

THE AIR FORCE INSTALLATION RESTORATION PROGRAM:

PROGRESS AND PERSPECTIVE^a

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ABSTRACT

The Air Force Installation Restoration Program (IRP) has been underway since June of 1980 identifying, characterizing and cleaning up sites contaminated by hazardous wastes from past defense activities. Phase I, site identification has nearly been completed and almost 1500 sites have been identified on 160 bases and other installations in the U.S. and trust territories. Phase II site characterization, is well underway with field studies being carried out at dozens of bases. Phase III Technology Development is supporting applied R&D projects in air stripping groundwater, dioxin clean up, soil washing, in situ biological degradation, and other cleanup technologies. Phase IV, the implementation of remedial action is just being initiated. To effectively implement this phase the U.S. Air Force Engineering and Services Center, which is responsible for this phase, has entered into an Interagency Agreement with the U.S. Department of Energy (DOE). DOE will provide technical assistance through its Oak Ridge National Laboratory (ORNL) directly to the Air Force. This arrangement provides a rare opportunity for two agencies to mutually benefit through a cooperative work effort. DOE has only recently initiated its version of the IRP and is benefiting greatly from knowledge gained through the Air Force's five years of experience. The Air Force is benefiting from the vast technical resources of ORNL and DOE. This close working relationship has developed into broader technical and political cooperation in the hazardous waste area.

This paper describes the work effort, technical issues, technology development, progress and performance, and case studies and unique aspects of this cooperative effort for the Air Force's Phase IV IRP.

INTRODUCTION

The United States Air Force's defense mission is carried out at 160 Air Force bases (AFB) in the United States and its territories. Training and combat readiness missions require extensive support functions that result in bases being large industrial/residential complexes that generate many waste streams, some of which are hazardous. Hazardous wastes are generated by aircraft maintenance and overhaul, machine shops, metal plating shops, paint shops, grounds maintenance, training of fire fighters, accidents, and numerous other activities.

The greatest amount of industrial activity, and consequently the most environmental problems, occur at the five bases that are Air Logistics Centers (ALCs) operated by the Air Force Logistics Command: (1) the Sacramento Center at McClellan AFB in California, (2) the Ogden Center at Hill AFB in Utah, (3) the San Antonio Center at Kelly AFB in Texas, (4) the Warner-Robins Center at Robins AFB in Georgia, and (5) the Oklahoma Center at Tinker AFB in Oklahoma. The centers perform major aircraft maintenance and overhaul and have experienced

significant environmental problems. Each has a potential National Priority List (NPL) site and has been closely scrutinized by state and Environmental Protection Agency (EPA) regional regulators. Economic considerations complicate the base-regulator relationship, for each is the single largest employer in its state (with the exception of McClellan AFB) and provides over 30,000 jobs. Other major industrial complexes that generate hazardous wastes and consequently require cleanup include government-owned, company-operated plants that manufacture aircraft and research and development (R&D) facilities involved in new aircraft and weapon systems R&D. These facilities are critical to our national defense mission, and even minor disruptions of operations are considered unacceptable.

THE INSTALLATION RESTORATION PROGRAM

In 1980, the Department of Defense (DoD) established the Installation Restoration Program (IRP) to identify and evaluate the environmental problems at DoD facilities, to develop means for solving the problems, and to carry out environmental restorations as needed. Following

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the passage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, the IRP was designated the DoD CERCLA program. The IRP is carried out in four phases.

In Phase I, Installation Assessment, or records search, existing records of a base's past waste management activities are reviewed, present and former workers are interviewed, and sites which may require further action to evaluate their potential for environmental contamination are identified. Hazards are assessed using a methodology developed especially for DoD facilities, and the results guide the development of specific monitoring parameters and locations.

Phase II, Confirmation, is the actual sampling and analysis to confirm the presence and extent of contamination. The work done under phase II is tailored to each individual site according to the results from phase I. Typically, one installation will have several sites, each being comprised of a single locus of contamination or a few loci in close proximity.

Phase III, Technology Base Development, may be interpreted as the R&D required to solve the problems identified and evaluated in phases I and II. Phase III may be omitted from some IRP actions if the problems do not require technology development.

