain title and file patent applications on a specific Subject Invention may elect not to file patent applications thereon provided it so advises the other party within ninety (90) days from the date it reports the Subject Invention to the other party and in any case within a time early enough to allow the other party to file a patent application before a statutory bar has arisen. Thereafter, the other party may elect to file patent applications on such Subject Invention and the party initially reporting such Subject Invention agrees to assign or waive its right, title, and interest in such Subject Invention to the other party pursuant to this paragraph shall be subject to the retention by the party assigning or waiving title of a nonexclusive, revocable, paid-up license to practice, or have practiced, the Subject Invention throughout the world. In the event neither of the parties to this Agreement elect to file a patent application on a Subject Invention, either or both (if a joint invention) may, at their discretion release the right to file to the inventor(s) with a license in each party of at least the same scope as set forth in the immediate preceding sentence and subject to any other terms the Parties may agree on.

D. Patent Expenses. All of the expenses attendant to the filing and prosecution of a patent application, shall be borne by the party having the right to file the patent application. Payment of any post patent fees shall be subject to agreement between the same parties. Each party shall provide the other party with a copy of the patent application(s) it files on any Subject Invention along with the power to inspect and make copies of all documents retained in the official patent application files by the applicable patent office.

ARTICLE XIV. REPORTS OF INVENTION USE

The Participant agrees to submit, upon request of DOE, reports no more frequently than annually on the efforts to obtain utilization of any invention in accordance with 41 CFR 9-9.

ARTICLE XV. DOE MARCH-IN RIGHTS

The Participant recognizes that the DOE has certain march-in rights to any inventions arising from the performance of this CRADA in accordance with 48 CFR 27.304-1 (g).

ARTICLE XVI. ASSIGNMENT OF PERSONNEL

A. To the extent that the Parties may assign personnel to the other Party's facility as part of this CRADA, such personnel shall not be considered employees of the receiving Party for any purpose during the period of such assignment(s).

B. Notwithstanding the foregoing, METC shall have the right to exercise administrative and technical oversight of the activities of such personnel during the assignment period and shall have the right to approve the assignment of personnel or request their removal.

C. Unless otherwise agreed to by the Parties, the assigning Party shall bear any and all costs and expenses with regard to its personnel assigned to the receiving Party's facilities under this CRADA.

ARTICLE XVII. U.S. COMPETITIVENESS

The Parties agree that any products, processes, or services for use or sale in the United States under any U.S. Patent resulting from a subject invention shall be manufactured substantially in the United States. The Parties also agree that any products, processes, or services using intellectual property arising from the performance of this CRADA will be manufactured substantially in the United States.

ARTICLE XVIII. ADMINISTRATION OF THE CRADA

It is understood by the Parties that at all times the Laboratory Director, or his designee, shall supervise the administration of this CRADA. Research projects/activities will be joint efforts by METC and WVU researchers; as determined in the Statement of Work and modification thereto. In addition, the protocol agreement shall further define the rights, responsibilities, and tasks of the R&D activities. The protocol statement also addresses ES&H matters. However entire administration of the CRADA remains METC's responsibility. At all times during the performance of this CRADA, while on Government property, WVU employees, agents, and/or invitees shall adhere to the Governments's requirements regarding access, security, safety and health, waste generation and/or disposal, and such other administrative directives as may be imposed by the Government.

ARTICLE XIX. RECORDS AND ACCOUNTING SYSTEM

The Participant shall maintain records of receipts, expenditures, and the disposition of all Government property in its custody, related to the CRADA.

ARTICLE XX. NOTICES

A. Any communications required by this CRADA, if given by postage prepaid first class U.S. Mail addressed to the Party to receive the communication, shall be deemed made as of the day of receipt of such communication by the addressee, or on the date given if by verified facsimile. Address changes shall be given in accordance with this Article and shall be effective thereafter. All such communications, to be considered effective, shall include the number of this CRADA.

B. The points of contact, addresses, and facsimile numbers for the parties are as follows:

METC: Technical

John Notestein
Phone No. (304) 291-4232
FAX No. (304) 291-4292

Legal/Administration

Nancy Houston
Phone No. (304) 291-4081
FAX NO. (304) 291-4403

Address: Morgantown Energy Technology Center
P.O. Box 880 Collins Ferry Rd.
Morgantown, W.Va. 26507-0880

WVU: Technical

John Holmgren
Phone No. (304) 293-2867
FAX No. (304) 293-3749
Address: West Virginia University
Energy & Water Research Center
617 Spruce Street
Morgantown, WV 26506

Legal/Administration

William Reeves
Phone No. (304) 293-7398
FAX No. (304) 293-7435
Address: 213 Glenlock Hall
West Virginia University
Morgantown, WV 26506

ARTICLE XXI. DISPUTES

The Parties shall attempt to jointly resolve all disputes arising from this CRADA. If the Parties are unable to jointly resolve a dispute within a reasonable period of time, they agree to submit to the findings of a third non-interested party to be determined and chosen by the Parties. The findings of the third party Arbitrator shall be binding on the Parties.

ARTICLE XXII. ENTIRE CRADA AND MODIFICATIONS

A. It is expressly understood and agreed that this CRADA with its Appendices contains the entire agreement between the Parties with respect to the subject matter hereof and that all prior representations or agreements relating hereto have been merged into this document and are thus superseded in totality by this CRADA. This CRADA will be approved when signed by both parties. The term of this CRADA shall begin on the date signed and continue for a period of 5 years. The entire CRADA shall be reviewed annually by the Parties.

B. Any agreement to change any terms or conditions of this CRADA or the Appendices shall be valid only if the change is made in writing, executed by the Parties hereto, and approved by DOE.

ARTICLE XXIII. TERMINATION

This CRADA may be terminated by either Party upon 30 days written notice to the other Party. In the event of termination by either Party, each Party shall be responsible for its share of the costs incurred through the effective date of termination, as well as its share of the costs incurred after the effective date of termination, and which are related to the termination. The confidentiality, use, and/or non-disclosure obligations of this CRADA shall survive any termination of this CRADA.

FOR MORGANTOWN ENERGY TECHNOLOGY CENTER:

BY: Thomas F. Bat

TITLE: Director, METC

DATE: January 13, 1992

FOR WEST VIRGINIA UNIVERSITY

BY:

TITLE: Special Assistant to Provost for Research

DATE: Januray 13, 1992

STATEMENT OF WORK

1. MORGANTOWN ENERGY TECHNOLOGY CENTER (METC) will provide physical facilities in which West Virginia University will conduct research involving heat engines and waste treatment and amelioration of problems associated with process wastes. To support these activities METC will provide WVU access to the B-17 building and contents located on the METC site. WVU will provide technical consultation on NG-fuel conversion, donation of NG-fuel, and use of the WVU NG-fueling station to METC for use on METC vehicles.

2. WVU will be responsible for any physical modifications to B-17 and/or its contents to facilitate their R&D activities. WVU will document any modifications to the building in the form of engineering drawings and/or specifications, a reproducible copy of which is to be provided to METC in advance. Modifications must have prior written consent of METC.

3. DOE-METC will retain responsibility for the physical maintenance of the building and its interior utilities (e.g., HVAC system), supporting utilities to/from the building, and general security of the structure.

