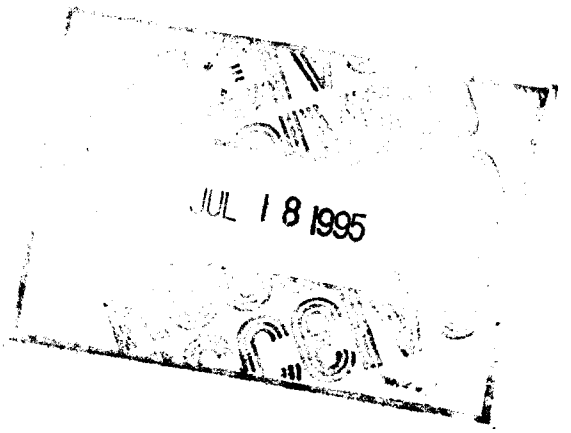
Barbara Stern File

Department of Energy
Los Alamos Area Office
Albuquerque Operations Office
Los Alamos, New Mexico 87544

JUL 11 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED



Mr. Benito J. Garcia, Bureau Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
525 Camino De Los Marquez, Suite 4
P. O. Box 26110
Santa Fe, New Mexico 87502

TA 53

Dear Mr. Garcia:

SUBJECT: Treatability Studies

As promised in a meeting between the Department of Energy (DOE), Los Alamos National Laboratory (LANL), and the New Mexico Environment Department (NMED) on June 1, 1995, this letter discusses two research bench-scale studies conducted at LANL. The studies involve the removal of lead from contaminated soils. One study was on soil collected from LANL's TA-53 Meson Physics Facility and the other study was on soil obtained from the Cal-West Superfund site in Socorro, New Mexico.

TA-53 Meson Physics Facility Soil

One kilogram (kg) of soil was collected at the TA-53 Meson Physics Facility. The soil was collected in June 1992, outside the fenced area called the *Boneyard*. The soil was collected to provide clean background soil samples for waste surrogate studies. A measured lead nitrate solution was added to this soil in the laboratory. The soil was then subjected to lead leaching studies involving the use of water-soluble chelating polymers that recover lead from the contaminated soil.

Because the soil was collected to provide clean background soil samples for waste surrogate lead leaching studies, these studies were not intended to be hazardous waste treatability studies and therefore, were never reported to NMED. What made these studies unique was the initial experiment indicated that *more* lead was being removed from the soil than was introduced by the lead nitrate solution. Further investigation revealed that the soil was contaminated with small fragments of lead shot and was not representative of TA-53 background soil conditions. It is believed that the source of the fragments of lead shot is from spills that had occurred in the *Boneyard*.

The *Boneyard* is an Environmental Management/Environmental Restoration (EM/ER) area of concern, with an EM/ER number 53-008. The *Boneyard* is 3 to 4 acres that receives radiation shielding, concrete, and radioactive contaminated equipment, with some special shaped shielding containing lead shot. Historically, some lead shot has been spilled on the ground in the

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TK

Boneyard. Soil containing the lead shot was collected and is now in storage in one of LANL's interim status mixed waste domes at TA-54 Area G. EM/ER intends to investigate the *Boneyard* to determine if any additional lead soil contamination exists. EM/ER has been notified of the lead contaminated soil found outside the *Boneyard* boundary.

Currently, all lead leaching studies on this soil have stopped. Approximately 500 grams of the original 1 kg of soil have been used in lead leaching studies. The remaining 500 grams of soil have been placed in a hazardous waste satellite storage area, and paperwork submitted to dispose of this material through LANL's New Mexico Hazardous Waste Act permitted facility located at TA-54. The type of waste generated from the lead leaching studies is a liquid effluent. The liquid effluent, consisting of mainly hydrochloric acid and lead, is managed as a hazardous waste.

Cal-West Soil

Cal-West is a former lead acid battery reprocessing facility in Socorro, New Mexico. This site was declared a Superfund site and the cleanup was managed by Carlos Sanchez of the Environmental Protection Agency (EPA) Region 6. His telephone number is (214) 665-6444. The Cal-West soil was first obtained by Dr. Adrian Hanson of New Mexico State University.

