NM - 49

GENERAL CORRESPONDENCE

YEAR(S): 1991

State of New Mexico
ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT
Santa Fe, New Mexico 87505

OIL CONSERVATION DIVISION

New Mexico DRUG FREE It's a State of Mind!

December 16, 1991

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

MATTHEW BACA
DEPUTY SECRETARY

CERTIFIED MAIL
RETURN RECEIPT NO. P-690-155-039

Mr. B.D. Shaw, Environmental Coordinator
Amoco Production Company
200 Amoco Court
Farmington, New Mexico

Re: Compost Facility
San Juan County, New Mexico

Dear Mr. Shaw:

The Oil Conservation Division (OCD) has received your request, dated October 4, 1991, for approval to operate a composting operation for oil contaminated soils removed as part of your unlined pit reclamation program. The proposed location of the composting facility is the SE/4 SW/4, Section 14, Township 28 North, Range 12 West, NMPM, San Juan County, New Mexico.

The proposed treatment of the contaminated soils is an environmentally sound method of waste reduction and remediation. The proposed facility is considered to be a centralized surface waste disposal facility and, therefore, must comply with the requirements set forth in OCD Rule 711 except A.(2) and A.(3). Enclosed is a copy of Rule 711 with highlighted sections indicating the areas where additional information is needed to supplement the original request.

If you have any questions please call me at (505) 827-5812.

Sincerely:

Roger C. Anderson
Environmental Engineer

Enclosures

xc: Denny Foust- Aztec

VILLAGRA BUILDING - 408 Galisteo
Forestry and Resources Conservation Division
P.O. Box 1948 87504-1948
827-5830

Park and Recreation Division
P.O. Box 1147 87504-1147
827-7465

2040 South Pacheco
Office of the Secretary
827-5950

Administrative Services
827-5925

Energy Conservation & Management
827-5900

Mining and Minerals
827-5970

LAND OFFICE BUILDING - 310 Old Santa Fe Trail
Oil Conservation Division
P.O. Box 2088 87504-2088
827-5800

RECEIVED
OCT 21 1991
OIL CONSERVATION DIV.
SANTA FE

San Juan Operations Center

Southern
Rockies
Business
Unit

October 4, 1991

New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, NM 87504
Attn: Dave Boyer

New Mexico Environmental Department
P. O. Box 26110
Santa Fe, NM 87502
Attn: Ernie Rebuck

Bureau of Land Management
1235 La Plata Hwy
Farmington, NM 87401
Attn: Don Ellsworth

File: BDS-38-986

Approval Request - Composting Oily Soil

Amoco Production Company requests approval to compost oily soil as part of our unlined pit reclamation program. We anticipate a five year program beginning as soon as we receive approval. Amoco is very encouraged by our test results and believes waste reduction is critical to our environment. We will also be helping minimize waste at waste water treatment plants, manure buildup at San Juan Downs and NAPI, and paper at the Regional Landfill, by using these items in the composting process.

The following attachments are offered to support Amoco's request:

I. Lab Results
II. Consultant Review
III. Site Plan
IV. Testing Procedure

Should you require a meeting or joint meeting to discuss our request, please call me at 326-9219. Amoco would like to begin composting in early November. We appreciate your consideration and cooperation.

B. D. Shaw
Environmental Coordinator

BDS/slb

Attachments

imL
Inter-Mountain
Laboratories, Inc.

Attachment I

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

Case Narrative

On September 6, 1991 a sample set consisting of six samples was received by Inter-Mountain Laboratories - Farmington, NM. Enclosed is a copy of the chain of custody indicating the analytical parameters for which analysis was requested.

It is the policy of this laboratory to employ, whenever possible, analytical methods which have been approved by regulatory agencies. The methods which we use are referenced in SW-846, "Test Methods for Evaluating Solid Waste", USEPA, 1986; "Chemical Analysis of Water and Waste", USEPA, 1978; and other references as applicable. All reports in this package have the analytical methods and the references footnoted.

A Hewlett-Packard Gas Chromatograph was used for the analysis which determined the presence of target BTEX compounds in all samples.

In addition, the pH values are as follows: 1-In is 7.4, 1-Out is 7.3, 3-In is 7.5, 3-Out is 7.4, 5-In is 7.4, and 5-Out is 7.2.

Quality Assurance reports have been included in this package. These reports can be identified by the notation in the Sample Id portion of the report.

Please feel free to call if you have any questions.

Tony Tristano

Tony Tristano
Senior Analytical Chemist

Inter·Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #1 INSIDE	Report Date:	09/16/91
Laboratory Number:	F7131	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	1110	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter·Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #1 OUTSIDE	Report Date:	09/16/91
Laboratory Number:	F7132	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	1250	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter·Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #3 INSIDE	Report Date:	09/16/91
Laboratory Number:	F7133	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	1850	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter-Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #3 OUTSIDE	Report Date:	09/16/91
Laboratory Number:	F7134	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	208	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter-Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #5 INSIDE	Report Date:	09/16/91
Laboratory Number:	F7135	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	450	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter·Mountain Laboratories, Inc.

1714 Phillips Circle
Gillette, Wyoming 82716

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Client:	AMOCO PRODUCTION		
Sample ID:	GCU-250 #5 OUTSIDE	Report Date:	09/16/91
Laboratory Number:	F7136	Date Sampled:	09/06/91
Analysis:	TRPH	Date Received:	09/10/91
Sample Matrix:	SOIL	Date Extracted:	09/11/91
Preservative:	COOL	Date Analyzed:	09/11/91
Condition:	INTACT		

Parameter	Concentration (mg/Kg)	Detection Limit (mg/Kg)
Total Recoverable Petroleum Hydrocarbons	280	25

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA, 1978.
Sample was placed in basic solution overnight and extracted as a water sample.