4. METC's agent, EG&G, is responsible for the activities conducted in the chemistry labs in B-17. These rooms and equipment are also anticipated to support the R&D activities conducted by WVU and are available to WVU personnel. WVU's work in this area is to be on a non-interference basis to EG&G's commitments and EG&G's role will be that of Custodian to facilitate and oversee independent WVU work. EG&G's primary function is to insure no harm comes to the EG&G personnel, the room and contents, or to work being conducted by EG&G.

5. METC will retain auditing, inspection, and administrative rights regarding use of the B-17. It will also provide WVU employees with DOE/METC policies and procedures regarding environmental, safety, and health (ES&H) issues.

6. WVU will be responsible for the conduct of their employees and students while on the METC site. WVU employees will have building access while on site during regular work times. Special circumstances may warrant extending these rights and will remain negotiable between the Parties. WVU must comply with all METC ES&H policies and procedures regarding personnel. Foreign nationals, both from sensitive and non-sensitive countries, must comply with DOE/METC procedures and advance notice requirements. (METC revised form IA-473). METC will provide a safe work space, parking facilities, dining facilities during regular (7:45-4:15)

work hours, and access to B-17 analytical labs and other required buildings on the METC site.

7. WVU will provide an "action description memorandum" to METC for each R&D activity to be housed in B-17. Projects will be reviewed by a joint METC/WVU team to determine the philosophical consistency with the technical focus of this CRADA, as noted above, and the need for NEPA action. This description will also be the basis of a joint METC/WVU safety review and will be retained in the METC Safety Analysis Review System (SARS). The SARS review process must be completed/accepted before testing activities commence.

8. WVU will provide personnel to execute the R&D activities to be conducted on the METC site.

9. B-17 is not precluded from housing other activities outside the specific parameters of this CRADA, some of which may be third parties, not known at this time, and some of which may be with WVU under separate and distinct agreements.

10. This Statement of Work may be amended by written consent of both Parties.

MATERIAL SAFETY DATA SHEET
Complies with OSHA's Hazard Communication Standard 29 CFR 1910.1200

Identity (As listed on label): POLYCEL One Foam Sealant and DB Plus Acoustical Sealant 10#, 16#
UPC: 83063, 83006, 83121, 83055, 83113, 83097, 83154,
HMIS: H: 2 F: 1 R: 0 P: B,G

SECTION I

Macklanburg-Duncan P.O. BOX 25188, 4041 North Santa Fe, OKC, OK 73118
24 Hour Number (405) 528-4411
Emergency Number: CHEMTREC 1-800-424-9300
Date Prepared: November 9, 1993
Replaces: October 21, 1993
Chemical Family: Moisture cure urethane prepolymer.
DOT Class: Compressed Gas, N.O.S. (Fluorocarbon) Hazard Class 2.2
UN 1956 Non-Flammable Gas

SECTION II Hazardous Ingredients / Identity Information

Component ACGIH TLV/OSHA PEL % (less than) CAS NUMBER

This product contains toxic chemicals, marked by an asterisk (*), subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372).

Polymeric Diisocyanate 0.005 ppm/0.02 ppm (MDI) 43%
LD50 Oral, Rat: 15,000 mg/kg CAS #: 026447-40-5/009016-87-9

Hydrofluorocarbon Propellent 21% CAS #: 75-45-6
1000 ppm-TWA/1000 ppm-TWA LC50 200,000 ppm (2hrs, rat, inhalation)

Tri(beta-chloropropyl) Phosphate NE/NE 12%
LD 50 = 4200 mg/Kg (oral, rat) CAS #: 13674-84-5

SECTION III Physical / Chemical Characteristics

Boiling Point (degrees F): HCFC: -41 Deg F
Vapor Pressure (mm Hg): 151 psig @ 25 Deg C for HCFC
Vapor Density (Air = 1): 3.03 for HCFC
Specific Gravity (Water = 1): 1.08
Bulk Density: 2 lbs/cubic foot (cured)
% Volatile: 21%
Evaporation Rate (Butyl Acetate = 1): >1 FOR HCFC
Solubility in Water: Insoluble. Uncured material reacts slowly with water to liberate carbon dioxide.
Appearance and Odor: Viscous foam with slight sweet odor. Solid upon curing.

SECTION IV Fire and Explosion Hazards

Flash Point (Method Used) (degrees F): NA
Flammable Limits LEL: NA UEL: NA
Extinguishing Media: Carbon dioxide, foam, dry chemical, high expansion chemical foam.

Special Fire Fighting Procedures: Self-contained breathing apparatus i[n] positive pressure mode and full protective gear should be worn.
Unusual Fire and Explosion Hazards: Irritating or toxic gases and aerosol[s] such as carbon monoxide, carbon dioxide, nitrous oxides, isocyanurates an[d] hydrogen cyanide may be produced during burning. Sealed containers contai[n] freon which may expand under pressure and explode. MDI vapors, fluror-carbo[n] vapors and other decomposition products that are highly toxic can b[e] generated. Cool fire exposed containers with cold water.
NFPA Rating: H-2, F-1, R-0

SECTION V Reactivity Data

Stability: stable
Conditions to avoid: Mixture is shipped in a pressurized DOT aerosol can. Proper precautions for handling should be observed. The following condition[s] should be avoided: water contamination, freezing, heat, temperatures abov[e] 120 deg F. Polymeric isocyanate is stable under normal conditions but ca[n] react with water, producing carbon dioxide. At elevated temperatures thi[s] reaction can be violent.
Incompatibility (Materials to Avoid): water, strong caustics, amines, som[e] metal compounds, alcohols. **Do not incinerate aerosol can.**
Hazardous Decomposition or Byproducts: Carbon dioxide, carbon monoxide, nitrous oxides, hydrogen cyanide, and isocyanurates.
Hazardous Polymerization Risk: Will not occur.
Conditions to Avoid: NA

SECTION VI Health Hazard Data

Route(s) of Entry; Symptoms and Treatment
Inhalation: Vapors of Polycel may contain trace levels of free isocyanates and propellent.
Persons sensitized to isocyanates may experience breathlessness, severe coughing, dyspnea, chest discomfort, nose and throat irritation and reduced pulmonary function. Inhalation of propellent at very high concentrations may cause lightheadedness, headache, giddiness, shortness of breath and may lead to narcosis, cardiac irregularities, unconsciousness and death. Treat symptomatically with vaso-dilators and oxygen.
Skin: Mixture is essentially non-irritating to skin. In a small population of persons Polycel may cause localized irritation and discoloration. Prolonged contact could produce reddening, swelling, or blistering and in some individuals, sensitization and dermatitis. Product adheres to skin like an adhesive. Remove contaminated clothing. Wash immediately with abrasive soap. Acetone or alcohol may also be helpful. After product cures it can only be removed mechanically. We recommend using an abrasive cleanser and a stiff vegetable brush.
Eyes: Liquid, vapors, or aerosol are irritating to the eyes. Corneal damage can occur; however, indications are that damage is reversible. Foam contact with the eyes can cause physical damage as well, due to the adhesive quality of the foam. If foam gets into eyes immediately flush with water for 15 minutes, holding eyelids apart. Consult physician immediately.
Ingestion: Ingestion of uncured foam can result in irritation and corrosive action in mouth and digestive tract. Uncured foam may possibly cure within the gastrointestinal tract and cause obstruction of free passage of food and air. **Do not ingest.** If swallowed, do not induce vomiting, contact physician. Obstruction of the GI tract may also occur if cured pieces of foam are swallowed. Cured foam is not considered toxic.