Laboratory researchers were told the following by Mr. Hanson: that the soil was transferred to him by Mr. Sanchez; Dr. Hanson specifically asked Mr. Sanchez about treatability paperwork and regulatory issues; and Mr. Sanchez said that because a Record of Decision had already been established (the site remediation technology had been chosen) for the Cal-West site, that the soil was not subject to treatability study requirements because the soil was not being studied for treatability purposes associated with the Cal-West site.

The Cal-West soil is a valuable research media. The soil's characteristics and contaminants have been fully studied and to Dr. Hanson, the Cal-West soil represented a "true" weathered soil, which provided an excellent media for testing and developing lead remediation technologies. Dr. Hanson was encouraged by EPA to test and develop lead remediation technologies using real lead contaminated soil over laboratory produced lead contaminated soil.

The Cal-West soil is a sandy loam soil and contaminated with approximately 7000 parts per million (ppm) of lead. LANL received two sets of this soil from Dr. Hanson, who supports lead leaching research at LANL. The first set of soil (approximately 5 kg) was transported to LANL by Dr. Hanson in June 1992, when one of Dr. Hanson's students came to work at LANL. This soil was used for a suite of bench-scale tests to determine the viability of water-soluble polymers as chelating agents for lead in lead contaminated soil. Typical bench tests used 0.5 grams of soil in 10 milliliters of aqueous based extractants. Variables such as polymer concentration, pH, and degree of polymer modification were examined in these bench-scale studies. Several hundred of these small bench-scale tests have been done since receiving the soil. Of the original 5 kg of Cal-West soil, LANL is still storing *2.95 kg* of this soil.

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In June 1994, another student of Dr. Hanson's came to work at LANL. Dr. Hanson, in support of the student's research, transported *70 kg* of Cal-West soil to LANL. This material was transported to LANL in two sealed five-gallon plastic buckets. Only 20 grams of the original 70 kg of soil were treated in lead leaching studies.

Currently, all lead leaching studies on the Cal-West soil have stopped. LANL has placed the remaining kilograms of Cal-West soil (*2.95 kg + 70 kg* = 72.95 kg) in a hazardous waste satellite storage area. The lead leaching studies on this soil generate a liquid effluent. The liquid effluent, consisting of mainly hydrochloric acid and lead, is managed as a hazardous waste.

With NMED's permission, LANL would like to study and treat the remaining 72.95 kg of Cal-West soil in LANL's treatability study entitled *The Application of Polymer Filtration to Lead Removal from Soil.* NMED was notified of this treatability study on April 14, 1995. A copy of the April 14, 1995, notification is enclosed. If approved, the total amount of soil to be treated in *The Application of Polymer Filtration to Lead Removal from Soil* treatability study would be [72.95 kg (Cal-West soil) + 5 kg (amount of soil specified in the April 14, 1995 notification)] = 77.95 kg. If you have questions, please contact me at (505) 665-5042.

Sincerely,

H. L. "Jody" Plum
Office of Environment and Projects

LAAMEP:8JP-006

Enclosure:
April 14, 1995, Hazardous Waste
Treatability Study Notification

cc w/enclosure:
J. Mack, AAMEP, LAAO
J. Carmichael, ESH-19, LANL, MS-K498
M. Cournoyer, CST-10, LANL, MS-J569

cc w/o enclosure:
T. Grieggs, ESH-19, LANL, MS-K498
N. Sauser, CST-18, LANL, MS-J514
ESH-19 (95-295.JAC), LANL, MS-K490

Department of Energy
Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

APR 4 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Benito J. Garcia, Bureau Chief
Hazardous and Radioactive Waste Bureau
New Mexico Environment Department
525 Camino de los Marquez, Suite #4
Santa Fe, NM 87502

Dear Mr. Garcia:

Subject: Treatability Studies Notification

The purpose of this letter is to provide notification of intent to conduct two hazardous waste treatability studies at Los Alamos National Laboratory (LANL). The first study will be conducted by the Material Research and Processing Science Group. This study will support Hanford's waste remediation and disposition mission and the operation of the Hanford Initial Pretreatment Module. This study involves analyses of mixed waste sludges and determining waste characteristics and composition. LANL will also conduct experiments to develop and establish chemical and physical process parameters for subsequent use by Hanford engineers to design pretreatment modules on a large scale. Approximately seven kilograms of waste will be needed to conduct this study.

