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PROJECT SUMMARY FULL SCALE INCINERATOR FIELD TRIAL FOR HERBICIDE ORANGE AND DIOXIN CONTAMINATED SITES NCBC GULFPORT MS

5/1/1987

U S AIR FORCE

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PROJECT SUMMARY

FULL SCALE INCINERATOR FIELD TRIAL

HERBICIDE ORANGE/DIOXIN CONTAMINATED SITE

NAVAL CONSTRUCTION BATTALION CENTER, GULFPORT, MISSISSIPPI

INTRODUCTION

Historical Background

The Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi was used as a storage and transshipment facility for Herbicide Orange earmarked for delivery to Viet Nam. The storage facility was active from 1968 through 1970. Following a 1971 EPA ban on the use of herbicides containing trichlorophenoxyacetic acid (2,4,5-T), remaining U.S. stocks of Herbicide Orange were delivered to NCBC for storage pending ultimate disposal. The drummed Herbicide Orange remained in storage until 1977 when it was dedrummed, transferred to the incinerator ship Vulcanus, and subsequently destroyed by incineration in the central Pacific Ocean. Herbicide Orange is composed of a 50: 50 mixture of the N-butyl esters of 2,4,5-trichlorophenoxyacetic acid and 2,4,-dichlorophenoxyacetic acid. The trace level contaminant 2,3,7,8-tetrachlorodibenzo-p-dioxin was present in Herbicide Orange at an average concentration of 2.0 parts per million.

Following the disposal of the NCBC Herbicide Orange stocks, the Air Force Occupational and Environmental Health Laboratory (OEHL) and the Air Force Engineering and Services Center (AFESC) conducted preliminary studies to document the levels of Herbicide Orange and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) present in NCBC soils as a result of leakage or spills that occurred during shipment or storage. Results of the preliminary studies indicated that Herbicide Orange components 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) were present in the soil at concentrations ranging from a few parts per billion (ug/kg) to over 200,000 parts per million (mg/kg). The TCDD, a trace contaminant in Herbicide Orange, was present a concentrations ranging from a few parts per trillion (ng/kg) to 500 parts per billion.

Based on the preliminary findings, the Deputy Secretary of the Air Force for Environment and Safety (SAF/MIQ) directed that a research program be established to :

a. Comprehensively determine the levels of soil contamination at NCBC.

b. Determine if the contaminants degrade naturally.

c. Develop or identify technologies that could be employed to return the site to full and beneficial use.

Headquarters Air Force Engineering and Services Center (HQ AFESC) at Tyndall AFB, Florida was tasked with conducting the research program.

SITE CHARACTERIZATION

Site Description

The Naval Construction Battalion Center is located within the city of Gulfport, Mississippi (figures 1 and 2). The former Herbicide Orange storage site is located in the center of the Navy facility. The soil at the site is a sandy-loam intermixed with some clay deposits. The top 8-10 inches of the soil was stabilized with Portland cement in 1956 to provide a hardened parking area for heavy equipment. Since the site was stabilized, various overburden, such as oyster shell, pea gravel, asphalt, and road oil, have been placed on the site. Drainage of surface water from the site is handled by a series of drainage ditches or swales. In 1979 the Air Force installed a series of sedimentation basins and fabric filters to remove soil particles from the surface water draining from the site. The drainage flows west and then north, entering natural waters (Turkey Creek) approximately 3 miles north of the Navy Facility.

Natural Degradation/Soil Mapping

AFESC conducted a series of studies that demonstrated that 2,4-D and 2,4,5-T degraded naturally in NCBC soil. The study indicated that approximately 60 to 80 percent of the two herbicides were degraded in a 3 year period. However, the study indicated that TCDD did not degrade in the environment.

To accomplish the task of "mapping" the contaminated soil at NCBC, HQ AFESC contracted with the Idaho National Engineering Laboratory (DOE), operated by EG&G Idaho, to conduct the mapping activity. EG&G completed the study in 1985. These data indicate that TCDD is present in surface soils at concentrations averaging 14.3 ppb (based on 1639 samples) with a range of less than 0.1 ppb to 500 ppb (figure 3). Profiles of the NCBC site indicate that most of the contamination in contained in the top 12 inches of soil. Trace levels of TCDD were detected at a maximum depth of 3 feet. Based on the surface and profile data there are an estimated 11,000 cubic yards of soil containing TCDD contamination in excess of 1 part per billion.

RESEARCH PROGRAM

Pilot Scale Technology Demonstrations

In 1985 HQ AFESC contracted with the Idaho National Engineering Laboratory (INEL) to demonstrate innovative remedial action technologies at the NCBC site. INEL subcontracted with the J.M Huber Corp., Borger, Texas and the International Technologies Corp.,Knoxville, Tennessee to demonstrate pilot scale technologies. J.M. Huber proposed an Advanced Electric Reactor (AER) and International Technologies proposed a Thermal Desorption/U.V. destruction (TD/UV) system. Both technologies were permitted under The Toxic Substances Control Act (TOSCA) and demonstrated at NCBC during the summer of 1985. Both the AER and TD/UV systems met the project goal of reducing the TCDD contamination in contaminated soil to levels less than 1 part per billion (ug/kg). A second trial of the TD/UV system, permitted under the Resource Conservation and Recovery Act (RCRA), was conducted on Johnston Atoll during the summer of 1986.