Medical Conditions Aggravated by Exposure: Chronic respiratory problems
Carcinogenicity: Components of this blend are not classified as carcinogenic by IRAC, NTP, or OSHA.

SECTION VII Precautions for Safe Handling and Use

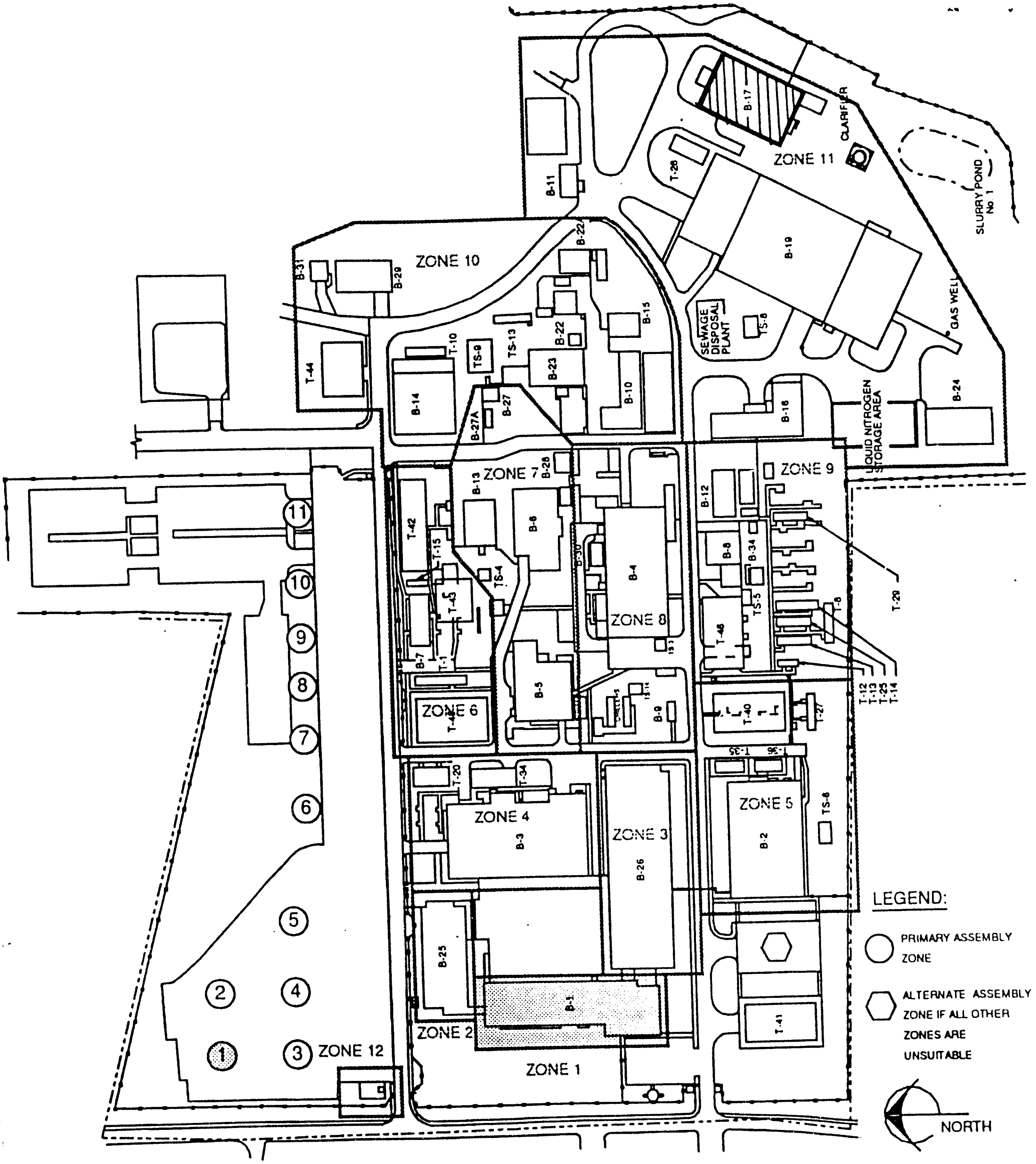
Steps To Be Taken In Case Material is Spilled or Released: Wear impervious gloves, safety glasses and appropriate work clothes. Cover with absorbent material (sawdust); place in open top container or plastic sheet. After curing, material can only be removed mechanically.
Waste Disposal Method: Use entire can of foam within 30 days of initial application. If excess product needs to be disposed of, vent can and dispense foam into a suitable waste container, allow to cure, and dispose of in a sanitary landfill in accordance with local, state and federal regulations. **Do not incinerate or puncture can.** Empty can completely before disposal.
Handling and Storage Precautions: Do not store near heat sources, sparks, or flame. STORE BETWEEN 40 degrees AND 120 degrees F. Do not freeze. DO NOT STORE IN CARS, CAR TRUNKS, OUTSIDE IN DIRECT SUNLIGHT ON HOT DAYS, OR IN ANY LOCATION WHERE TEMPERATURE MAY EXCEED 120 degrees F. CONTENTS UNDER PRESSURE HEAT MAY CAUSE UNCONTROLLED RELEASE OF MATERIAL OR EXPLOSION. If can is stored at temperatures less than 40 degrees F, contents may separate. Shake can vigorously to recombine.
KEEP OUT OF REACH OF CHILDREN.
Other Precautions: Do not ingest.
READ and understand all instructions before use. Avoid contact with skin as it is very difficult to remove.

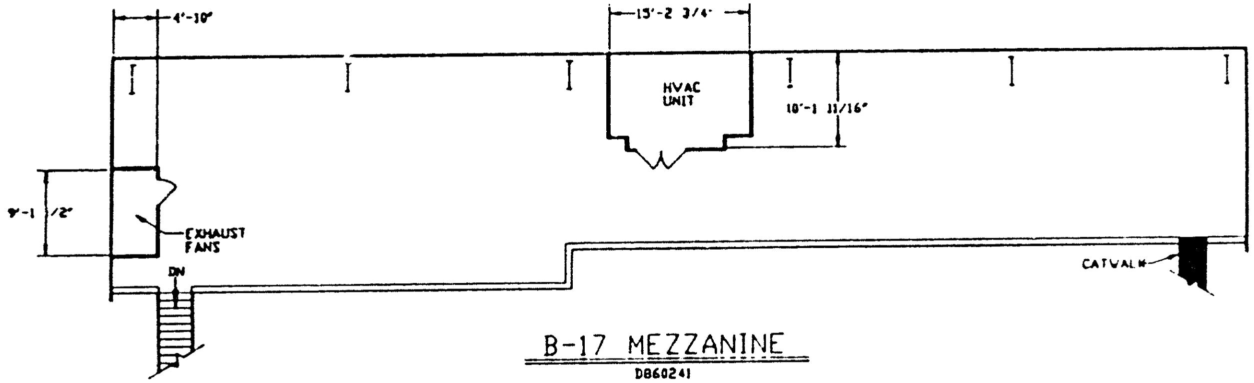
SECTION VIII Control Measures

Respiratory Protection: Adequate to maintain below TLV, mechanical exhaust is recommended. If respiratory protection is required, use an air purifying or positive pressure supplied air system or a self contained breathing apparatus. Use only in well ventilated areas.
Protective Gloves: USE CHEMICALLY RESISTANT RUBBER OR PLASTIC GLOVES! Product cures to a rigid solid within 30 minutes--this residue cannot be removed from skin without mechanical abrasion. Before foam cures it may be removed with acetone, paint thinner or similar solvent. It is imperative care is taken to prevent foam contact with skin!
Eye Protection: safety goggles or face shield
Hygienic Practices: Wash skin and hands after use.

