6/14/95

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS & SOLID WASTE GROUP (ESH-19)
FAX TRANSMITTAL SHEET

FAX #: (505) 667-5224 VERIFICATION #: (505) 665-9527

DATE: 6/23/95 ID # ____ LOG NO: ESH-19:95-FAX-

FROM: Jeff Carmichael PHONE #: (___) 5-2505

TO: Barbara Holitscheck FAX #: (___) 827-4389 VERIFY PHONE #(___) 827-4308

GRP/ORG: NMED

TO: Jody Plum FAX #: (___) 5-4872 VERIFY PHONE #(___) ____

GRP/ORG: DOE/LAAO

TO: ____ FAX #: (___) ____ VERIFY PHONE #(___) ____

GRP/ORG: ____

MESSAGE: Proposed Treatability Study
Issue: In-situ Treatability Study of Soil, will you Allow.

NUMBER OF PAGES TO FOLLOW: 3

Cy: CRM-4, MS A150

SECTION LEADER

GROUP OR DEPUTY GROUP LEADER

January 13, 1995

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Los Alamos
NATIONAL LABORATORY

memorandum

Chemical Science and Technology
Responsible Chemistry for America

Environmental Restoration Project, CST-18
Los Alamos, New Mexico 87545

To/MS: Jeff Carmichael, ESH-19, K498
From/MS: Brad Martin, CST-18, MS E525
Phone/FAX: 7-6080/5-4632
Symbol: CST-ER/BM-95-013
Date: June 14, 1995

SUBJECT: DOCUMENTATION TO INITIATE A LANL TREATABILITY STUDY; NOTIFICATION OF INTENT FOR TA-16-260 OUTFALL

Field Unit 3 of the LANL ER Project is actively investigating the nature and extent of contamination at the TA-16-260 outfall. This outfall received discharges from operations involving the machining of high explosives. As part of the investigation and characterization of the environment at this outfall, a treatability study would evaluate bioremediation as a pretreatment technology to reduce the explosive hazards of contaminated soil. The proposed treatability study will be performed in two segments: 1) *in-situ* experiments in the soils at the TA-16-260 outfall, and 2) laboratory experiments at TA-9, building 35. A complete Project Description outlining the scope of this effort is presented in Attachment #1.

It is anticipated that the amount of waste material required for the laboratory-scale portion of this study will not exceed 200 kg. This level is below the limits specified in the sample exclusion provision of RCRA, therefore no exemptions are required under the Treatability Studies Exemption Rule. In addition, this 200 kg of material will be moved within technical areas of the laboratory at one time, and will not involve any shipment, storage, treatment and record keeping requirements.

Copies of the required Treatability Study reporting and recordkeeping forms are provided in Attachment #2.

Facility Name: Los Alamos National Laboratory, Chemical Science and Technology Division, CST-18, Waste Treatment and Minimization Science and Technology

Project Title: Remediation of Soil Contaminated with High Explosives

Project Contact: Pat J. Unkefer, Ph.D.; LANL; CST-18, J563
(505) 665-2556; FAX (505) 665-6936
Other Contacts: John Sanchez, Ph.D.; LANL, DX-16, C920
(505) 667-2012

Facility EPA ID Number: NM0890010515

Project Description:

Problem Being Addressed: Near areas of manufacturing, machining, and packing of explosives there are areas of soil contamination. Most of these sites have not been remediated. Technologies being evaluated for remediation include: incineration, bioremediation, and soil washing. Incineration is expensive and requires excavation. The other two methods may be done in situ.