Comments:

Analyst

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #1 Inside
Lab Id: 3706/7131
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	6.6	100
Cadmium	mg/L	0.010	1.0
Chromium	mg/L	0.09	5.0
Lead	mg/L	0.3	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.01	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: C B.

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS
Quality Control/Duplicate Analysis

Client: **Amoco Production**
Sample Id: #1 Inside
Lab Id: 3706/7131
Date: 09/24/91

Parameter:	Initial Sample Result mg/L	Second Sample Result mg/L	Relative Percent Difference
Arsenic	<0.1	<0.1	
Barium	6.6	6.6	0.0
Cadmium	0.010	0.010	0.0
Chromium	0.09	0.09	0.0
Lead	0.3	0.2	40.0
Mercury	<0.001	<0.001	
Selenium	<0.1	<0.1	
Silver	0.01	0.01	0.0

Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses, USEPA, July 1988.

Comment: _____

_____

_____

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS
Quality Control/Matrix Spike

Client: **Amoco Productions**
Sample Id: #1 Inside
Lab Id: 3706/7131
Date: 09/24/91

Parameter:	Spiked Sample Result mg/L	Sample Result mg/L	Spike Added mg/L	Percent Recovery
Arsenic	1.8	<0.1	2.2	81.8
Barium	7.6	6.6	1.0	100.0
Cadmium	0.462	0.010	0.575	78.6
Chromium	0.52	0.09	0.52	82.7
Lead	1.1	0.3	1.0	80.0
Mercury	0.009	<0.001	0.010	90.0
Selenium	1.9	<0.1	2.2	86.4
Silver	0.33	0.01	1.08	29.6 *

Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses, USEPA, July 1988.

Comments: * Poor recovery due to precipitation of silver with inorganic chlorides.

Prepared by: C.B.

Inter·Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #1 Outside
Lab Id: 3707/7132
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	7.5	100
Cadmium	mg/L	0.006	1.0
Chromium	mg/L	0.09	5.0
Lead	mg/L	0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.01	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #3 Inside
Lab Id: 3708/7133
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	5.2	100
Cadmium	mg/L	0.006	1.0
Chromium	mg/L	0.09	5.0
Lead	mg/L	0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.02	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #3 Outside
Lab Id: 3709/7134
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	4.4	100
Cadmium	mg/L	0.007	1.0
Chromium	mg/L	0.09	5.0
Lead	mg/L	0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.01	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: C.B.

Inter·Mountain Laboratories, Inc
1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #5 Inside
Lab Id: 3710/7135
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	4.4	100
Cadmium	mg/L	0.008	1.0
Chromium	mg/L	0.08	5.0
Lead	mg/L	0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.02	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #5 Outside
Lab Id: 3711/7136
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	4.1	100
Cadmium	mg/L	0.007	1.0
Chromium	mg/L	0.09	5.0
Lead	mg/L	0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	0.01	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: IML Blank
Lab Id: 3712
Matrix: Fluid
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/06/91
Date Received: 09/10/91
Date Analyzed: 09/21/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	<0.5	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter·Mountain
Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

Case Narrative

On September 3, 1991 a sample set consisting of seven samples was received by Inter-Mountain Laboratories - Farmington, NM. Enclosed is a copy of the chain of custody indicating the analytical parameters for which analysis was requested.

It is the policy of this laboratory to employ, whenever possible, analytical methods which have been approved by regulatory agencies. The methods which we use are referenced in SW-846, "Test Methods for Evaluating Solid Waste", USEPA, 1986; "Chemical Analysis of Water and Waste", USEPA, 1978; and other references as applicable. All reports in this package have the analytical methods and the references footnoted.

The results from the requested analysis on sample 1-JJ are as follows: TKN of 31.20%, Ammonia of 0.0003% TOC of 99.1%, and Moisture of 5.7%.

Quality Assurance reports have been included in this package. These reports can be identified by the notation in the Sample Id portion of the report.

Please feel free to call if you have any questions.

Tony Tristano

Tony Tristano
Senior Analytical Chemist

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, Wyoming 82801

CASE NARRATIVE

On 09/12/91, six TCLP extracts were received by Inter-Mountain Laboratories, Inc. at 1633 Terra Ave, Sheridan, Wyoming. The sample custody document indicated requests for analysis of parameters from the TC Rule analyte list. The samples arrived cool and intact, custody sheets remained with the extracts.

The TCLP preparations and extractions were performed following the steps defined by the EPA using Method 1311, SW-846, Nov. 1990 and found in the Federal Register, 40 CFR 261, Vol. 55, No. 126, June 29, 1990. A duplicate analysis was prepared to evaluate extraction reproducibility. A matrix spike was used to determine matrix effect on recovery of target analytes. Matrix spike information is used, via the TC Rule, for the final calculation of analyte concentrations. Method blanks are used to determine any method induced contaminations.

Limits of detection for each instrument/analysis are determined with respect to matrix effect, instrument performance under standard operating conditions, and sample dilution. TCLP results are reported as mass per unit volume of leachate. Data qualifiers may be used in accordance with USEPA data validation guidelines.