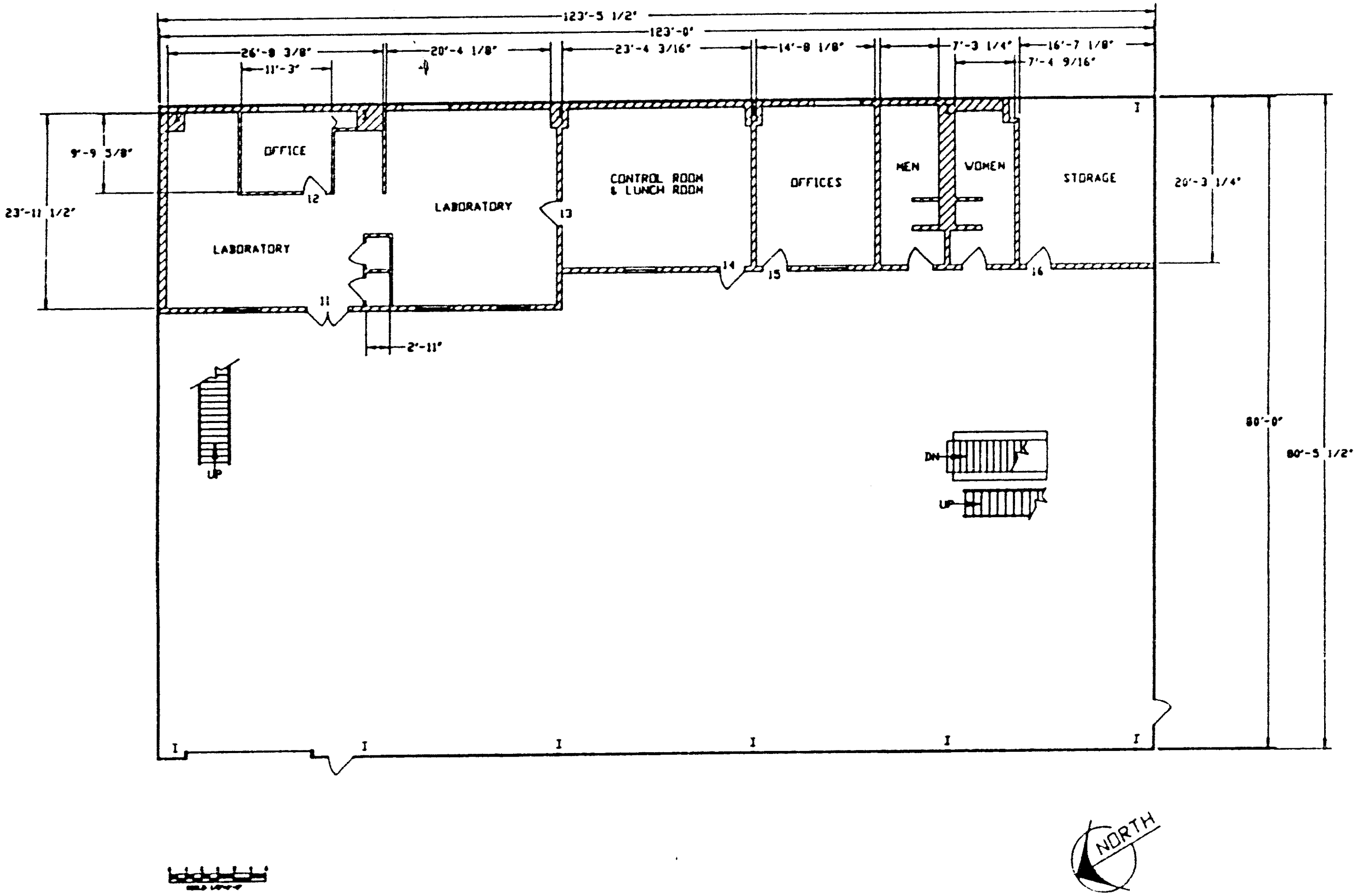
Section 6

Drawings

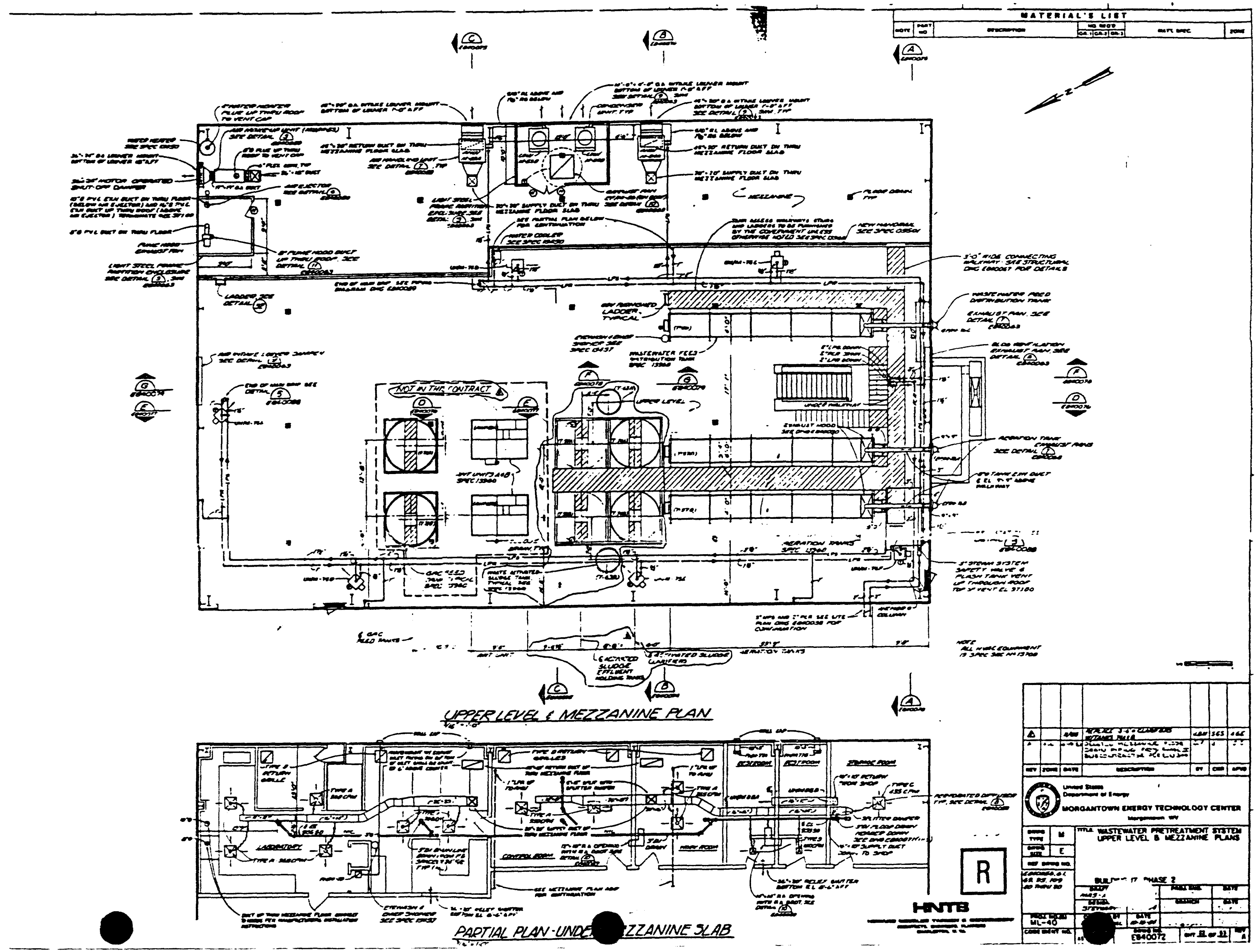

ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7
ZONE 8
ZONE 9
ZONE 10
ZONE 11
ZONE 12
CLARIFIER
SLURRY POND No. 1
GAS WELL
SEWAGE DISPOSAL PLANT
LIQUID NITROGEN STORAGE AREA
B-1
B-2
B-3
B-4
B-5
B-6
B-8
B-10
B-11
B-12
B-13
B-14
B-15
B-16
B-17
B-19
B-22
B-23
B-24
B-25
B-26
B-27
B-27A
B-28
B-29
B-31
B-34
T-10
T-12
T-13
T-14
T-20
T-25
T-27
T-29
T-34
T-35
T-36
T-40
T-41
T-42
T-44
T-46
TS-4
TS-5
TS-6
TS-8
TS-9
TS-13
LEGEND:
PRIMARY ASSEMBLY ZONE