Phase IV, Implementation, involves the selection of the actual remedial action to be taken at a site and the undertaking and completion of that action. Phase IV consists of remedial action planning (Phase IVa) and implementation (final design and construction) (Phase IVb).

An IRP effort may terminate at any phase if there is justification that no further action is warranted. Less than half of the sites identified in phase I are expected to require remedial actions.

The Air Force IRP is managed by Major Commands (MAJCOMs) such as the Strategic Air Command (SAC) and the Tactical Air Command (TAC), which provide resources, develop priorities, coordinate with the implementing agents, and facilitate the acquisition of data. The implementing agents for MAJCOMs are the Air Force Engineering and Services Center at Tyndall AFB in Florida for phases I through IV and the Air Force Occupational Environmental Health Laboratory at Brooks AFB, Texas, for phase II. Prior to initiating phase IVb to clean up a contaminated site, the remedial action plan developed in phase IVa must be approved by the Air Force Installation Restoration Management (AFIRM) committee. This committee, which consists of MAJCOM representatives, the Adjutant General, and the Air Force Directorate of Engineering and Services, serves as the final judgment review that the proposed cleanup meets Air Force policy objectives, is based on sound engineering principles, is consistent with other approaches, and meets the requirements of applicable environmental laws and regulations.

DOE'S ROLE IN IRP

The Department of Energy (DOE) operates some 50 installations that generate hazardous wastes,

many of which are directly involved in the nation's defense effort. Under a Memorandum of Understanding (MOU) with the EPA, DOE practiced self-regulation with respect to hazardous waste management at its facilities operated under authority of the Atomic Energy Act. That MOU was voided by a federal court in May of 1984 and DOE found that it needed to adapt quickly to a new regulatory environment.^b Concurrently, the Air Force found itself in need of certain expertise that was available within DOE.

In July 1984, an Interagency Agreement (IAG) was established between DOE's Oak Ridge Operations and the Engineering Services Center at Tyndall AFB. The IAG provides mutual benefits. The major benefit to DOE is access to the Air Force's greater experience in managing hazardous wastes under external regulation and technology developed in response to its needs. By assisting the Air Force, DOE's scientists and engineers at Oak Ridge National Laboratory (ORNL) are gaining experience training in operations-level hazardous waste management. In return, the Air Force has access to an experienced pool of project managers and scientific experts who can manage its increasing load of environmental restoration projects without having to hire and train additional employees. The Air Force also has access to a large federal R&D enterprise which is addressing similar problems. For example ORNL is establishing a technology center for development of innovative methods for treatment and disposal of hazardous wastes. Existing laboratory facilities, shops, and even contaminated sites will be available for research, development, and demonstration projects. Both DOE and the Air Force are optimistic about the benefits to be gained through this agreement.

The remainder of this paper focuses on ORNL's role in the management of phase IVa of the IRP. The Hazardous Waste Program Support Contractor Office (SCO) has assembled a team of experienced project managers to oversee the preparation of Remedial Action Plans (RAPs) under phase IVa. The potential workload is large; over 1500 contaminated sites have been identified on 160 installations. As many as 400 separate remedial actions may be required, each of which must have an approved RAP. We anticipate a need for simultaneously preparing up to 50 RAPs in order to complete the cleanup job in a responsive manner. To accomplish this work load, subcontracts have been placed with eight firms which will prepare many of the RAPs. Each of six firms will be responsible for the Air Force installations in one region of the U.S. The regions were defined on the basis of roughly equivalent number of bases, and thus roughly equivalent potential work loads, and boundaries of standard federal regions. Each EPA Regional Office will be dealing with only one IRP phase IVa subcontractor. We believe this arrangement will improve communication and efficiency. The remaining two subcontractors will be available to assist with excess work loads or to replace subcontractors whose performance is unsatisfactory.

^bA more detailed discussion of DOE's hazardous waste issues was presented at this conference last year; see Eyman and Craig (1985) and McBryer and Jacobs (1985).