Reviewed by: Chris L Brackeen

Chris L. Brackeen
Environmental Chemist
Sheridan, WY

Data File Id: 00-309

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #1 Inside
Lab Id: 3773/7084
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	3.0	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS
Quality Control/Duplicate Analysis

Client: **Amoco Production**
Sample Id: #1 Inside (7084)
Lab Id: 3773
Date: 09/23/91

Parameter:	Initial Sample Result mg/L	Second Sample Result mg/L	Relative Percent Difference
Arsenic	<0.1	<0.1	
Barium	3.0	3.2	6.5
Cadmium	<0.005	<0.005	
Chromium	<0.01	<0.01	
Lead	<0.2	<0.2	
Mercury	<0.001	<0.001	
Selenium	<0.1	<0.1	
Silver	<0.01	<0.01	

Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses, USEPA, July 1988.

Comment: _____

_____

_____

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS
Quality Control/Matrix Spike

Client: **Amoco Production**
Sample Id: #1 Inside (7084)
Lab Id: 3773
Date: 09/23/91

Parameter:	Spiked Sample Result mg/L	Sample Result mg/L	Spike Added mg/L	Percent Recovery
Arsenic	1.8	<0.1	2.2	81.8
Barium	3.6	2.7	1.0	90.0
Cadmium	0.460	<.005	0.575	80.0
Chromium	0.42	<0.01	0.52	80.8
Lead	0.8	<0.2	1.0	80.0
Mercury	0.010	<0.001	0.010	100.0
Selenium	1.9	<0.1	2.2	86.4
Silver	0.05	<0.01	1.08	4.6 *

Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses, USEPA, July 1988.

Comments: * Poor recovery due to the precipitation of silver with inorganic chlorides.

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #1 Outside
Lab Id: 3774/7085
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	2.9	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #3 Inside
Lab Id: 3775/7086
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	3.2	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #3 Outside
Lab Id: 3776/7087
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	2.9	100
Cadmium	mg/L	0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: 

Inter-Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #5 Inside
Lab Id: 3777/7088
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	3.3	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: _____

Inter-Mountain Laboratories, Inc

1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Productions**
Sample Id: #5 Outside
Lab Id: 3778/7089
Matrix: Soil
Preservation: COOL / INTACT

Report Date: 09/24/91
Date Sampled: 09/03/91
Date Received: 09/04/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	3.0	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A: Inductively Coupled Plasma-Atomic Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: C. B

Inter·Mountain Laboratories, Inc.
1633 Terra Avenue
Sheridan, Wyoming 82801

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TRACE METAL CONCENTRATIONS

Client: **Amoco Production**
Sample Id: Internal Lab Blank
Lab Id: 3779
Matrix: Fluid
Preservation: Intact

Report Date: 09/24/91
TCLP Extract: 09/10/91
Date Analyzed: 09/20/91

Parameter:	(units)	Analytical Result	Regulatory Level
Arsenic	mg/L	<0.1	5.0
Barium	mg/L	<0.5	100
Cadmium	mg/L	<0.005	1.0
Chromium	mg/L	<0.01	5.0
Lead	mg/L	<0.2	5.0
Mercury	mg/L	<0.001	0.2
Selenium	mg/L	<0.1	1.0
Silver	mg/L	<0.01	1.0

Toxicity Characteristic Leaching Procedure, Final Rule, Federal Register, 40 CFR 261-302, Part V, EPA Vol 55, No. 126 June 29, 1990
Method 6010A, Inductively Coupled Plasma, Emission Spectroscopy, SW-846, Nov. 1990.
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), SW-846, Nov. 1990.

Prepared by: CB

see attached explanation

inl

Inter-Mountain Laboratories, Inc.

2506 West Main Street | Farmington, New Mexico 87401 | Tel. (505) 326-4737

Pile #	Sample id	Lab #	TPH mg/Kg	Total BTEX	TKN %	Density lbs/cu ft	Moisture %	pH	Ash %	TOC %	Ammonia %	P_2O_5 %	Potassium %
1		6670	13,400	5,599									
1		6704	10,300	1,450									
1		6748	17,000										
1		6851	8,630		0.41		8.5						
1		6968			0.23		20.7						
1-A		6706	10,500	263									
1-AA		6903			5.66		4.5					15.73	0.12
1-B	S	6712	265000	1596000	7.13		2.3						
1-B	L	6712	91,800	2404000									
1-BB		6944			0.14								0.08
1-C		6729	25,100	258	22.50		0.2						
1-CC		6959			23.70								
1-D		6730	145000	659500	5.49		1.1						
1-DD		6960		last BTEX	10.30							25.06	0.13
1-E		6747		clean							22.3		
1-E		6751	63,700	↓	10.80								
1-EE		6961		↓	5.40							9.35	

imi

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

Sample id	Lab #	TPH mg/Kg	Total BTEX	TKN %	Density lbs/cu ft	Moisture %	pH	Ash %	TOC %	Ammonia %	P_2O_5 %	Potassium %
1-F	6752	15,900										
1-FF	6962		clean	10.30								0.10
1-G	6753	35,300										
1-I	6769									21.8		0.21
1-J	6770	4,930		12.40			7.4					
1-JJ	7083			31.20		5.7			99.1			
1-K	6774									14.61		7.01
1-L	6775	128000		5.52						3.40		
1-M	6797				47.8	14.6						
1-N	6850	7,710		0.61		29.6						
1-O	6813	4,730				8.3						
1-P	6814	4,220				15.6						
1-Q	6815	1,470				13.3						
1-R	6820	4,800		47.23		9.7						
1-S	6816	17,400		11.61		10.9						2.30
1-T	6817			6.91		10.3				0.11	<0.01	4.68
1-U	6818	ok		27.04		18.5				0.02	0.02	0.15