ALTERNATE ASSEMBLY ZONE IF ALL OTHER ZONES ARE UNSUITABLE
NORTH

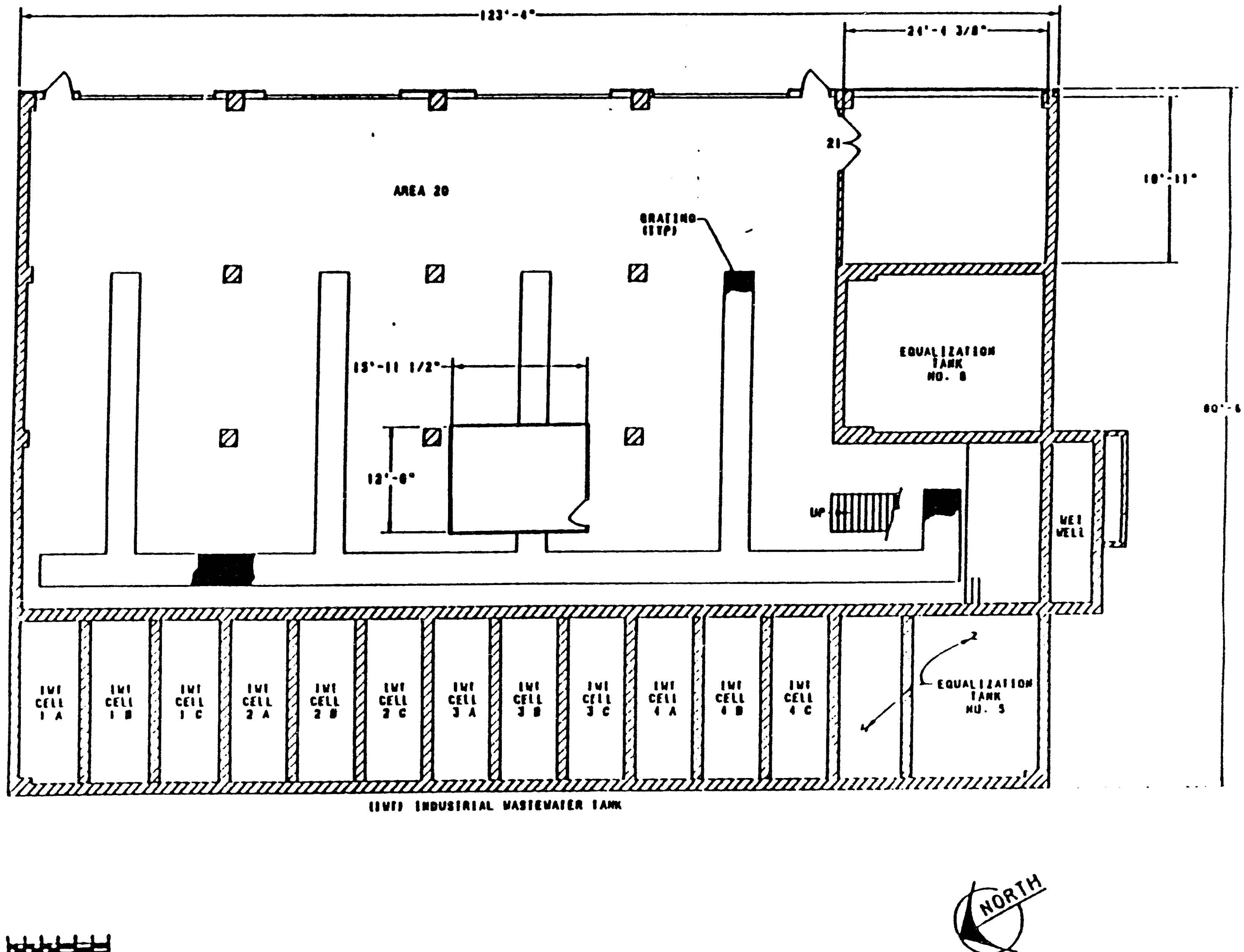


B-17 MEZZANINE
DB60241



B-17 FIRST FLOOR N VIEW
DB60241


MATERIAL'S LIST
UPPER LEVEL & MEZZANINE PLAN
PARTIAL PLAN - UNDE MEZZANINE SLAB
NOT IN THE CONTRACT
AERATION TANKS
NOTE ALL HVAC EQUIPMENT IS SPEC SEC No 15700
LABORATORY
CONTROL ROOM
HNTB
R
United States
Department of Energy
MORGANTOWN ENERGY TECHNOLOGY CENTER
Morgantown WV
TITLE WASTEWATER PRETREATMENT SYSTEM
UPPER LEVEL & MEZZANINE PLANS
BUILDING 17 PHASE 2
ML-40
E840072

