



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 29 1994

EPA-MS
Rec'd Jun 94

OFFICE OF
ADMINISTRATION
AND RESOURCES
MANAGEMENT

Dr. O. W. Miller
U.S. Army Corps of Engineers
Geotechnical Laboratory
Waterways Experiment Station
Vicksburg, MS 39180-6199

EPA Reference: DW96936530-01-0

Dear Dr. Miller:

I am forwarding to you for review and acceptance or rejection two signed copies of an interagency agreement entitled "Application of the Hydrofracturing Process for In Situ Treatment of Contaminated Soil."

If you wish to accept the agreement, please have your authorizing official sign these copies and return one signed copy to the address in Block 29 of the EPA Form 1610-1. The other copy with official signatures should be retained by your agency. Your early attention will be appreciated. Please return a signed acceptance by July 29, 1994, so that the funds for this agreement may be obligated.

Please reference the EPA interagency agreement number in future correspondence on this agreement. If you have any questions or comments regarding the administrative management of this agreement, please contact Dorothy Jackson, of my staff, on (202) 260-4392.

Sincerely,

for

W. Scott McMoran, Chief
Grants Information & Analysis Branch
Grants Administration Division

Enclosures

cc: Michael H. Roulier, RREL/CIN
Lucille Light, RREL/CIN
Linda Iori, RREL/CIN



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United States Environmental Protection Agency
Washington DC 20460



Interagency Agreement /
Amendment

Part I - General Information

1. EPA / IAG Identification Number

DW96936530-01-0

2. Other Agency ID Number

3. Type of Action

NEW

4. Funding Location
by Region

HQ

5. Program Office
Abbreviation

RREL/CIN

6. Name and Address of EPA Organization

ENVIRONMENTAL PROTECTION AGENCY
RREL/OEETD/WMDDRD/MSWRMB
26 WEST MARTIN LUTHER KING DRIVE
CINCINNATI, OH 45268

7. Name and Address of Other Agency

ARMY, DEPARTMENT OF/CORPS OF ENGINEERS
GEOTECHNICAL LABORATORY
WATERWAYS EXPERIMENT STATION
VICKSBURG, MS 39180-6199

8. Project Title APPLICATION OF THE HYDROFRACTURING PROCESS FOR IN SITU TREATMENT OF
CONTAMINATED SOIL

9. EPA Project Officer (Name, Address, Telephone Number)

ROULIER, MICHAEL H.
RREL/OEETD/WMDDRD/MSWRMB
26 WEST MARTIN LUTHER KING DRIVE
CINCINNATI, OH 45268
(513) 569-7796

10. Other Agency Project Officer (Name, Address, Telephone Number)

MILLER, O. W. PH.D, P.E., U.S. ARMY/COE
GEOTECHNICAL LABORATORY
WATERWAYS EXPERIMENT STATION
VICKSBURG, MS 39180-6199
(601) 634-3147

11. Project Period

07/01/94 to 07/01/96

12. Budget Period

07/01/94 to 07/01/95

13. Scope of Work (Attach additional sheets, as needed)

SEE ATTACHMENT

The EPA Grants Specialist for this IAG is
Dorothy L. Jackson, Phone No. (202) 260-4392

COMMITMENT VERIFIED.
Date: 6/27/94 By: [Signature]

14. Statutory Authority for Both Transfer of Funds and Project Activities

CERCLA AS AMENDED BY SARA; EXECUTIVE ORDER 12580

15. Other Agency Type

FEDERAL

| FUNDS | PREVIOUS AMOUNT | AMOUNT THIS ACTION | AMENDED TOTAL |
|---------------------------------|-----------------|--------------------|---------------|
| 16. EPA Amount | 0 | 150,000 | |
| 17. EPA In-Kind Amount | 0 | 0 | |
| 18. Other Agency Amount | 0 | 0 | |
| 19. Other Agency In-Kind Amount | 0 | 40,000 | |
| 20. Total Project Cost | 0 | 190,000 | |

21. Financial Information

| Financial Element | FY | Appropriation | Doc. Control No. | Account Number | Object Class | Obligation/Deoblig. Amt. |
|-------------------|----|---------------|------------------|----------------|--------------|--------------------------|
| 09H1A | 94 | 684/50107 | C4E506 | 4CC926CAHX | 25.71 | 150,000 |

Part II - Approved Budget

EPA IAG Identification Number
DW96936530-01-0

| 22. Budget Categories | Itemization of This Action | Itemization of Total Project Estimated Cost to Date |
|---|----------------------------|---|
| (a) Personnel | 55,250 | 55,250 |
| (b) Fringe Benefits | 27,080 | 27,080 |
| (c) Travel | 15,000 | 15,000 |
| (d) Equipment | 5,000 | 5,000 |
| (e) Supplies | 2,750 | 2,750 |
| (f) Procurement / Assistance | 0 | 0 |
| (g) Construction | 10,000 | 10,000 |
| (h) Other See Attached S.O. W. | 2,480 | 2,480 |
| (i) Total Direct Charges | 117,560 | 117,560 |
| (j) Indirect Costs: Rate _____ Base \$ _____ | 72,440 | 72,440 |
| (k) Total: (EPA Share: <u>78.90%</u>) (Other Agency Share <u>21.10%</u>) | 190,000 | 190,000 |

23. Is Equipment authorized to be furnished by EPA or leased, purchased, or rented with EPA funds? Yes No
(Identify all equipment costing \$1000 or more.)