imL

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

Sample id	Lab #	TPH mg/Kg	Total BTEX	TKN %	Density lbs/cu ft	Moisture %	pH	Ash %	TOC %	Ammonia %	P_2O_5 %	Potassium %
1-V	6819			9.78		26.4				1.69	6.42	0.23
1-X	6826	41,340		7.26		38.3						
1-Y	6894			6.20								1.06
1-Z	6895			6.53								2.75
1-In	7131	710	-969				7.4					
1-Out	7132	740	-969				7.3					
Pile # 2	6671	10,400	3,124									
2	6705	7,580	1,084									
Pile # 3	6680	11,200	621									
3	6749	7,950										
3	6852	3,640		0.38		8.8						
3-In	7133	1,160	+969				7.5					
3-Out	7134	178	-969				7.4					
Pile # 4	6681	948	ND									
4	6710	1,490	ND									
4	6771	89,600										
Pile # 5	6682	4,470	808									

iml

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Sample id	Lab #	TPH mg/Kg	Total BTEX	TKN %	Density lbs/cu ft	Moisture %	pH	Ash %	TOC %	Ammonia %	P_2O_5 %	Potassium %
5	6711	7,910	794									
5	7056			0.11		7.5						
5-In	7135	500	-969				7.4					
5-Out	7136	258	-969				7.2					
6	6822	24,281			119.0	11.7						
6	7095	910				14.8						
6	7174	1,430										
6-A	6827			0.66	67.1	9.2	7.2	25.45				
6-B	6828	16,303		0.05	138.8	12.1	7.1	6.56	5.99			
6-C	6829			0.11	2.3	1.9	6.1	80.20				
6-E	6892			0.15		31.9						
6-F	6943			38.00								
6-G	6963					27.2						
Cow	6974	24										
Paper	6975	141										
Crdbrd	6976	307										
WoodCh	6977	258										

imi

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Sample id	Lab #	TPH mg/Kg	Total BTEX	TKN %	Density lbs/cu ft	Moisture %	pH	Ash %	TOC %	Ammonia %	P_2O_5 %	Potassium %
Sludge	6978	2,900										
Horse	6979	130										

****NOTES****

This summary is based upon September 19, 1991 available results for Amoco at GCU-250.

The values for the Ash and Total Organic Carbon (TOC) represent the percent material lost during heating; 850 degrees Celsius and 600 degrees Celsius respectively.

Sample 1-B was divided into a solid (S) and a liquid (L) portion and analyzed separately.

The BTEX results for each component was added together resulting in a single number in ug/Kg. For the individual component concentrations consult the reports for those samples.

Cow = Cow Manure
Crdbrd = Cardboard
Wood Ch = Wood Chips
Horse = Horse Manure

Using the percentages of raw components that were used in preparing the compost a blank value was calculated by multiplying the percentage of the component times the TPH value of the pure component and adding these values together. The result is a raw materials TPH backout value of 969 mg/Kg that can be subtracted from the TPH compost values on sample identifications 1-In, 1-Out, 3-In, 3-Out, 5-In, & 5-Out.

Feel free to contact me with any questions.

Tony Tristano

Tony Tristano - Senior Analytical Chemist

JERRY FINNEY
JWF ASSOCIATES

BUDDY SHAW
ENVIRONMENTAL CO-ORDINATOR
AMOCO PRODUCTION
200 AMOCO COURT
FARMINGTON, NEW MEXICO 87401

EXPLANATION OF SAMPLES ON IML LAB REPORTS.
NOTE-WHEN NUMBERS SUCH AS 41-0-0 OR 21-0-0 ARE USED N-NITROGEN , P-PHOSPHATES, K-POTASSIUM DENOTES N-P-K VALUES.

THE LAB SAMPLES LABELED 1-B THRU 1-KK WERE SEPARATE TESTS CONDUCTED IN 5 GALLON BUCKETS WITH VARIOUS BLENDS OF FERTILIZER NUTRIENTS. THESE WERE CONDUCTED TO PROVE THE USE OF VARIOUS NUTRIENTS TO ACCELERATE THE DESTRUCTION OF HYDROCARBONS, AND ACHIEVE AN ORGANIC FERTILIZER OF DIFFERENT GRADES.

THE FOLLOWING IS A BRIEF DESCRIPTION OF EACH SAMPLE. ALL ARE BASE MIXES FROM PILE #1.

1-A DRIED COMPOST-RUN FOR TPH
1-B MIXED COMPOST, WITH HEAVY PARAFIN AND PRODUCED WATER AND 42-0-0 AREA IN PILE HEAT. TESTED FOR TPH, BTX, TKN.
1-C 42-0-0 AREA AND COMPOST AND OIL MIXED ON 7-14 AND SAMPLED ON 7-25 TESTED FOR TPH,TKN, BTX.
1-D THIS IS THE MIX IN SAMPLE 1-B WITH 21-0-0 AMMONIUM SULFATE ADDED AND THE ANALYSES RUN 2 HOURS AFTER MIXING AND PLACING INSIDE OF PILE.
1-E THIS IS SAMPLE OF BUCKET B AND 1-D ONLY TAKEN AT 72 HOURS AFTER REMOVING FROM HEAT TO SEE IF THE REACTION CONTINUED.
1-F SAMPLE OF POTASSIUM BLEND 0-0-20- AFTER COOKING AT 130 DEGREES FOR 24 HOURS AND DRYING FOR 72 HOURS.
1-H SAMPLE OF CRYSTALS FROM BOTTOM OF BUCKET 1-D, WITH WATER AND 0-0-20 POTASSIUM ADDED AND COOKED AT 130 DEGREES FOR TWO HOURS WITH CRYSTALS TAKEN FROM BOTTOM.
1-I CRYSTALS ON TOP OF BUCKET SAME AS 1-H AND 1-D
1-J BUCKET 1-D DRIED IN SUN FOR 48 HOURS
1-K CRYSTALS FROM 1-J AND 1-D CATION AND ANION
1-L SAME AS 1-K TESTED FOR TPH, TKN AND AMMONICAL NITROGEN.
1-M ACTUAL SAMPLE OF PILE #1 FOR MOISTURE AND DENSITY TO EVALUATE PERFORMANCE.
1-N SAMPLE OF PILE #1 WITH 10-0-0 BLOOD MEAL ADDED.
1-O PILE #1-N FOR MOISTURE AND TPH
1-P PILE #1 FOR MOISTURE AND TPH
1-Q PILE #5 MOISTURE TPH
1-R BUCKET C CRYSTALS CATION ANION, TKN,TPH.
1-S BOTTOM OF BUCKET D FOR POTASSIUM TKN-TPH