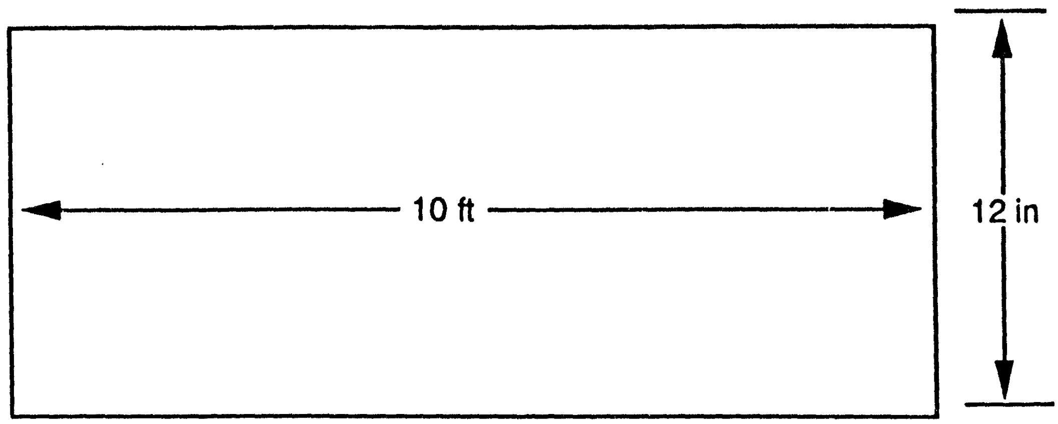


B-17 GROUND FLOOR PLAN VIEW

D840338

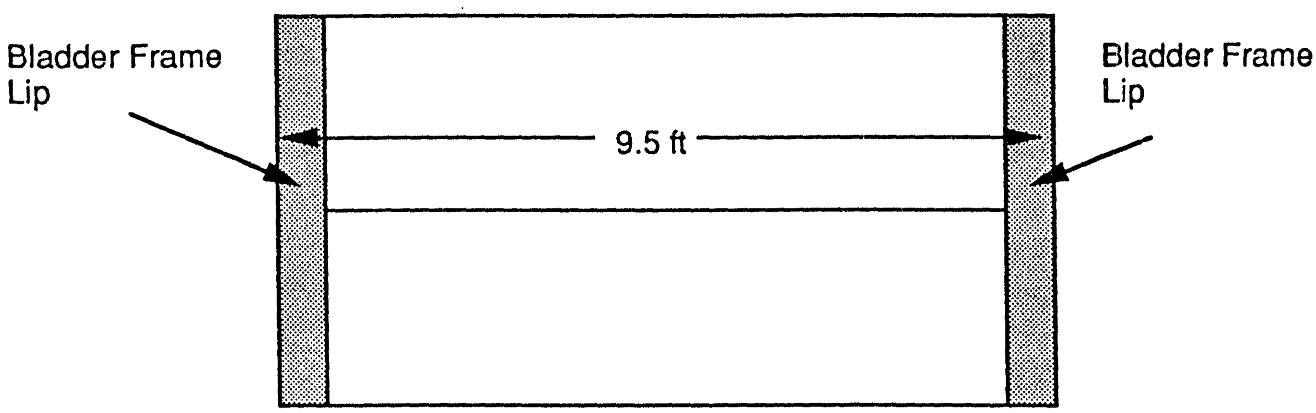
Assembly Drawing for Porous Media Vessel

Rubber Bladder



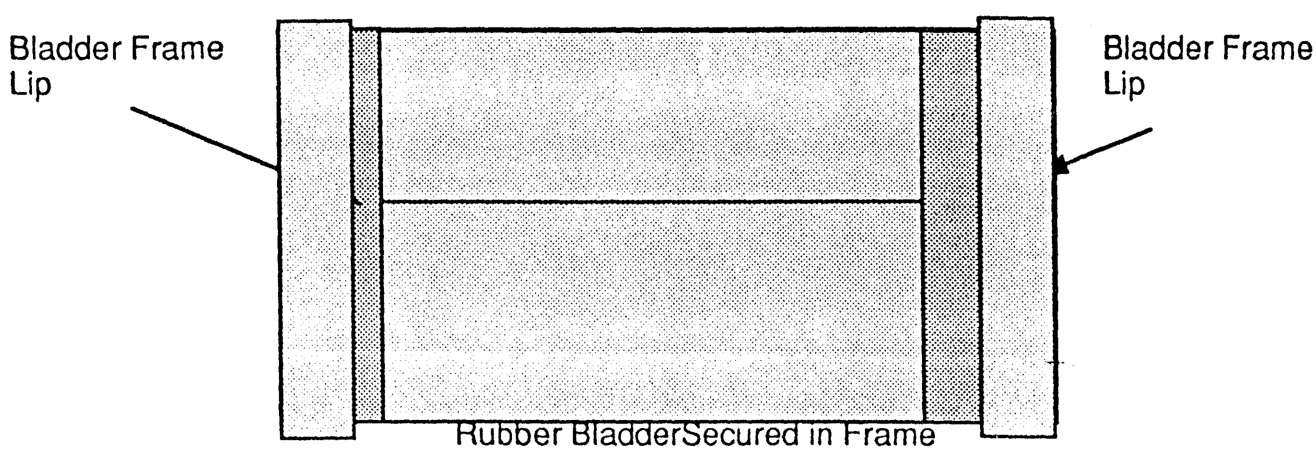
Bladder's diameter is slightly smaller than frames. Bladder is longer than frame. Ends of bladder are folded back on frame lips. Bladder enos are held in place by ring clamps.