REMEDIAL ACTION PLANNING

The RAPs are the functional equivalent of the feasibility studies conducted under Superfund. Based on the information gained during the prior phases of IRP, the subcontractor will develop alternatives, including the "no action" alternative, for cleanup at contaminated sites. These alternatives will then be evaluated on the basis of total cost to the Air Force, technological feasibility, and effectiveness in obtaining the desired level of cleanup. An environmental impact analysis will be conducted for each alternative considered, and community relations support to the affected base will be provided. Depending on the nature of the problems being addressed, the wishes of the base commander, and the community relations resources available at the base, this support may range from preparing supporting technical information to coordinating full community involvement in scoping the effort and evaluating alternatives.

A recommended alternative will be identified based on its ability to achieve the desired level of cleanup in the most cost-effective manner. The recommended alternative will then be presented to the MAJCOM with responsibility for the base, along with the rationale for selecting the alternative, the alternatives rejected, and the rationale for rejecting other alternatives. The MAJCOM will make the final selection of the alternative. The alternative will then be reviewed by the AFIRM committee for efficacy and adherence to Air Force policy. Once approved, the RAP will be returned to the major command or base commander, who will contract for the actual cleanup.

ISSUES AND CHALLENGES

Remedial action planning must deal with a wide range of contaminants of varying toxicity in diverse environments. Consequently, broad technical expertise must be available. ORNL, the SCO, and its contractors have a large force of chemists, hydrogeologists, engineers, biologists, economists, planners, community relations specialists, and others who can cope with any contingency that might arise. If the required expertise is still not available within these organizations, the resources located at any of the other DOE facilities across the nation could be quickly mobilized.

The number of sites requiring remedial actions will not be known until phase II is complete. Current estimates are that the number will be greater than 1500, of which 1 to 2 dozen will be placed on the NPL. The Air Force is aggressively dealing with these sites, including requesting funding through line-item appropriations. Current budget requests total \$135 million annually.

The unresolved needs of the IRP are similar to those of DOE and the chemical industry. Development of insitu technologies for waste treatment or stabilization could significantly improve cleanup and reduce costs. They could also prevent CERCLA wastes from becoming new Resource Conservation and Recovery Act wastes and possibly requiring additional cleanup in the future. Finally, the development of accepted cleanup standards could simplify remedial action planning and increase cost effectiveness.

EXAMPLE STUDIES

Three of the first tasks to be initiated under the IRP are discussed below.

Massachusetts Military Reservation

The Massachusetts Military Reservation (MMR) on Cape Cod is located approximately seven miles northeast of Falmouth. The reservation, which was formerly Otis Air Force Base, is now the home of the Air National Guard's 102nd Fighter Interceptor Wing; the U.S. Coast Guard Air Station; a U.S. Coast Guard Communications Station; the Army National Guard Camp Edwards Training Installation; the U.S. Air Force PAVE PAWS facility; and a Veterans Administration national cemetery. The complex occupies an area of approximately 20,480 acres on the west end of Cape Cod between the towns of Falmouth, Bourne, Sandwich, and Mashpee.

The current task proposal will support a comprehensive IRP approach at the MMR to identify, evaluate, and, where necessary, remediate past hazardous waste disposal sites.

The impact of the potential hazardous waste sites on each organization's portion of the reservation may cross organizational boundaries, or act in concert rather than independently. Therefore, the IRP will be conducted for the entire MMR as a single installation to the extent practicable. To this end, the National Guard Bureau has designated the Otis ANGB as the lead coordinating agency in the remediation process, having procured written consent to the collective IRP approach from each of the resident organizations. This includes the U.S. Coast Guard facilities which are under the direction of the U.S. Department of Transportation rather than DoD.

Potential hazardous waste sites to be addressed by this effort include both current and former fire training facilities, the reservation landfill, aviation fuel pumping and transport facilities, fuel storage areas, aircraft and ground transportation maintenance areas, and equipment testing and personnel training facilities. The program will also include an evaluation of the Reservation Sewage Treatment Facility as a potential conduit for hazardous waste to the off-reservation environment. There is a known plume of organic contaminants immediately down-gradient of the sewage treatment facility, just outside of the base boundary. If this plume is determined to have been generated by a resident of the MMR, the IRP will be extended to the off-reservation area affected and appropriate remedial measures taken.

