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ADDENDUM TO THE RESOURCE CONSERVATION AND RECOVERY ACT RESEARCH,
DEVELOPMENT AND DEMONSTRATION PERMIT APPLICATION FULL-SCALE
INCINERATION FIELD DEMONSTRATION NCBC GULFPORT MS
4/3/1986
TYNDALL AIR FORCE BASE

39501-SITE 8 INCINERATION
09.02.08.0002

ADDENDUM TO RCRA RD&D PERMIT APPLICATION:
FULL-SCALE INCINERATION FIELD DEMONSTRATION
Naval Construction Battalion Center
Gulfport, Mississippi

PROPOSAL TO CONDUCT CHEMICAL TREATMENT TESTS

Jointly sponsored by
Air Force Engineering and Services Center
Tyndall Air Force Base, Florida

and

U.S. Environmental Protection Agency
Hazardous Waste Environmental Research Laboratory
Cincinnati, Ohio

April 3, 1986

ADDENDUM TO RD&D PERMIT APPLICATION

The U. S. Air Force, Engineering and Services Center (USAF ESC), is proposing to conduct a full-scale Research, Development, and Demonstration (RD&D) project at the Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi. In order to conduct this demonstration, a RD&D permit is being sought from EPA Region IV. The technology to be demonstrated is incineration in a multi-unit transportable waste incineration system to demonstrate the destruction of dioxin and dibenzofurans in soil.

In conjunction with the above demonstration, the USAF ESC and EPA, Hazardous Waste Environmental Research Laboratory, are proposing to jointly sponsor three tests of chemical treatment methods for chlorinated dioxin-contaminated soil. These tests are proposed to take place at the Herbicide Orange site at NCBC at the same time the full-scale demonstration takes place in order to have the following advantages:

1. The NCBC site has been characterized for vertical and horizontal dioxin contamination through a soil sampling and analysis program.
2. Prior to operation of the full-scale demonstration, the incinerator feedstock (soil) will have been characterized for Appendix VIII constituents.
3. The full-scale demonstration will have carefully controlled soil excavation/handling capabilities. (The proposed tests will require a total of about 12 yd³ of soil.)
4. The tests will have benefit of the full-scale demonstration's contingency plans, sampling and analysis plans, and environmental protection, as well as being contained within the special controls attached to the full-scale demonstration.
5. Soil and materials used in the proposed tests will have the additional benefit of incineration in the full-scale demonstration. Therefore, none of the materials involved will leave the site.

Benefits to be derived from conducting the three tests are as follows:

1. Comparisons can be made of the decontamination efficiency and economics of thermal and chemical treatment of soil contaminated with chlorinated dioxins.
2. Comparisons can be made of the decontamination efficiency of slurry and in place chemical treatments.
3. The efficiency of chemical reagents to decontaminate surfaces can be tested.

A description of the three proposed tests is provided as Attachment 1. The tests will be conducted by an EPA contractor, Galson Research Corporation.

Contacts for the proposed tests are also provided in Attachment 1.

ADDENDUM TO RCRA RD&D PERMIT APPLICATION

for

FULL SCALE ROTARY KILN FIELD TEST
NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

Jointly sponsored study by

Air Force Engineering and Services Center
Tyndall AFB, Florida

and

U.S. Environmental Protection Agency
Hazardous Waste Environmental Research Laboratory
Cincinnati, Ohio

PURPOSE:

To test chemical treatment methods for soils contaminated with chlorinated dioxins.

BENEFITS OF RESEARCH:

- Compare decontamination efficiency and economics of thermal and chemical treatment of soils contaminated with chlorinated dioxins.
- Compare decontamination efficiency of slurry and in place chemical treatments.
- Test chemical reagents capability to decontaminate surfaces.

PROPOSED TESTS:

Three tests are proposed. AFESC and EPA are interested in conducting any one, or all of these tests. We estimate all three tests could be accomplished with 12 cubic yards of soil. All tests will be conducted at the former Herbicide Orange storage site at the Naval Construction Battalion Center (NCBC), Gulfport, Mississippi. Chemical treatment tests will be held in conjunction with the thermal treatment tests.

Chemical Reagent: Treatment will be achieved with the reagent KOH/PEG/DMSO. This reagent consists of equal parts 50% potassium hydroxide in water (KOH), polyethylene glycol (PEG) and dimethyl

sulfoxide (DMSO). Treatment is achieved by the replacement of chlorine atoms from the chlorinated dioxin molecule with a glycol chain. Laboratory scale tests by Galson Research Corporation on spiked soils from NCBC showed reductions of 1,2,3,4 -tetrachloro-dibenzo-p-dioxin from over 2000 parts per billion (ppb) to less than one ppb. Ames tests performed by Research Triangle Institute showed that the dioxin-glycol complex is nonmutagenic. The other product of the reaction is the salt potassium chloride. Dimethyl sulfoxide acts as a solvent and catalyst for the reaction.

Test 1. Slurry Process: Feed stock for the incinerator will be used for a slurry test of the chemical treatment. Three tests will be conducted, each in a 55-gallon drum. About 100 lbs of soil will be treated in each drum (about 0.1 cubic yards of soil, total) by an equal amount of reagent. The reagent used in the first slurry test will be recovered and used in the second and third tests. A total of about 20 gallons of reagent will be used. Barrels will be heated to 150°C, and the treatment will last 1 to 8 hours. Water vapor from the drums will be vented to a drum filter containing activated carbon. Following treatment, the soil will be rinsed with water, and sampled for laboratory analyses. All remaining wastes (treated soil, wash water, etc.) will be disposed of in the incinerator.