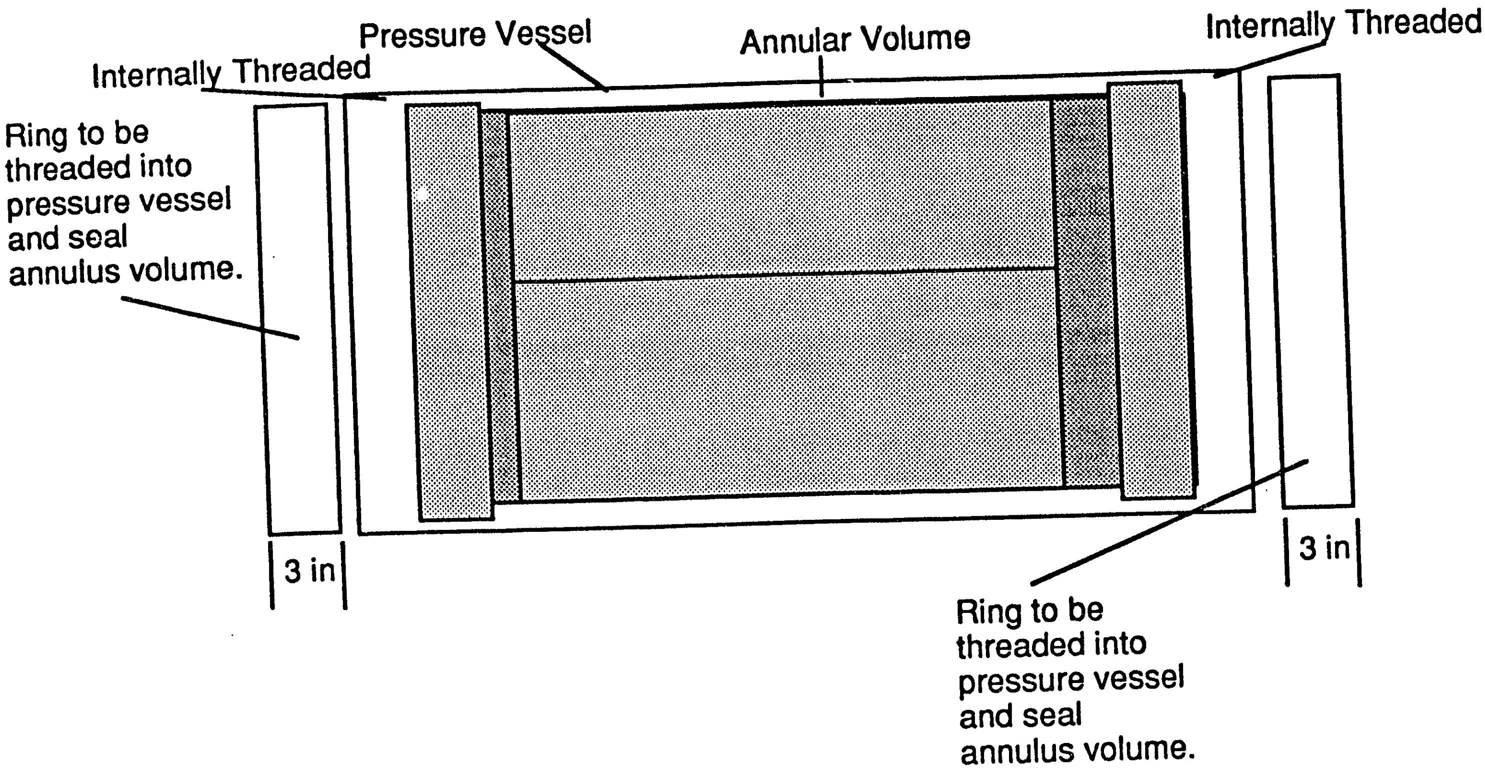
Bladder Frame



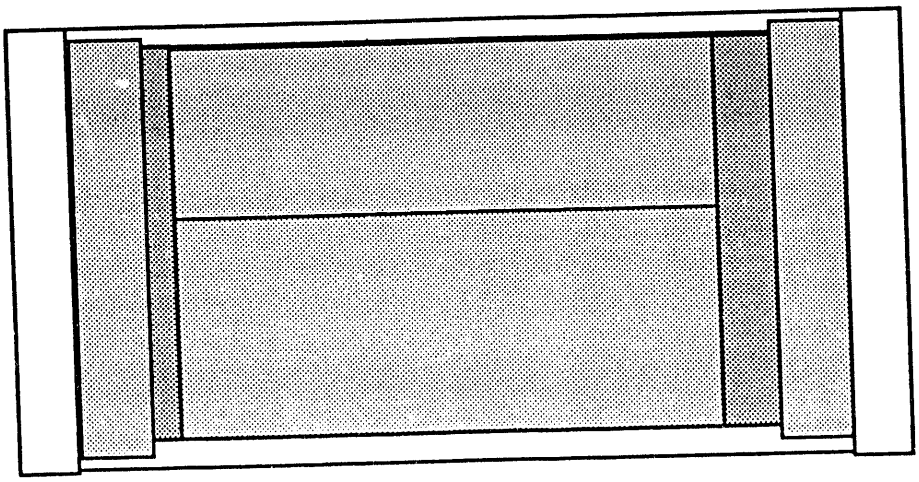
Bladder frame should be constructed from SS and be rigid enough that length and diameter remain constant. Frame sides are rigid pillars.

Bladder Frame

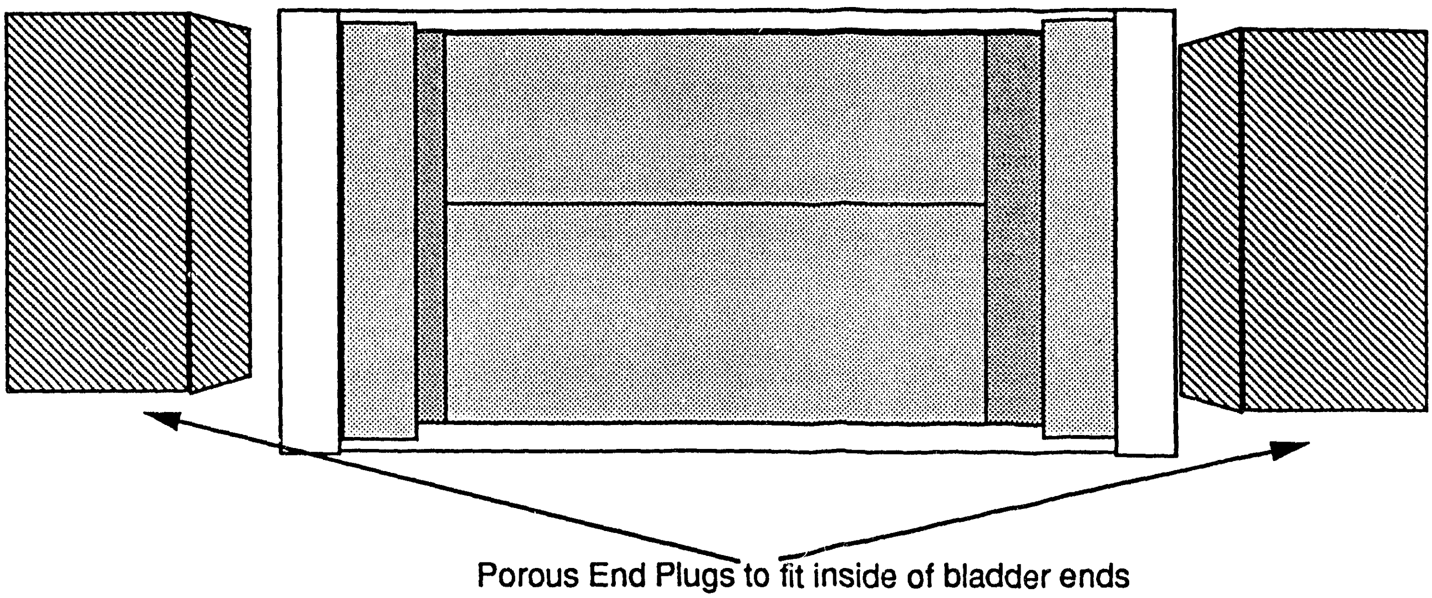


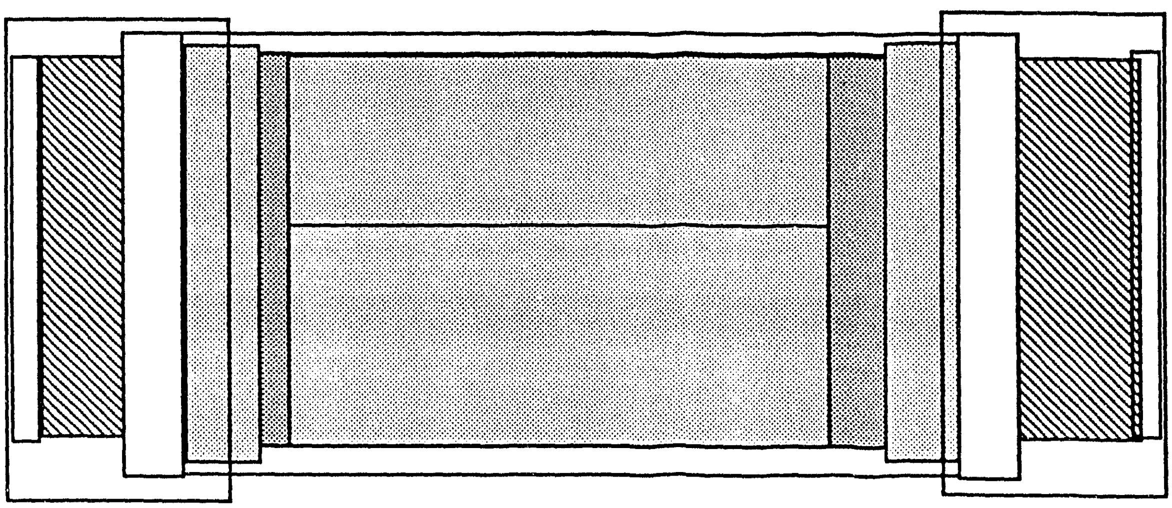


Bladder installed in frame, placed in pressure vessel and locked into place by rings.