1-T SAMPLE LOF 11-52-0 FOR AMMONIA PK-TKN
1-U SAMPLE OF 0-0-20 FOR AMMONIA P-K-TKN
1-V SAMPLE OF 20-52-0 FOR AMMONIA P-K-TKN
1-X 72 HOURS SAMPLE OF SAMPLE 1-J AND BUCKET D FOR TPH AND TKN
1-Y BUCKET 1-D CRYSTALS FROM BOTTOM OF BUCKET
1-Z BUCKET 1-D CRYSTALS FROM TOP OF BUCKET
1-AA 11-52-0 FERTILIZER FOR TKN P-K, MOISTURE, TPH, ANION AND CATION.
1-BB CRYSTALS FROM 1-AA FOR TKN-TPH CATION AND ANION.
1-CC LIQUID FROM 1-C AFTER 2 WEEKS FOR TPH TKN-TOC.
1-DD TOP CRYSTALS FROM BUCKET (AA FOR TPH TKN-TOC
1-EE SOLIDS FROM BUCKET 1-AA FOR TPH TKN PHOSPHATES TOC
1-FF MIDDLE CRYSTALS FROM BUCKET 1-AA FOR TOC-TPH-TKN CATION ANION
1-JJ CRYSTALS FROM BUCKET RUN FOR TKN-TOC-TPH
6-A NAPI FEED LOT MANURE FOR ASH, MOISTURE, DENSITY, TKN, PH.
6-B HOMOGENIZED ONLY DIRT TEST SAME AS 6-A
6-C GROUND MAGAZINES-SAME TESTS
6-D DIGESTED SLUDGE-FARMINGTON-SAME TESTS
6-E BEGINNING COMPOST-TPH-MOISTURE-TKW
6-F PILE #6 TPH-BIX-TKW-72 HOURS AFTER MIXING.

Jerry Finney

10-2-91

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

Attachment I-4

VOLATILE AROMATIC HYDROCARBONS

Client: Amoco
Project Name: GCU-250
Sample ID: #1 Inside
Laboratory Number: 7131
Analysis Requested: BTEX
Sample Matrix: Soil

Report Date: 09-24-91
Date Sampled: 09-06-91
Date Received: 09-06-91
Date Analyzed: 09-20-91
Preservative: Cool
Condition: Ambient & Intact

Parameter	Concentration (ppb) (ug/Kg)	Det. Limit (ug/Kg)
Benzene	97.7	35
Toluene	87.8	35
Ethylbenzene	ND	35
p,m-Xylene	182.5	35
o-Xylene	160.7	35

SURROGATE RECOVERIES:	Parameter	Percent Recovery
	Bromfluorobenzene	79.1 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).
ND - Parameter not detected at the stated detection limit.

Comments:

Tony Tristano
Analyst

Inter·Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

VOLATILE AROMATIC HYDROCARBONS

Client:	Amoco	Report Date:	09-24-91
Project Name:	GCU-250		
Sample ID:	#1 Outside	Date Sampled:	09-06-91
Laboratory Number:	7132	Date Received:	09-06-91
Analysis Requested:	BTEX	Date Analyzed:	09-20-91
Sample Matrix:	Soil	Preservative:	Cool
		Condition:	Ambient & Intact

Parameter	Concentration (ug/Kg)	Det. Limit (ug/Kg)
Benzene	85.4	35
Toluene	ND	35
Ethylbenzene	ND	35
p,m-Xylene	ND	35
o-Xylene	ND	35

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Bromfluorobenzene	67.3 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).

ND - Parameter not detected at the stated detection limit.

Comments:

Tony Trustano

Analyst

Inter·Mountain
Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

VOLATILE AROMATIC HYDROCARBONS

Client: Amoco
Project Name: GCU-250
Sample ID: #3 Inside
Laboratory Number: 7133
Analysis Requested: BTEX
Sample Matrix: Soil

Report Date: 09-24-91
Date Sampled: 09-06-91
Date Received: 09-06-91
Date Analyzed: 09-20-91
Preservative: Cool
Condition: Ambient & Intact

Parameter	Concentration (ug/Kg)	Det. Limit (ug/Kg)
Benzene	67.3	35
Toluene	ND	35
Ethylbenzene	ND	35
p,m-Xylene	ND	35
o-Xylene	98.5	35

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Bromfluorobenzene	139 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).
ND - Parameter not detected at the stated detection limit.