Test 2. In Place Treatment: A 10 ft x 10 ft plot of soil contaminated with chlorinated dioxin will be identified and isolated with a temporary wooden barrier. The loose soil above the cement stabilized soil (hardpan) will be treated with the KOH/PEG/DMSO reagent in a ratio of soil to reagent of 5:1. For example, if 3 inches of soil is present on top of the hardpan, the amount of soil treated would be 10'x10'x0.25' = 25 cubic feet. Assuming the specific weight of soil is twice that of the reagent, 10 cubic feet or 75 gallons of reagent would be used. The reagent would be worked into the soil with a hoe, and the plot covered with a sheet of plastic to protect the treated soil from rain. The plastic sheet, wooden barrier and hardpan will prevent any migration of reagent or reaction end-products. The treatment will last 7 days. At the end of the test, the soil will be sampled for analyses. The treated area will then be excavated to the depth that no reagent or contaminants are found by sampling and analysis. The excavated soil will be processed and used as feed stock for the incinerator. Assuming an excavation depth of two feet, the total amount of soil excavated as a result of this test will be less than 8 cubic yards. Note that this test will be conducted after 1 November to avoid hurricane season.

Test 3. Treatment of Surfaces: This test will be conducted on the cement slab floor of Building 411 at the site. This cement floor may be contaminated with chlorinated dioxins, and is scheduled to be excavated and treated in the incinerator. We propose to take a sample of the floor prior to its excavation, and determine whether or not contamination exists on the surface. If the floor is contaminated, we will test the ability of the reagent to treat surface contamination. Part of the floor will

be divided into nine 5 ft x 5 ft squares. A barrier will be constructed around the slab to prevent any spillage of reagent onto the surrounding soils. Around the perimeter of each of these 25 square foot areas will be constructed a plastic barrier about 2 inches high. Three of these test plots will have a thin (one quarter inch deep) layer of reagent poured onto them. Three plots will receive a layer of the reagent applied with a brush, and the remaining three will remain untreated controls. The treatment will last 7 days. A sample of the cement slab from each test plot will be collected for analyses, and the entire floor will then be excavated and incinerated as planned. The amount of reagent needed for this test should be less than one cubic foot (7.5 gallons). If the floor is excavated to a depth of six inches, the amount of waste solid material affected by this test would be $6 \times 25 \text{ ft}^2 \times 0.5 \text{ ft} = 75$ cubic feet, or about 3 cubic yards. The cement floor should be impermeable and the reagent will remain on the surface of the floor.

Waste Disposal: Chemical treatment with the reagent KOH/PEG/DMSO is still in the development phase. We are not trying to delist the soils treated in this manner. Instead, the purpose of these tests is to better understand the feasibility and economics of chemical treatment. We propose to dispose of all wastes in the incinerator. If all three tests are run, about 12 cubic yards of soil will be incinerated which would contain less than 110 gallons (about 0.5 cubic yards) of the reagent KOH/PEG/DMSO. The polyethylene glycol, dimethyl sulfoxide and the dioxin-glycol complexes will all be destroyed by incineration. Potassium chloride will remain unaffected but is harmless. Potassium hydroxide is a strong base. We do not anticipate any problems of putting it in the incinerator (in fact it may help neutralize any acid formation), but it can be neutralized with a weak acid if necessary. Soil which contained the reagent will be analyzed for the reagent and its reaction end-products after it is incinerated.

ANALYSES:

Soil will be analyzed before and after testing. Sampling and analyses shall be conducted to thoroughly test the efficiency of the chemical treatment. Soils will be analyzed for all chemicals necessary for delisting. This will include chemical analyses performed for delisting of the thermally treated soils, and for the reagent and the chemical reaction end-products. The purpose of doing the delisting analyses is to gain information on the capabilities of the chemical treatment. If the test at NCBC is successful, we want enough data to justify using the chemical reagent as the primary treatment at some other site.

PERSONNEL:

Contractor: Tests will be conducted by an EPA contractor, Galson Research Corporation. The principal investigator is Mr Robert Peterson, and their address is:

Galson Research Corporation
6601 Kirkville Road
E. Syracuse, New York 13057

(315) 432-0506

Mr Peterson and personnel at Galson Research Corporation developed the KOH/PEG/DMSO reagent and are very experienced with its use. They have tested the reagent on dioxin contaminated soils in the laboratory for the EPA's Hazardous Waste Environmental Research Laboratory, Cincinnati, Ohio. In addition, they have conducted field tests, similar to those proposed here, using the reagent to treat PCB contaminated soils at the Bengart and Memmel site, Buffalo, New York in July and August 1985.

Environmental Protection Agency: The EPA project officer for this effort is Mr Charles Rogers, Hazardous Waste Environmental Research Laboratory, 26 West St. Clair, Cincinnati, Ohio 45268, phone (513) 569-7757.

Air Force: The Air Force project officer for the chemical treatment of dioxin is Capt Edward Heyse, HQ AFESC/RDVW, Tyndall AFB, Florida 32403-6001, phone (904) 283-4628.