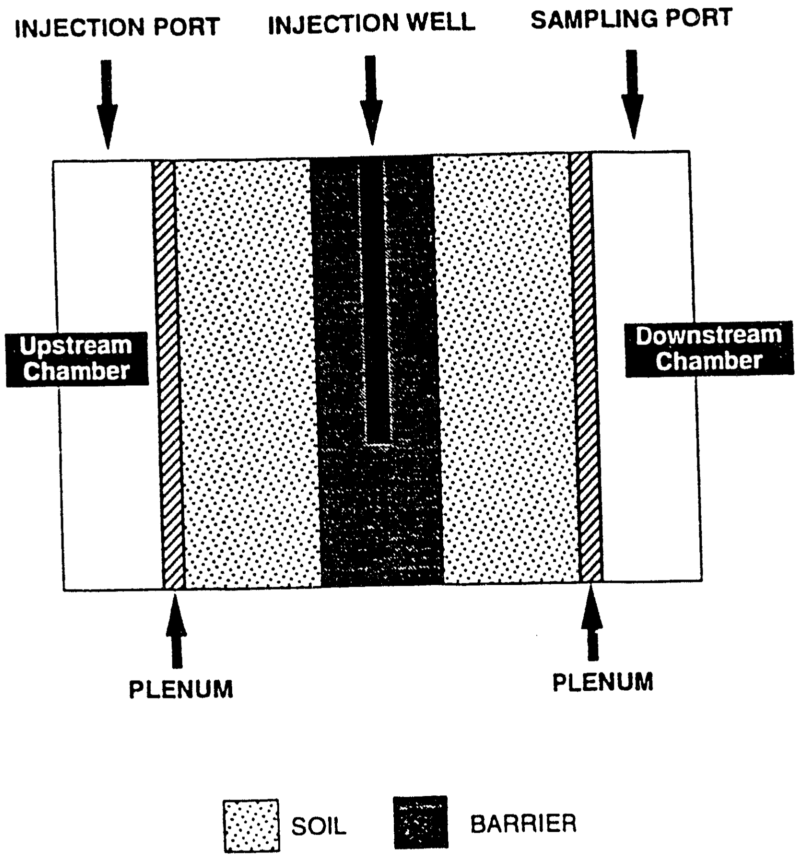


Bladder installed in frame, placed in rigid sleeve and locked into place by rings.



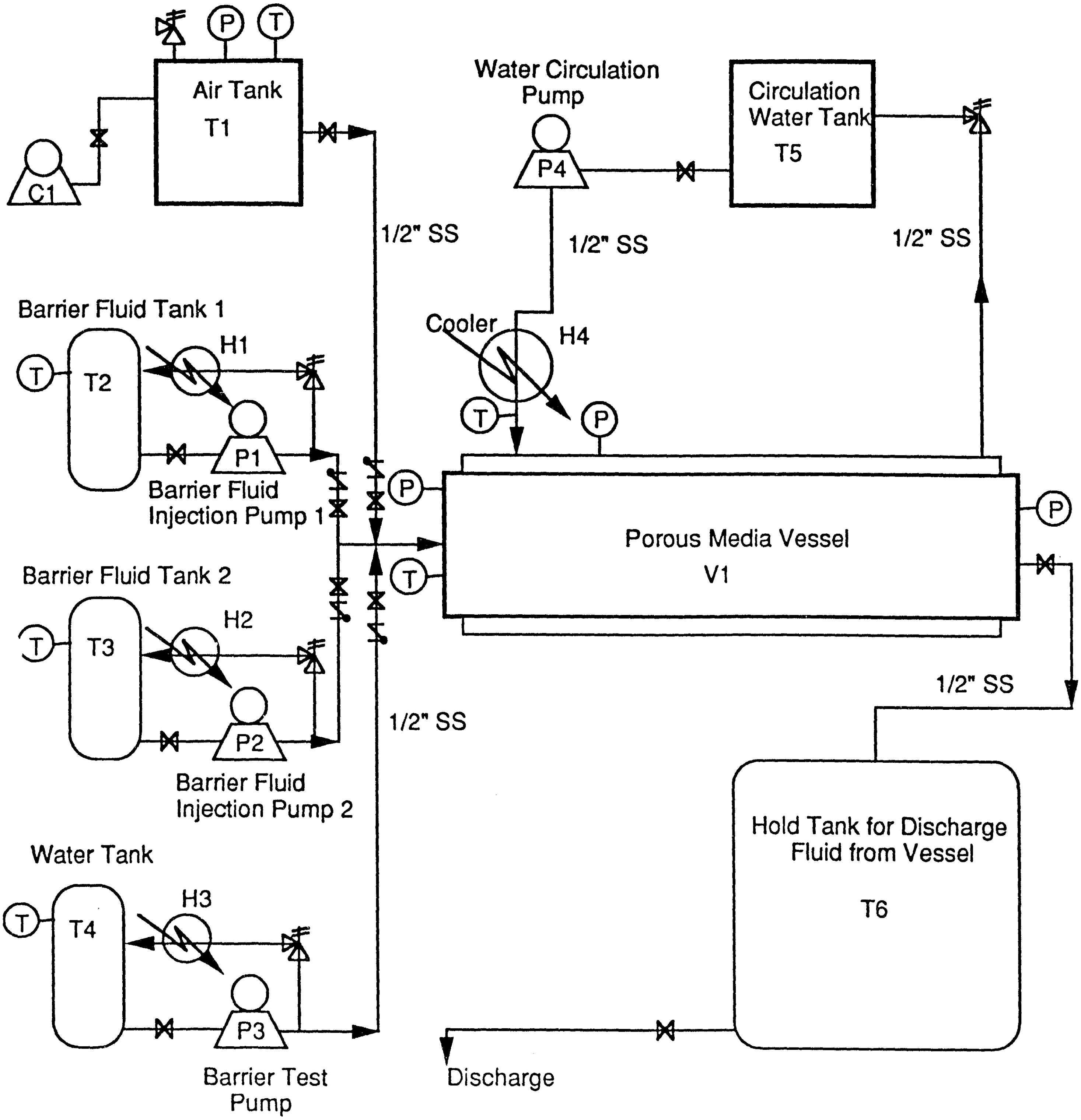


Porous End Plugs Inserteted and End Flange Caps IBolted On



Typical Scaled Model Test Apparatus To Be Employed in the B-17 Building.

Process Flow Drawing
Insitu Barrier Formation and Evaluation



DATE
FILMED
8/10/94

END