Full-Scale Rotary-Kiln Incinerator Field Trial

The Air Force contracted with the Idaho National Engineering Laboratory (DOE), operated by EG&G Idaho, to field demonstrate innovative site restoration technologies. As part of this research program EG&G has contracted with the ENSCO Corp. to conduct a full scale demonstration of a modular, transportable rotary-kiln incinerator at the Naval facility. The original field trial plans called for a heavily documented verification test burn followed by a 90 to 150 day period of operations to determine the reliability, maintainability, and cost associated with operation of the rotary-kiln incinerator. Based on the planned operations, 9,000 to 11,000 cubic yards of soil were to be treated.
A final Resource Conservation and Recovery Act (RCRA) Research/Development/Demonstration Permit was awarded to the Air Force on 2 July, 1986. The ENSCO modular incinerator was delivered to the Naval Construction Battalion Center on 17 September, 1986. The heavily validated verification test burn was completed on 16 Dec 86. Results of the December 86 test indicated that the unit was capable of reducing the concentrations of TCDD in native contaminated soil from approximately 60 parts per billion (ppb) to levels at or below 1.0 parts per trillion (ng/kg). Although no TCDD was detected in the stack gas samples collected during the five verification tests ,Destruction and Removal Efficiencies (DRE) could not be demonstrated at 99.9999 (6x9s) percent or greater due to the low concentrations of TCDD in the soil feed stock. During the verification tests at NCBC two of the five test runs demonstrated a 6x9s DRE for the herbicide 2,4,5-T which was present as a principal organic hazardous constituent (POHC) in the soil feed stock. A third test demonstrated a 99.9998 percent DRE. The tests demonstrating the 99.9999 percent DRE were performed at 3.7 ton/hr and 6.3 ton/hr feed rates. 2,4,5-T is ranked as more difficult to destroy than TCDD based on EPA's heat of combustion ranking system.

On 26 Feb 87 EPA, Region 4 notified the HQ AFESC/RDVW that the full scale field trial at NCBC could not proceed until a 6x9s DRE test burn (RCRA) was conducted using dioxin surrogate materials. The EPA decision was based on a failure of a similar incinerator, owned by ENSCO , to successfully pass a 6x9s DRE test using a surrogate for dioxin. The failed test, which was conducted in Eldorado, Arkansas, included 18 test runs using 3 dioxin surrogates. All the tests were conducted at very high surrogate feed rates. Chlorine content , measured in the feed was in excess of 30 percent. Nine of the eighteen runs demonstrated over 6x9s DRE. The balance of the runs demonstrated at least 5x9s and a fraction. The failure of the unit to pass all test runs has been attributed to a very high chlorine feed rate and analytical problems with the stack-gas samples.
To comply with the EPA region 4 requirement for a RCRA trial burn, HQ AFESC and contractors prepared a formal trial burn plan. The RCRA trial burn, employing the dioxin surrogates hexachloroethane and 1,2,4-trichlorobenzene, was completed on 16 May, 1987. A final report on the RCRA trial burn was submitted to EPA, region 4 on 23 July 87. The report concluded that the ENSCO incinerator is capable of achieving a 99.99997 percent or greater DRE while treating chemicals rated as more difficult to destroy than TCDD. No dioxin surrogate was detected in the stack gas, treated soil or scrubber water.

CURRENT STATUS

EPA, Region 4 has reviewed the surrogate trial burn report and forwarded comments to AFESC for resolution. Air Force contractors are currently addressing these comments and preparing an official response. Some of the comments required a substantial effort to gather technical information necessary for response preparation.

Beginning on 29 August, 1987 a clean soil test will be conducted to prepare the incinerator for full scale operations. Additional studies will be conducted to optimize the soil excavation protocol.

SCHEDULE

The date for commencement of routine operations is uncertain as it is dependent on the EPA review of the Air Force's response to comments. Tentatively operations should begin within the next two to three weeks.

RECOMMENDATION: None. For information only.

ACTION OFFICE: HQ AFESC/RDVW, Tyndall AFB FL/Maj Stoddart AUTOVON 523-2942 (Gulfport MS Field Office tele: 601-864-4139)

AUTHENTICATION: Terry L. Stoddart

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DATE: 27 August, 1987

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ROTARY KILN INCINERATOR FIELD TRIAL
NCBC, GULFPORT, MS

PROBLEM

Herbicide Orange Contamination at NCBC
- spilled during storage
- 11,000 cubic yards contaminated
- Navy unable to use 18 acre site

AFESC/RDVW directed to conduct research program
- -Comprehensively determine the levels of soil contamination at NCBC.
- -Determine if the contaminants degrade naturally.
- -Develop or identify technologies that could be employed to return the site to full and beneficial use.

PROJECT SUMMARY

AFESC/RDV contracts for full scale incinerator field trial
- -EG&G Idaho prime contractor
  - --Idaho National Engineering Laboratory (DOE)
  - --ENSCO subcontractor
    - ---Incinerator manufacturer/operator

Equipment arrives NCBC, Sept 86

Verification trial burn successfully completed Dec 86
- No dioxin detected in treated soil

EPA states requirement for second test burn
- Failure of sister unit during Arkansas test
- Legal requirements (RCRA)

Test burn plan completed April 87
- Comprehensive document required by RCRA regulations
  - --Approved by EPA

Second test successfully completed May 87

- -Test burn report submitted to EPA 23 July 87
  - --EPA provides comments on test report 20 Aug 87
  - --Air Force Contractors prepare response to EPA comments
    - ---Response to be submitted to EPA 4 Sept 87

STATUS

Project on hold
-AF response to EPA questions
--Final EPA approval

Readiness review with all contractors scheduled; 4 Sept 87

Tentative start date; 9 September 87
--soil excavation will precede incinerator start

RECOMMENDATION: None. For information only.

ACTION OFFICE: HQ AFESC/RDVW, Tyndall AFB FL/Maj Stoddart
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