The second study will be conducted by the Materials and Chemical Design Group. This study will evaluate the effectiveness of a water-soluble polymeric soil washing system for removing lead. Approximately five kilograms of lead contaminated soil will be needed to conduct this study. More specific details on both studies are provided in the enclosures. If you have any questions, please contact Jon Mack of my staff at (505) 665-5026.

Sincerely,

ORIGINAL SIGNED BY
JOSEPH C. VOZELLA

Joseph C. Vozella
Acting Assistant Area Manager
Office of Environment and Projects

LAAMEP:1JM-079

Enclosures:
1. Remediation of the Radioactive Waste Contained in Hanford Waste Tanks.
2. The Application of Polymer Filtration to Lead Removal From Soils.

cc:
See page 2

bcc w/enclosures:
J. Mack, AAMEP, LAAO
J. Plum, Scientech, LAAO

bcc w/o enclosures:
J. Carmichael, (ESH-19,:95-0128-1),
LANL, MS-K498
R. Villarreal, MST-5, LANL,
MS-G730
M. Cournoyer, CST-10, LANL,
MS-J569

ENCLOSURE 1

REMEDIATION OF THE RADIOACTIVE WASTE CONTAINED IN HANFORD WASTE TANKS

Los Alamos
NATIONAL LABORATORY

memorandum

Materials Science and Technology Division
MST-5 • Materials Research and Processing Science

To/MS: Tony Grieggs, ESH-19, MS K498
From/MS: Robert Villarreal, MST-5, MS G730 R.V
Phone/FAX: 7-9333/FAX 7-1058
Symbol: MST-5:95-rv244
Date: February 8, 1995

SUBJECT: DOCUMENTATION TO INITIATE LANL TREATABILITY STUDY; NOTIFICATION OF INTENT

LANL (MST-5) is seeking to conduct an experimental project in support of DOE process development tests including analytical analyses of radioactive sludge wastes prior to, during, and after testing in the LANL Hot Cells located in Wing 9 of the CMR Building. The primary focus of this work is to support process development activities for ultimate remediation and disposition of wastes from the Hanford Tank Waste Remediation System (TWRS) as described in the Project Description in Attachment #1. We have determined that the Hot Cell Facility conducting the tests will exceed the scope of the sample exclusion provision [40 CFR 261.4 (d)] which exempts from regulation, under subtitle C of the Resource Conservation and Recovery Act waste samples collected solely for the purpose of monitoring or testing to determine their characteristics or composition. Although the developmental tests conducted in the Hot Cell Facilities will have as a major activity the testing of the TWRS wastes to determine their characteristics and composition, we will also conduct experiments to develop and establish chemical and physical process parameters for subsequent use by Hanford Engineers to design pretreatment modules on a large scale basis. Because we will exceed the limits specified in the sample exclusion provision with this project, we are seeking to conduct the experiments according to the Treatability Studies Exemption Rule (40 CFR 261.4 e-f) as a RCRA exemption for small scale studies (53 FR 27290). To comply with the provisions of the Treatability Exemption Rule, we will conduct the experiments within the range of quantity limits for shipment, treatment and storage.

The radioactive wastes contained in the TWRS tanks which would be used for the LANL Hot Cell experiments are assumed to be mixed waste because they exhibit a hazardous waste characteristic (40 CFR 261, Subpart C) or a listed hazardous waste under 40 CFR 261 Subpart D; the wastes are not considered to be acute hazardous wastes.

The limitations specified under the existing Treatability Studies Exemption Rule are as follows:

SHIPMENT: The mass of each sample shipment may not exceed 1000kg of "as received" waste [40 CFR 261.4 (e) (2) (ii)].