24. Are any of these funds being used on extramural agreements? (See Item 22f.) Yes No

Type of extramural agreement Grant Cooperative Agreement Procurement (Includes Small Purchase Order)

| Contractor / Recipient Name (if known) | Total Extramural Amount under this Project | Percent Funded by EPA (if known) |
|--|--|----------------------------------|
| | | 0.00 |

Part III - Funding Methods and Billing Instructions

25. Funds-Out Agreement (Note: EPA Agency Location Code (ALC) - 68010727)

Disbursement Agreement

Repayment Request for repayment of actual costs must be itemized on SF-1080 and submitted to the Financial Management Office, Cincinnati, OH 45268:
 Monthly Quarterly Upon Completion of Work

Advance Only available for use by Federal agencies on working capital fund or with appropriate justification of need for this type of payment method. Unexpended funds at completion of work will be returned to EPA. Quarterly cost reports will be forwarded to the Financial Management Center, EPA, Cincinnati, OH 45268.

Allocation Transfer-Out Used to transfer obligational authority or transfer of function between Federal agencies. Must receive prior approval by the Office of the Comptroller, Budget Division, Budget Formulation and Control Branch, EPA Hdqtrs. Forward appropriate reports to the Financial Reports and Analysis Branch, Financial Management Division, PM-226F, EPA, Washington, DC 20460.

26. Funds-In Agreement

Reimbursement Agreement Repayment Advance

Allocation Transfer-In

Agency's IAG Identification Number

EPA Program Office Allowance Holder/Resp. Center No.
26C

Other Agency's Billing Address (include ALC or Station Symbol Number)

Other Agency's Billing Instruction and Frequency

Part IV - Acceptance Conditions

EPA IAG Identification Number
DW96936530-01-0

27. General Conditions

The other agency covenants and agrees that it will expeditiously initiate and complete the project for which funds have been awarded under this agreement.

28. Special Conditions (Attach additional sheets if needed)

The Corps of Engineers certifies: (1) that any indirect costs included in billings to EPA represent, in accordance with GAD principles, indirect costs that are funded out of the performing agency's currently available appropriations and that bear a significant relationship to the performing of the service or work, or (2) that statutory authority exists for charging other than these costs or performance. If any audit determines that any direct or indirect costs charged to EPA are unallowable, EPA will be notified immediately following the resolution of the audit and EPA will be credited for those costs.

See attached DBE Special Conditions

Part V - Offer and Acceptance

Note: 1) For Funds-out actions, the agreement/amendment must be signed by the other agency official in duplicate and one original returned to the Grants Administration Division for Headquarters agreements or to the appropriate EPA Regional IAG administration office within 3 calendar weeks after receipt or within any extension of time as may be granted by EPA. The agreement/amendment must be forwarded to the address cited in Item 29 after acceptance signature.

Receipt of a written refusal or failure to return the properly executed document within the prescribed time may result in the withdrawal of the offer by EPA. Any change to the agreement/amendment by the other agency subsequent to the document being signed by the EPA Action Official, which the Action Official determines to materially alter the agreement/amendment, shall void the agreement/amendment.


2) For Funds-in actions, the other agency will initiate the action and forward two original agreements/amendments to the appropriate EPA program office for signature. The agreements/amendments will then be forwarded to the appropriate EPA IAG administration office for acceptance signature on behalf of the EPA. One original copy will be returned to the other agency after acceptance.

| EPA IAG Administration Office (for administrative assistance) | EPA Program Office (for technical assistance) |
|--|---|
| <p>29. Organization/Address Grants Information & Analysis Branch Grants Administration Division (3903E) USEPA 401 M Street, SW Washington, DC 20460</p> | <p>30. Organization/Address Waste Minimization, Destruction and Disposal Research Division USEPA 26 W.M.L. King Drive Cincinnati, OH 45268</p> |


Certification

All signers certify that the statements made on this form and all attachments thereto are true, accurate, and complete. Signers acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

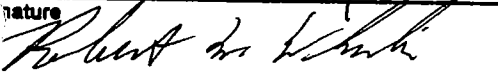
Decision Official on Behalf of the Environmental Protection Agency Program Office

| | | |
|---|--|--------------------------------|
| <p>31. Signature </p> | <p>Typed Name and Title E. Timothy Oppelt, Director Risk Reduction Engineering Laboratory</p> | <p>Date 5/26/94</p> |
|---|--|--------------------------------|

Action Official on Behalf of the Environmental Protection Agency

| | | |
|---|---|--------------------------------|
| <p>32. Signature </p> | <p>Typed Name and Title W. Scott McMoran, Chief Grants Information & Analysis Br., GAD</p> | <p>Date 6/29/94</p> |
|---|---|--------------------------------|