Comments:

Tony Tristano
Analyst

Inter·Mountain
Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

VOLATILE AROMATIC HYDROCARBONS

Client: Amoco
Project Name: GCU-250
Sample ID: 3 Outside
Laboratory Number: 7134
Analysis Requested: BTEX
Sample Matrix: Soil

Report Date: 09-24-91
Date Sampled: 09-06-91
Date Received: 09-06-91
Date Analyzed: 09-20-91
Preservative: Cool
Condition: Ambient & Intact

Parameter	Concentration (ug/Kg)	Det. Limit (ug/Kg)
Benzene	69.1	35
Toluene	38.0	35
Ethylbenzene	ND	35
p,m-Xylene	54.8	35
o-Xylene	ND	35

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Bromfluorobenzene	69.8 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).
ND - Parameter not detected at the stated detection limit.

Comments:

Tony Tristano
Analyst

Inter·Mountain
Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

VOLATILE AROMATIC HYDROCARBONS

Client:	Amoco	Report Date:	09-24-91
Project Name:	GCU-250		
Sample ID:	#5 Inside	Date Sampled:	09-06-91
Laboratory Number:	7135	Date Received:	09-06-91
Analysis Requested:	BTEX	Date Analyzed:	09-20-91
Sample Matrix:	Soil	Preservative:	Cool
		Condition:	Ambient & Intact

Parameter	Concentration (ug/Kg)	Det. Limit (ug/Kg)
Benzene	57.8	30
Toluene	ND	30
Ethylbenzene	ND	30
p,m-Xylene	ND	30
o-Xylene	ND	30

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Bromfluorobenzene	70.3 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).

ND - Parameter not detected at the stated detection limit.

Comments:

Tony Tristano

Analyst

Inter·Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

VOLATILE AROMATIC HYDROCARBONS

Client:	Amoco	Report Date:	09-24-91
Project Name:	GCU-250		
Sample ID:	5 Outside	Date Sampled:	09-06-91
Laboratory Number:	7136	Date Received:	09-06-91
Analysis Requested:	BTEX	Date Analyzed:	09-20-91
Sample Matrix:	Soil	Preservative:	Cool
		Condition:	Ambient & Intact

Parameter	Concentration (ug/Kg)	Det. Limit (ug/Kg)
Benzene	76.3	30
Toluene	39.1	30
Ethylbenzene	ND	30
p,m-Xylene	ND	30
o-Xylene	ND	30

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Bromfluorobenzene	84.2 %

Method: Method 8020, Aromatic Volatile Organics, SW-846, USEPA, (Sept. 1986).

ND - Parameter not detected at the stated detection limit.

Comments:

Tony Tristano

Analyst

Attachment II

Engineering Biosciences Research Center
Cater-Mathis Hall • Texas Engineering Experiment Station • The Texas A&M University System • College Station, Texas 77843-2476 • Office 409/845-3046 • Fax 409/845 3744

October 2, 1991

Mr. Buddy Shaw, Environmental Coordinator
Amoco Production Corporation
200 Amoco Court
Farmington, New Mexico 87401

Dear Buddy,

In reviewing the report I submitted to you last week I noticed a few typographical errors which do not affect the meaning. There is one other error I made which does affect the meaning. The correct units for the BTEX measurements in my report should be parts per billion (micrograms per kilogram) rather than parts per million, as I mistakenly reported. I had used the units for TPH rather than the correct BTEX units when I wrote up the report. I have not been able to find any other errors of substance. Please call or write if you have questions.

Sincerely yours,

Bruce E. Dale, Director
Professor, Department of Chemical Engineering
Professor, Department of Agricultural Engineering

COMPOSTING FOR REMEDIATION OF OIL FIELD WASTES: A PRELIMINARY TECHNICAL/REGULATORY EVALUATION

Submitted to:

Mr. Buddy Shaw, Environmental Coordinator
Amoco Production Corporation
200 Amoco Court
Farmington, New Mexico 87401

Submitted by:

Bruce E. Dale, Ph. D.
Professor of Chemical Engineering
Professor of Agricultural Engineering
Director, Engineering Biosciences Research Center
Cater-Mattil Hall
Texas A&M University
College Station, Texas 77843-2476

Date: September 25, 1991

EXECUTIVE SUMMARY

I was retained by Mr. Buddy Shaw, Environmental Coordinator for AMOCO Production Corporation, to provide an independent technical assessment of composting as a means of remediating oil field wastes. The composting tests were conducted by Mr. Jerry Finney of JWF Associates in Farmington, New Mexico. The composting mixture consisted of sewage sludge, manure, waste paper and oily dirt in approximately equal volumes.

In short, the composting tests were successful. A highly active microbial community was maintained within the composting piles over a period of many weeks as evidenced by the high pile temperatures maintained, the disappearance of any oily smell or appearance, the disappearance of sewage sludge odor and disintegration of the cardboard boxes. The microbes consumed both the hydrocarbons in the oily dirt and the cellulosics in the cardboard boxes. Benzene, toluene and xylene (BTEX) concentrations were reduced to acceptable limits and eight heavy metals as determined by TCLP were also well under regulatory limits. The analytical test for Total Petroleum Hydrocarbons (TPH) was not originally developed for a sample matrix containing a large fraction of biological material and gave false positive results. These false positives showed TPH increasing in the later stages of composting and then decreasing again. This is clearly impossible; microbes do not make oil. They do make compounds with carbon-hydrogen bonds which may appear as TPH on the infrared analysis. When the apparent TPH was corrected by subtracting a weighted average of the apparent TPH in the starting composting materials (excluding the oily dirt) the TPH in the final composted products were within regulatory limits.