STORAGE: The Laboratory or testing facility (in our case, the Hot Cell Facility) may store up to 1000kg of non-acute hazardous waste [40 CFR 261.4 (f) (4)]. This quantity limitation does not include Treatability Study residues and treatment materials added to "as received" hazardous waste. Any untreated sample and any residue generated during the treatability study must be returned to Hanford within 90 days of study completion or within one-year from the date of shipment by Hanford to LANL, whichever is earlier.

TREATMENT: The Laboratory or testing facility, on a per waste stream per treatment process basis, may conduct treatability tests up to 1000kg of non-acute hazardous waste [40 CFR 261.4 (e) (2) (i)]. The rule imposes a treatment initiation rate limit of 250kg per day of "as received" waste for the entire Laboratory or testing facility [40 CFR 261.4 (f) (3)]. "As received" would refer to the waste shipped by Hanford as it arrives at the Laboratory or testing facility.

NOTE: Although the limits for contaminated media such as soil and debris have been recently increased (59 FR 8362, February 18, 1994), the EPA did not include newly-generated waste or waste sludges in the ruling but these types of waste forms will be considered in a subsequent rulemaking.

REPORTING AND RECORDKEEPING REQUIREMENTS: The EPA has stipulated specific reporting and recordkeeping requirements to document compliance with the quantity and time limitations set forth in the Rule.

1. **Hanford (the generators and shipper) and LANL (MST-5 Hot Cells) must keep the following records for three years after completion of the study.**

   a. A copy of the contract between Hanford and LANL to conduct the treatability study.

   b. Copies of the shipping documents.

2. **Hanford must maintain records indicating the following:**

   a. The amount of waste (per waste stream and treatment process shipped) under the exemption.

   b. The name, address, and EPA identification number of the Laboratory or testing facility (LANL) conducting the study.

   c. The date shipment was made.

   d. Whether or not any unused sample or any residue generated from the treatability study was returned.

   e. Hanford must report this information in their biennial reports.

3. **LANL must accomplish the following:**

   a. Send a letter to the EPA Regional Administrator or the State of New Mexico informing the EPA that LANL intends to conduct small-scale treatability studies; the letter must be received 45 days before the facility begins conducting treatability studies. The letter should indicate the LANL address and EPA identification number and the types of treatability studies anticipated.

   b. LANL must maintain appropriate records and documentation for a period of three years following completion of each treatability study to show compliance with the appropriate quantity and time limitations. The records must indicate that LANL is meeting the requirements for shipment limits, treatment rate limits, and storage

limits. Specific minimum information, by treatability study, that must be maintained include the following:

- The name, address, and EPA ID number of the generator (Hanford) of the waste samples.
- The date LANL received the shipment.
- The quantity of waste accepted.
- The quantity of "as received" waste in storage each day.
- The date the treatment study was initiated and the amount of "as received" waste introduced to treatment each day.
- The date the treatability study was concluded.
- The date the unused sample and residue were returned to the generator (Hanford) including Hanford's EPA ID number and name of generator. LANL must keep copies of all shipping documents associated with transport of waste to and from the facility.

c. By March 15 of each year, submit a report to the Regional Administrator or State of New Mexico that includes an estimate of the number of studies and the amount of waste expected to be used in treatability studies during the current year. Also, provide the following information for the previous calendar year.

- The name, address, and EPA ID number of the generator (Hanford) of each waste sample).
- The date the shipment was received by LANL.
- The quantity of waste accepted.
- The total quantity of "as received" waste in storage each day.
- The date the treatment study was initiated, and the amount of "as received" waste introduced to treatment each day.
- The date the treatability study was concluded.
- The date any unused sample and residues generated from the treatability study were returned to Hanford.

d. Notify the Regional Administrator or State of New Mexico by letter when and if LANL is no longer planning to conduct any further treatability studies at the site.