Objectives: The primary objective is to use bioremediation as a pretreatment technology to reduce the explosive hazard of soil. Then, the soil can be excavated and treated with base to remove all remaining explosive material. Bioremediation is a low cost method of in situ remediation. TNT, RDX, and HMX have successfully been remediated in liquid cultures. RDX has also been biodegraded in slurry reactors. We will demonstrate that bioremediation of RDX and TNT can be achieved in situ. Bacteria from horse manure and corn steep liquor, a cheap nutrient source, will be added to the soil. Samples will be withdrawn twice a week and analyzed using EPA Standard Methods for explosives and known biodegradation intermediates. After one to two months, the majority of the RDX and TNT in the soil will have degraded, thus lowering the explosive hazard of the soil. The soil can then be excavated with less hazard for the workers. Excavated soil will also be washed with a base, such as sodium hydroxide, to remove the explosives. The feasibility of combining biodegradation with base washing will also be examined. This combined technology will remove all explosives to levels below the current LANL Screening Action Levels and post-treatment analysis will be used to confirm this. If the soil is found to have rad or other RCRA regulated constituents, it will be managed appropriately after treatment. The soil can then be disposed of in a landfill or returned to the original site.

Project Goal:

- Short Term (2 months): Demonstrate with a laboratory-scale unit, the effectiveness of bioremediation of explosives in soil, as well as the effectiveness of base soil washing.

- Long Term (1 year): Demonstrate in situ bioremediation of the explosive contaminated soil.

Project Tasks:

1. Obtain soil samples from contaminated LANL site to be tested.
2. Obtain explosives analysis of contaminated soil.
3. Grow organisms which will be added to the soil in the laboratory.
4. Perform laboratory-scale biodegradation experiments.
5. Perform laboratory-scale soil washing experiments.
6. Perform in situ bioremediation experiment.

Milestones: (Assume start date of 7/15/95)

1. Complete first sets of laboratory-scale bioremediation experiments	9/15/95
2. Complete first sets of laboratory-scale soil washing experiments	9/15/95

3. Complete in situ bioremediation experiments 7/15/96
4. Complete any subsequent laboratory-scale experiments 7/15/96

Location of Project:

TA-9, Bldg 35 (laboratory experiments)
TA-16, Behind Bldg 260 (in situ experiments)

Amount of Hazardous Material:

200 kg of contaminated soil for laboratory experiments.

Qualifications:

1. Experience:

Over the past 5 years, we have established a bioremediation program, that addresses problems such as explosives contaminated soils and waters and solvents contaminated media. The team that will participate on this project consists of a combination of chemical engineers, biologists, and biochemists. The team has taken projects from bench to full scale operation.

2. Key Staff:

(LANL Project Leader) Pat J. Unkefer, Ph. D. Biochemistry (Texas A &M University), 16 years professional experience, 11 at LANL as staff member. Experience: biological processes, microbiology, kinetics, plant and soil physiology.

(University Collaborator) Kimberly L. Ogden, Ph. D. Chemical Engineering (University of Colorado), 1 year National Laboratory (LANL), 3 years University of Arizona. Experience: biodegradation, fermentation, pharmaceuticals, transport, and kinetics.

(Explosives) John Sanchez, M.S. Chemical Engineering (University of New Mexico), 15 years National Laboratory (LANL). Experience: explosives, scale-up, supercritical water, hydrolysis, and process engineering.

(Explosives) Ray Flesner, Ph. D. Chemical Engineering (University of Colorado), 3 years National Laboratory (LANL). Experience: explosives, catalysis, supercritical water, scale-up, and hydrolysis.

(Microbiology) Marc Alvarez, MS. Microbiology (New Mexico State University), 3 years National Laboratory (LANL). Experience: biodegradation, analytical chemistry, enzymes, and molecular biology.

(Fermentation) John Hanners, 32 years National Laboratory (LANL). Experience: biodegradation, fermentation, amino acids, bioseparations, and cell culture.

3. Equipment and Facilities

The facilities available to perform this work will include the Fermentation and Analytical Laboratory in the Chemical Sciences and Technology Division, and the Explosives Handling Laboratory in the DX Division. These facilities contain equipment for handling explosives, culturing microorganisms and for chemical analysis. Select equipment includes: 5, 20, and 60 l fermentors, FT-IR, NMR, UV-Vis spectrometer, HPLC, GC, GC-MS, and LC-MS.