Authorizing Official on Behalf of the Other Agency

| | | |
|---|---|--------------------------------|
| <p>Signature </p> | <p>Typed Name and Title Dr. Robert W. Whalin Director, USAE, WES</p> | <p>Date 25th 94</p> |
|---|---|--------------------------------|

STATEMENT OF WORK
INTERAGENCY AGREEMENT BETWEEN USAE WATERWAYS EXPERIMENT STATION
AND THE USEPA RISK REDUCTION ENGINEERING LABORATORY

Title: **Application of the Hydrofracturing Process for In Situ Treatment of Contaminated Soil**

Goal: **Improvement in Hydrofracturing Technology and Application to a Wider Range of Environmental Problems**

Background:

Contaminated soil is a problem at nearly every Superfund site and at many RCRA sites. Amounts vary widely from site to site, depending on the age of the site, physical form of wastes, and the type of soil. After structures, drummed wastes, piles, ponds, and heavily contaminated surface soils have been removed for treatment or disposal, there often remain considerable depths of soil with low to moderate levels of contamination. There are economic and social pressures to deal with such soils in place (in situ); these result from the difficulties in controlling particulate and volatile emissions during excavation and pre-processing of soil.

In situ treatment, to date, has been limited to gas-phase removal of organics (vacuum extraction) and, to a lesser extent, solidification/stabilization (S/S) and biological treatment. These promising in situ treatments have been found to be much less effective in low-permeability clay and silt soils that are present at many sites. The hydrofracturing technology that is the subject of this agreement has the potential to overcome these difficulties and allow successful in situ treatment of soil at a greater number of sites.

Hydrofracturing was developed years ago by the petroleum industry to increase the yield of oil wells. The Risk Reduction Engineering Laboratory (RREL) has adapted it for use in soils to speed up existing in-place treatments for contaminated soil and to allow use of laboratory treatments that could not previously be applied in the field (1-4). Hydrofracturing is accomplished by applying water pressure to an unlined vertical or horizontal well. The fracture starts from a notch cut in the soil in the side of the well with a high-pressure water lance; the crack is kept open by pumping in a mixture of sand and gel. These "fracs" are up to 30 feet in diameter and are shaped like large, thin (one-inch thick) horizontal pancakes. The "fracs" are usually sandy zones where it is easy to add or recover gases and liquids (vapor extraction, soil flushing, pump and treat etc). Hydrofracturing is also useful for delivering (placing) treatment materials in deep soils that are difficult and costly to treat. Solid materials may be substituted for part or all of the sand to create subsurface deposits.

DBE SPECIAL CONDITION

The EPA's policy requires at least 8% of its Federal funding for prime and subcontracts be awarded to businesses or other organizations owned or controlled by socially and economically disadvantaged individuals.

As a recipient of monies under this IAG, the US Army Corps of Engineers must ensure to the fullest extent possible that at least 8% of funds for prime or subcontracts and subgrants for services are made available to businesses owned or controlled by socially and economically disadvantaged individuals, women-owned businesses, and Historically Black Colleges and Universities. (DBE)

The US Army Corps of Engineers must report to EPA showing the total extramural funds awarded and the amount and percentage of extramural funds awarded to DBEs by November 15, 1994. Reports should be submitted to:

Office of Small and Disadvantaged
Business Utilization (1230C)
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

2. Murdoch, L. C. 1993. Hydraulic Fracturing of Soil During Laboratory Experiments. *Geotechnique*
Part I: Methods and Observations, 43(2): 255-265.
Part II: Propagation, 43(2):267-276.
Part III: Theoretical Analysis, 43(2): 277-287.
3. Murdoch, L., M. Kemper, A. Wolf, E. Spencer, and P. Cluxton. 1993. Hydraulic and Impulse Fracturing to Enhance Remediation. IN: Abstract Proceedings of the 19th Annual Hazardous Waste Research Symposium (EPA/600/R-93/040, April 1993); USEPA Risk Reduction Engineering Laboratory, Cincinnati, OH 45268, pp. 197-201.
4. Vesper, S., L. Murdoch, R. Brand, P. Cluxton, M. Kemper, D. Kreuzmann, K. Pete Paris, F. Sheehy, and W. Davis-Hoover. 1992. The Use of Hydraulic Fracturing to Enhance In Situ Bioremediation. IN: Abstract Proceedings of the 18th Annual Research Symposium, (EPA/600/R-92/028, April 1992), USEPA Risk Reduction Engineering Laboratory, Cincinnati, OH 45268, pp. 59-61.
5. U.S. Environmental Protection Agency. 1993. Hydraulic Fracturing Technology: Application Analysis and Technology Evaluation Report (EPA/540/R-93/505 September 1993) Risk Reduction Engineering Laboratory, Cincinnati, OH 45268, 129p.
6. University of Cincinnati. 1994. Manual of Hydraulic Fracturing: Procedure, Equipment Design, and Operation. Draft final report to the USEPA Risk Reduction Engineering Laboratory, Cincinnati, Ohio for work assignment #3-41 under contract 68-C9-0031.