RV/wm

Attachments: a/s

Distribution:
Author File
MST-5 Wing 2 File

ATTACHMENT I

PROJECT DESCRIPTION SUMMARY OF PROPOSED HOT CELL PROCESSES WITH HANFORD WASTES FOR TREATABILITY STUDY EXEMPTION CONSIDERATION

Remediation of the radioactive wastes contained in the Hanford Waste tanks includes implementation of a technical strategy to develop the necessary technology and processes to meet the Hanford site cleanup goals and objectives according to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). One of the primary facilities needed to fulfill the Hanford Tank Waste Remediation Systems (TWRS) waste remediation and disposition mission is operation of the Hanford Initial Pretreatment Module (IPM). The design, construction, and operation of the IPM will require data from physical and chemical processing tests beyond the current laboratory experiments conducted with gram quantity actual wastes. To provide the required engineering and basic chemical process data that will be the basis for design of the IPM, a project to test the pretreatment technical strategies has been outlined, and the LANL Hot Cells in Wing 9 of the CMR Building is being recommended to conduct the predetermined tests on actual wastes from the Hanford Tanks.

The testing strategies to be functionally investigated by Hanford are categorized into six groups of which LANL has been recommended to work on group 2 Sludge Washing (Basic and Enchanced) and if successful, a portion of some of the other groups listed below:

1). Ion exchange tests for Cs, Sr, Tc, and TRU,
2). Sludge Washing (Basic and Enhanced),
3). Centrifugation,
4). Filtration,
5). Settling, and
6). Organic Defunctionalization.

All actual waste to be tested for the LANL portion of the project (sludge washing, basic and enhanced) will be taken from the Hanford Tanks and transported to LANL via approved shipment containers as a responsibility of Hanford (PNL and WHC). The other five testing groups have been recommended to be conducted at Hanford with potential backup sites at ORNL. However, LANL may be asked to provide consultatory or experimental support to augment certain technical areas where focussed expertise is readily available at LANL such as ion-exchange. The quantity of waste to be sampled and shipped to LANL for the proposed tests is given below.

Sludge Washing - TEST Group #1
Sample Size = 40 gm sludge/salt
Number of tests = 30
Total Sludge volume = 1200 gm

Sludge Washing - TEST Group #3
Sample Size = 10 ml slurry/complex concentrate
Number of tests = 18
Total sample volume = 180 ml

Sludge Washing - TEST Group #4
Sample Size = 20 ml slurry/complex concentrate
Number of tests = 18
Total sample volume = 360 ml

Approximate Sample Volume = 1740 ml

TOTAL volume for all tests = < 3 liter

The Tank Waste to be tested is assumed to be mixed waste. Analytical analyses will be performed on samples of waste to establish the physical and chemical properties of the waste prior to, during, and after the test. The primary bulk waste from the tests will be returned to Hanford after testing. The secondary wastes resulting from chemical analyses will be disposed according to established LANL waste disposal SOPs. All tests will be conducted in the CMR Hot

Cells (Wing 9) and essentially all analytical work will be performed in laboratories designed to perform radioactive sample work in the CMR Building. Small quantity (grams) requiring highly specialized analyses may be transported to other appropriate LANL laboratories outside the CMR Building. All analytical work to be conducted as part of this project is similar-in-kind to existing and on-going work in the CMR Building that has been through the ES&H process and has been granted a categorical exclusion (ES&H Questionnaire) numbers 94-0035, 94-0113, DEC-94-0040).

This project is expected to continue for three to five years. A detailed outline of the sludge washing (Basic and Enhanced) testing strategy is given in Attachment II.

ATTACHMENT II

2.0 Functions and Requirements for Sludge Washing

The primary intent for sludge washing is to separate radioactive elements from nonradioactive elements to minimize the amount of HLW.