Eglin Air Force Base

Eglin Air Force Base is located approximately two miles southeast of Valparaiso and seven miles northeast of Fort Walton Beach, FL. The Air Force Systems Command Installation is the present home of the Air Force Armament Division, the Air Force Armament Laboratory, the 3246th Test Wing, the 39th Aerospace Rescue and Recovery Wing, the 55th Aerospace Rescue and Squadron, the 33rd Tactical Fighter Wing, the TAC Air Warfare Center, the 1972nd Communications Squadron, the 728th Tactical Control Squadron, and the 919th Special Operations Group. The base covers approximately 465,000 acres.

This project involves consolidation, repackaging, and removal of depleted-uranium-contaminated sand from Eglin AFB to an approved radioactive waste disposal facility. The sand was used as a berm containment for armor piercing shells on the facility's test ranges. The bulk of the depleted uranium fragments are periodically removed from the soil, but residual contamination has resulted from the abrasion of the shells on impact with the sand berm. Consequently, the sand in the berms must be collected and replaced with some regularity.

The installation has an NRC-imposed limit on the total volume of this material that can be stored on the base at any given time. As the total volume of stored waste is nearing that limit, the material volume will have to be reduced by consolidation and/or removal to an appropriate permanent repository or the base will have to curtail operations.

In addition to providing technical support for the remediation effort, ORNL has proposed a method of consolidating or concentrating the contaminated soil to minimize the waste volume. This process will be suitable for use on the existing, as well as future, wastes prior to shipment to suitable long-term storage sites. In conjunction with waste volume reduction R&D effort, procurement activities have been initiated on the \$1,400,000 (estimated) remediation contract.

Robins Air Force Base

Robins Air Force Base is located in central Georgia, approximately 90 miles southeast of Atlanta and 18 miles south of Macon. The installation a Logistics Command facility and includes the Headquarters (HQ) - Warner Robins ALC, HQ - Air Force Reserve, the 2853rd Air Base Group, the 19th Bomb Wing, the 5th Combat Communications Group, the 3503rd Recruiting Group, and the 1926th Communication Squadron. The installation occupies approximately 8900 acres.

The first RAP for the base will address the old Landfill No. 4 and an adjacent sludge lagoon. These two areas were in active operation from approximately 1965 to 1978 and 1962 to 1978, respectively, during which the landfill received a variety of general refuse, garbage, and industrial wastes. The sludge lagoon received approximately 130,000 gal of industrial liquid wastes per month plus approximately 104,000 gal of grease and solvents. Both of these areas have been covered with approximately 0 to 4 ft of clayey and silty sands. The proposed study includes provisions for taking 25 to 30 new soil borings in the area to assess the level of contamination and the threat to both the on- and off-base environments. Present plans call for samples to be taken, split, and analyzed at 3-ft increments of boring depth.

The project is currently funded at approximately \$6,700,000 through completion of the remediation efforts. It is anticipated that this amount will not be sufficient to complete the task (see the following table).

Status of Cleanup			
IRP Phase	Number of Sites	Number Initiated	Number Completed
IRP Status Summary			
I	2061	1850	-1800
II	>1200	-600	151
III	12	12	0
IV	~1200	176	12
DOE Status Summary			
I	>500	-500	0
II	>300	>20	0
III	-20	-5	0
IV	-360	-2	0

CONCLUSIONS

There is much to be done to clean up sites on federal facilities contaminated with hazardous wastes. The Air Force and DOE combined have most of the problems. Each has a multibillion-dollar cleanup effort ahead which dwarfs that of other agencies (except the Army). These two agencies have embarked on a novel experiment of interagency cooperation and pooling of scarce resources. Public scrutiny and political pressure require fast, efficient, and effective cleanup. Through cooperation, a definite advantage is seen for both. The agencies are each benefitting and positive results are already beginning to appear. Sites are moving quickly through the planning to the implementation stage.

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