Composting therefore appears to be a viable, efficient, environmentally sound alternative to land farming for remediation of oil field wastes. Additional supplies of sewage sludge and manure beyond those available in the Farmington area will be needed to remediate the large estimated volumes of oily dirt in the San Juan basin and adjacent areas or improved composting methods will need to be developed. Using existing, microbially active, compost piles as if they were sourdough starters to begin new piles should be a viable option to supplement the existing supplies of sludge and manure. No insuperable technical obstacles to large scale composting for remediation of oil field wastes were uncovered by this test and evaluation.

BACKGROUND AND OVERVIEW

Composting of petroleum-based oil field wastes was investigated as an alternative to land farming of these wastes. Land farming is increasingly restricted as a means of disposing of the contents of oil pits at gas-oil wells in the Farmington area. Restrictions on land farming arise from lack of available space as well as from increasingly strict environmental regulations. Composting offers a potentially more rapid, environmentally more acceptable means of disposing of these oily wastes. The basic principle involved is that the hydrocarbons offer a "substrate" or food for the microorganisms in the composting mixture which they consume during growth and their maintenance as living organisms. This is the same principle utilized by the oil-consuming microbes for remediation of oil spills in marine environments. However, the concentration and variety of microbes present in the composting mixture, as well as the high temperatures in the pile which tend to speed up microbial action, should make the process much more rapid and complete than is possible in dispersed situations such as spills in the open ocean.

CONDUCT OF THE TEST AND ANALYSES

The composting evaluation was carried out by Mr. Jerry Finney and his associates at an AMOCO production well near the Farmington area. Five different composting piles were constructed within a fenced area near the oil pit. The oil content in each of these piles generally decreased with increasing pile number from pile one to pile five. The piles consisted of a mixture of municipal sewage sludge, waste paper (mostly cardboard boxes), horse manure and oily dirt from the pit at the site. The approximate volume percents of each of the four components in the pile were 30% sludge, 20% paper, 25% manure and 25% oily dirt. The composting began in late June and continued for several weeks thereafter.

During the composting process the piles were monitored for temperature (elevated temperatures are strong evidence for good microbial activity in composting), total petroleum hydrocarbons (TPH), total BTEX (benzene, toluene and xylene), moisture and other components. In addition, Toxicity Characteristic Leaching Procedures (TCLPs) were run to evaluate a variety of organic chemicals and heavy metals. Except for pile temperatures all analytical tests were run by Inter-Mountain Laboratories (IML) in Farmington. Standard duplicate analyses and

recoveries of surrogate samples were run by IML as quality control procedures to verify the validity of the test results. These duplicates and recoveries were always within acceptable ranges, indicating that the test results were valid and can be used with confidence.

TPH Test Results are Suspect

A difficulty arose during the evaluation of the TPH levels during the test. This test is essentially a Freon extraction of the sample followed by infrared analysis to detect the presence of carbon-hydrogen bonds in the material dissolved in the Freon. All microbes and their decomposition products (dead microbes and their fragments) have abundant carbon-hydrogen bonds and will then show up as false positives in tests for measuring TPH if these microbial components are extracted into the Freon. Simply put, this means that the TPH procedure is unreliable in the presence of microorganisms or microbial decomposition products. Thus the initial drop in TPH observed in many of the piles followed by a rise in TPH is consistent with the idea that the microbes first digest the oil and other carbon sources (such as the cardboard boxes) and then produce additional microbial mass which ages, dies and releases compounds (lipids, carbohydrates, proteins, etc.) which show up as TPH in the test. These cell constituents, however, are <u>not</u> petroleum hydrocarbon compounds although they contain carbon-hydrogen bonds and will appear as TPH on the TPH test. Thus compensating for the presence of TPH-false compounds by subtracting a weighted average of the apparent TPH in the starting materials (sludge, paper, manure, etc.) is a reasonable means of correcting for an inadequate experimental method.

RESULTS

Overall Evaluation

Based on the high temperature profiles maintained over several weeks by each of the five piles, the disappearance of the liquid oil from the piles, the disappearance of complex carbohydrates (cardboard boxes, straw residues from manure, etc) and the smell of the piles, it is obvious that microbial activity in the piles was extensive and long lasting. Even during my visit over two months after beginning the test, the piles were still warm, indicating continuing but less vigorous microbial activity. The more oil in the pile, the higher the temperature obtained. Pile #1

maintained temperatures near or above155 F for almost a month. Other piles had somewhat lower temperatures but all piles maintained temperatures of 130 F or above for many days, which is primary evidence for extensive, aerobic microbial activity. The moisture levels in these piles were generally below 30% by weight which is significantly less than the 65% moisture usually thought necessary for composting. Whether we choose to call this "composting" or not is irrelevant, the fact is that aerobic microbial activity continued for many weeks and consumed both oil and cellulosic materials.

When I visited the site on September 13, there was no oil visible in the piles, even though a video of pile construction showed the oil being poured on the pile. No oily smell was present. Instead the predominant smell of the piles was a musty, moldy smell similar to that found in a root cellar. This smell is consistent with the visible colonization of the piles by large numbers of whitish grey fungi (molds). These molds thrive best in low water environments such as those found in these piles near the end of the composting cycle.