The analytical instrumentation and equipment projected for this activity is as follows:

1) ICP-AES

2) FAAS

3) GFAAS

4) IC

5) Gamma-ray Spectrometry

6) Total alpha analysis

7) Alpha energy spectrum analysis or equivalent

8) ICP-MS can replace ICP-AEA, FAAS, and GFAAS

9) Radiochemical instrumentation to measure ^{137}Cs, ^{90}Sr, and ^{99}Tc

10) Shaker table with constant temperature reaction vessels

11) Analytical balances down to 0.1 mg

12) SEM

13) TEM

14) Zeta Potential (for peptization)

15) Solids Rheology equipment (for peptization)

16) Tc speciation and measurement, XAFS

17) Centrifuge

- The Laboratory or facility must have the capability to handle 250 ml radioactive (mixed) waste samples.

ENCLOSURE 2

THE APPLICATION OF POLYMER FILTRATION TO LEAD REMOVAL FROM SOILS

Los Alamos
NATIONAL LABORATORY

Chemical Science and Technology
Responsible Chemistry for America

CST-10 Materials & Chemical Design, MS J569
Los Alamos, New Mexico 87545

To/MS: Jeff Carmichael, ESH-19, MS K498
From/MS: Michael E. Cournoyer, J569
Phone/FAX: 665-7616/665-7620
Symbol: CST-10/MEC-95-1
Date: Wednesday, March 8, 1995

SUBJECT: DOCUMENTATION TO INITIATED LANL TREATABILITY STUDY; NOTIFICATION OF INTENT

LANL (CST-5) is seeking to remove lead contamination from soil located at TA ?? Project Description is discussed in Attachment #1. The primary focus of this work is to demonstrate treatment technologies for lead removal from soil. A description of the waste is shown in Attachment #2. We will conduct experiments to develop and establish chemical and engineering parameters for subsequent use by CST-5 to design soil remediation modules on a large scale basis. Because we will exceed the limits specified in the sample exclusion provision with this project, we are seeking to conduct the experiments according to the Treatability Studies Exemption Rule (40 CFR 261.4 e-f) as a RCRA exemption for small scale studies (53 FR 27290). To comply with the provisions of the Treatability Exemption Rule, we will conduct the experiments within the range of quantity limits for shipment, treatment and storage.

The limitations specified under the existing Treatability Studies Exemption Rule are as follows:

Shipment: The mass of each sample shipment may not exceed 1000 kg of "as received waste [40 CFR 261.4 (e) 2 (ii)].

Storage: The Laboratory or testing facility (in our case, the Advance Diagnostic Facility) may store up to 1000 kg on non-acute hazardous waste [40 CFR 261.4 (f) (4)]. This quantity limitation does not include Treatability Study residues and treatment materials added to "as received" hazardous waste. Any untreated sample and any residue generated during the treatability study must be returned to CST-5 within 90 days of study completion or within one-year from the date of shipment by CST-5 to CST-10, whichever is earlier.

Treatment: The Laboratory or testing facility, on a per waste stream per treatment process basis, may conduct treatability tests up to 1000 kg on non-acute hazardous waste [40 CFR 261.4 (e) (2) (i)]. The rule imposes a treatment initiation rate limit of 250 kg per day of "as received" waste for the entire Laboratory or testing facility [40 CFR 261.4 (f) (3)]. "As received" would refer to the waste shipped by CST-5 as it arrives at the CST-10 testing facility.

NOTE: Although the limits for contaminated media such as soil and debris have been recently increased (59 FR 8362, February 18, 1994), the EPA did not include newly-generated waste or waste sludges in the ruling but these types of waste forms will be considered in a subsequent rulemaking.

Reporting and Recordkeeping Requirements: The EPA has stipulated specific reporting and recordkeeping requirements to document compliance with the quantity and time limitations set forth in the Rule:

1. **CST-5 (the generators and shipper) and CST-10 must keep the following records for three years after completion of the study.**

   a. A copy of the contract between CST-5 and CST-10 to conduct the treatability study.

   b. Copies of the shipping documents.

2. **CST-5 must maintain records indicating the following:**

   a. The amount of waste (per waste stream and treatment process shipped) under the exemption.

   b. The name, address, and EPA identification number of the Laboratory or testing facility (CST-10) conducting the study.

   c. The date shipment was made.

   d. Whether or not any unused sample or any residue generated from the treatability study was returned.

   e. CST-5 must report this information in their biennial reports.

   f. Send a letter to the EPA Regional Administrator or the State of NM informing the EPA that CST-5 intends to conduct small-scale treatability studies; the letter must be received 45 days before the facility begins conducting treatability studies. The letter should indicate the LANL address and EPA identification number and the types of treatability studies anticipated.

3. **CST-10 must accomplish the following:**

   a. CST-10 must maintain appropriate records and documentation for a period of three years following completion of each treatability study to show compliance with the appropriate quantity and time limitations. The records must indicate that CST-10 is meeting the requirements for shipment limits, treatment rate limits, and storage limits. Specific minimum information, by treatability study, that must be maintained include the following:

   - The name, address, and EPA ID number of the generator (CST-5) of the waste samples.

   - The quantity of waste accepted.

   - The date CST-10 received the shipment.

- The quantity of "as received" waste introduced to treatment each day.

- The date the treatment study was initiated and the amount of "as received" waste introduced to treatment each day.

- The date the treatability study was concluded.

- The date the unused sample and residue were returned to the generator (CST-5) including CST-5 EPA ID number and name of generator. CST-10 must keep copies of shipping documents associated with transport of waste to and from the facility.

b. By March 15 of each year, submit a report to the Regional Administrator or State of New Mexico that includes an estimate of the number of studies and the amount of waste expected to be used in treatability studies during the current year. Also, provide the following information for the previous calendar year.

- The name, address, and EPA ID number of the generator (CST-5) of the waste samples.

- The quantity of waste accepted.

- The date CST-10 received the shipment.

- The quantity of "as received" waste introduced to treatment each day.

- The date the treatment study was initiated and the amount of "as received" waste introduced to treatment each day.

- The date the treatability study was concluded.

- The date the unused sample and residue were returned to the generator (CST-5) including CST-5 EPA ID number and name of generator.

d. Notify the Regional Administrator or State of New Mexico by letter when and if CST-10 is no longer planning to conduct any further treatability studies at the site.

Project Title: The Application of Polymer Filtration to Lead Removal from Soils

Project Contact: Michael E. Cournoyer, Ph. D., LANL; CST-10, J569
(505) 665-7616; FAX (505) 665-7620

Other Contacts: Tom Robison, Ph. D., LANL; CST-10, J569
(505) 665-7615; FAX (505) 665-7620

Barbara Smith, Ph. D., LANL; CST-10
(505) 667-2391; FAX (505) 665-4737
G740

Nancy N. Sauer, Ph. D., LANL; CST-18
(505) 665-3759; FAX (505) 665-4955
C346

Project Description:

Problem(s) Being Addressed: Removal of lead contamination from soil is a formidable problem. The present method of disposal is barreling the hazardous waste and burying it off-site. This is expensive and liability remains with LANL.

Objectives: We will demonstrate a water-soluble polymeric soil washing system for removing lead. This technology, called **Polymer Filtration**, combines the most positive aspects of chelation technology (rapid sorption kinetics, ion-selectivity) with the convenience of ion-exchange technology (easy of use, high through-put). Contaminated soil is washed with chelating polymers. The metal-laden polymer is then drained into an ultra-filtration chamber where the polymer is captured, the wash water is recycled, and the lead-laden polymer is regenerated with the lead eluted in a concentrated solution. The chelating groups on the polymers are selected to maximize uptake of the lead ions with minimized sorption of ancillary metals. Dissolution may be enhanced by a variety of methods including vigorous mixing. Using Polymer Filtration, a high level of lead removal can be achieved with a minimal secondary waste generation and minimal use of wash water. The soil following Polymer Filtration will past current and future TCLP test and can be disposed of in a solid waste (special waste) landfill or an authorized disposal site rather than a hazardous waste disposal site.

Project Goal:

- Short Term (first week): Demonstrate with a laboratory-scale unit, the effectiveness of this polymer filtration application for lead removal from soil that has a TCLP test of 100 ppb lead. This includes recycling of the wash water and recovery/immobilization of the lead.