Constraints on Large Scale Composting in the Farmington Area

Given estimates on the number and size of AMOCO pits in the Farmington area (approximately 4,000 pits each 25 feet long by 25 feet wide by 5 feet deep) I calculated the approximate amount of AMOCO oily dirt to be remediated to be in the neighborhood of 1 million tons. If this is done over 5 years, approximately 100,000 cubic yards of oily dirt per year will need to be treated. At the levels of raw material used in this test that translates into an annual demand of about 150,000 yards of sludge, 100,000 yards of paper and 150,000 yards of manure. Ample paper is available in the area but much more manure and sludge will be needed than is currently available. This is not expected to be a severe hurdle since actively composting piles can be subdivided (much like a sourdough starter) to provide the microbes which will then continue to grow on the ample food (oily dirt and paper) provided for them. There may also be financial/political benefits of hauling sludge from Albuquerque or Santa Fe.

Laboratory Analyses

BTEX Laboratory analyses showed that benzene, toluene, xylene levels in all piles sampled were reduced to well under the regulatory

levels of 50 ppm total BTEX with less than 10 ppm benzene. For Pile #1 for instance, the initial level of 48 ppm BTEX was reduced to less than 2 ppm in less than three weeks.

TPH Total petroleum hydrocarbon levels in Piles #1 and #2 started out at about 10,000 mg/kg or about 1 percent by weight which is one hundred times the regulatory limit of 100 ppm. These TPH levels decreased over the first week or two of composting and then jumped back up to more than the initial levels before tending to decrease again. Clearly the microbes are not producing oil so these results must be a false positive caused by the presence of some other component in the mixture which is behaving as TPH in the analytical test. Some possible compounds which might be responsible for these false positives were mentioned above.

However, when the TPH results were adjusted by subtracting a weighted average of the apparent TPH in the starting materials (again, except for the oily dirt), the final TPH levels of the piles were within acceptable ranges. The sewage sludge has by far the highest content of apparent TPH compounds of any of the starting materials. It also has by far the highest microbial content so this is consistent with the idea suggested above that microbes or their breakdown products are responsible for the increase in apparent TPH. Ultimately, a more reliable test for true petroleum hydrocarbons in these composting systems may need to be developed.

TCLP Metals Leaching of metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) from the composted materials was determined by standard EPA procedures. In all cases the leaching of these metals was well under the regulatory levels and for arsenic, chromium, lead, mercury, selenium and silver the metal levels in the leachate are below detection limits. Total metals in these samples were also generally low, except for barium which has 200-350 mg/kg. Detectable amounts of cadmium and chromium (approximately 1 mg/kg) as total metals were also found. These metals are known to be present in most sewage sludges.

RECOMMENDATIONS

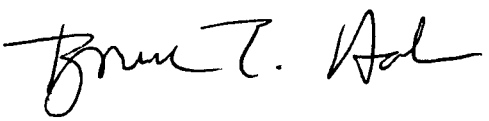
1) Oxygen levels in the piles should be monitored during some

subsequent tests as additional assurance that aerobic, oxygen-consuming processes are occurring.

2) The change in microbial populations (bacteria, yeasts, fungi, etc.) should be monitored in subsequent tests to relate shifts in major microbial population groups to performance of the composting operation.

3) The concept of using an active composting pile to start a new composting pile should be tested as soon as possible.

4) An alternative to the TPH test should be sought and/or direct proof obtained that biological compounds such as proteins, lipids and carbohydrates show as false positives on the TPH test.



Bruce E. Dale, Ph. D.
September 25, 1991

Attachment IV

Testing Procedure

1. Initial Test of Pit to be reclaimed - Metals

2. Tests to be done prior to removal of soil as fill material at excavated pits
   - A. TCLP
   - B. BTEX
   - C. pH

250 FT

305 FT

400 FT

555 FT

TREATED SOIL
STEP III (FINISHED)

TREATED SOIL
STEP II (OLD)

TREATED SOIL
STEP I (NEW)

SITE PLAN

SCALE 1" = 20FT

NORTH

KEYED NOTES

1. OILY DIRT STORAGE
2. MANURE STORAGE
3. NUTRIENT STORAGE BLDG
4. PAPER STORAGE BLDG
5. TUB GRINDER
6. STIRRED SLUDGE TANK
7. STIRRED REACTOR TANK
8. PUG MILL
9. PUG MILL CONVEYOR
10. TREATED SOIL STORAGE
11. SITE OFFICE
12. 16 FT GATE
13. 6FT CHAIN LINK FENCE w/BARBED WIRE
14. INTERIOR ACCESS ROAD
15. CONTAINMENT BERM
16. NEW FILL/PUMP CONNECTION
17. WATER STORAGE TANK
18. FINISHED PRODUCT TANK
19. WET OIL STORAGE TANK #1
20. WET OIL STORAGE TANK #2
21. PIT OIL STORAGE TANK
22. SEDIMENT FILTER TANK
23. COALESER
24. EXISTING SITE EQUIPMENT
25. EXISTING PUMP JACK
26. EXISTING DEHYDRATORS
27. EXISTING WELL HEAD
28. EX FILL/DUMP CONNECTION

PROJECT INFO

1 GALLEGOS CANYON UNIT
FEDERAL LEASE # SF-078828A
WELLS # 216 & #25
LOCATION: SE/4,SW/4,(N)
SEC14, T28N, R12W

2 ACTIVE STORAGE OF TREATED SOIL 6,850cy

BY	REVISION	DATE

PECOS BILL SPECIALITIES
P.O.Box 1264
Farmington, NM 87499-1264
(505) 327-6400
fax (505) 325-7765

SITE PLAN & PROJECT INFO
AMOCO COMPOSTING PROJECT
SITE #1

AMOCO PRODUCTION COMPANY
200 AMOCO COURT, FARMINGTON, NM 87401

DATE: SEPT'91
DRAWN BY: GEB
PROJ. 91601
SCALE: NA
SHEET C1
OF 1