- Long Term (third week): Demonstrate with a pilot lab-scale engineering prototype, the effectiveness of this polymer filtration application for lead removal. This is include cost and size estimates for a full-scale soil washing unit.

Project Tasks:

1. obtain soil samples from LANL site to be tested
2. obtain metal analysis of soil
3. prepare polymer system for testing
4. assemble equipment for testing
5. perform bench-scale tests on lead contaminated soil samples
6. perform pilotlab-scale tests on lead contaminated soil samples

Milestone Number/Title: (Assume start date 6/5/95)	End Date
A. Complete bench-scale tests	6/12/95
B. Complete pilot-scale tests for lead	7/3/95

Location of Project:

TA-48 BLDG. RC1 RM. 412

Amount of Hazardous Waste:

5 kgs of lead contaminated soil.

Qualifications

1. Experience:
Over the past decade, we have established an internationally recognized program in actinide and metals separations. The team that will participate on this project has a combined experience of over 40 years in ligand design, metal ions separations, environmental research, and pilot-lab operations. They have successfully taken ligand design and separations chemistry from the bench scale to the pilot scale to the full engineered process scale. They have experience working with radioactive materials, chemical synthesis, analytical chemistry, process chemistry, engineering, waste management, and marketing.

2. Key Staff:
(LANL project leader) Michael Cournoyer Ph. D. Organic Chem. (Purdue U), 10 yrs industrial (Miles Inc.), 3 yrs National Lab (LANL); experience: organic synthesis, pilot lab scale-up; metals separations, pharmaceuticals, corrosion inhibitors, dyes and pigments, program development.

(coordination chem.) Nancy N. Sauer: Ph.D. Inorganic Chem. (Iowa State U), 8 yrs National Lab (LANL); experience: metals separations. ligand design, actinide alkoxide chemistry, treatment and remediation of hazardous wastes, selective chelators for removal of toxic metals from soils and mechanism of low temperature oxidation of actinides.

(polymers) Thomas Wayne Robison: Ph. D. Organic Chem. (Texas Tech U), 4 yrs industrial (Am. Petrofina.), 4 yrs National Lab (LANL); experience: organic synthesis, pilot lab scale-up; polymer synthesis, ligand design, metals separations, coordination chemistry, crown ether design and synthesis.

(metal separations) Barbara F. Smith: Ph. D. Organic Chem. (UC Davis), 2 yrs analytical lab (Research Institute for Science), 4 yrs teaching (Idaho State U), 14 yrs National Lab (Ames, LANL); experience: organic synthesis, pesticide and organic analysis, toxicology, natural products, instrumental methods, coal chemistry, polymer synthesis, ligand design, metals separations.

(inorganic chem.) Gordon D. Jarvinen, Ph.D. Inorganic Chemistry (UCLA), 16 years National Laboratory (LANL) experience; metal ion separations, actinide/lanthanide design, synthesis and evaluation of new ligand systems, and coordination chemistry.

(EPA liaison) Joan Fisk, B.S. Chemistry (U. of Bridgeport), 2 years National Laboratory (LANL) experience; 14 years US Environmental Protection Agency; 1 year U.S. Chemical Research and Development Center 6 years analytical laboratory (Sharpley Laboratories, Inc. experience; management of environmental analytical activities, analytical methods development for superfund, management of Quality Assurance.

3. Equipment and Facilities:

The facility available to perform this work include the Advanced Diagnostic Facility at Los Alamos which includes equipment for all forms of organic synthesis and analysis such as FT-IR, NMR, UV-Vis, and fluorescence spectroscopy. Analytical separation equipment GC, GC-MS, LC, GPC, SFE, and ES-MS and a variety of ICPs for metal analysis are available within the Chemical Sciences and Technology Division. We have teamed with the University of Mass (Dr. S. Swan) for specialty polymer characterization. A special capability consists of an engineering prototype ultrafiltration unit that can be used to test a process at a rate of 2 gal./min. Direct scale up to commercial units may be obtained from this prototype.