November 18, 1999

NMED HRMB
2044 A Galisteo Street
Santa Fe, NM 87505

Project Name/Number: LOST RIVER

Attention: Kirby Olson

On 09/22/99, Pinnacle Laboratories Inc., (ADHS License No. AZ0592 pending), received a request to analyze aqueous and non-aqueous samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

All analyses were performed by ATEL, Tucson, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

Enclosure
<table>
<thead>
<tr>
<th>PINNACLE ID #</th>
<th>CLIENT DESCRIPTION</th>
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The above referenced samples were received in our laboratory on September 23 of this year. They comprised 4 aqueous and 6 nonaqueous samples to be analyzed for perchlorate. It was known from discussions with the client that the aqueous samples possessed very high conductivities and that high sulfate levels were potentially present. The nonaqueous samples were extracted with reagent water using standard protocols. Initial analyses of both the aqueous samples and the extracts showed that the background levels of anions in the samples precluded any meaningful data being acquired without some sort of pretreatment or dilution. Believing the problem to be due to high levels of sulfate, we attempted to use a Dionex product, the OnGuard-Ba pretreatment cartridges, to remove excess sulfate. Many approaches based on these cartridges were tried with no success. They did, in fact, seem to add to the problem. We were aware that EPA in Cincinnati had some experience with samples from a similar source and placed a call to Dan Hautman, who is currently developing a method for perchlorate analysis. He said that the samples were extremely high in chloride rather than sulfate, which explained why we could not get the OnGuard-Ba cartridges to work. We also discussed the impact of sample conductivity on perchlorate analysis. Mr. Hautman said that he considered the upper limit of sample conductivity for perchlorate analysis was about 3000 mS/cm and that the similar samples he had dealt with had conductivities of over 30,000 mS/cm. His suggestion was to dilute the samples. We measured the conductivities of the aqueous samples and confirmed they were in excess of 30,000 mS/cm. A ten fold dilution did not however, seem to sufficiently reduce the background. The chromatogram was still one big peak and it seems that Mr. Hautman’s method is better able to handle high backgrounds than is ours. Being reluctant to spend much more time on these samples we then diluted them 100 fold, analyzed them and reported the results. Our detection limit is 500 ppb for the aqueous samples, which is much higher than we had hoped. All of the appropriate quality control samples were analyzed and were within specifications.
- CERTIFICATE OF ANALYSIS -

**Client #:** T0499  
**Pinnacle Laboratories, Inc.**  
2709-D Pan American Freeway, NE  
Albuquerque, NM 87107-  

**Attn:**  

**Our Lab #:** 092399038  
**Date Logged-In:** 9/23/1999  
**Matrix:** Other/Undefined  
**Project #:**  

**Report Date:** 29-Oct-99  
**Phone:** (505) 344-3777  
**FAX:** (505) 344-4413  

**Your Sample ID:** 909062-01  
**Sample Source:** Other/Undefined  
**Client Project #:** PO#: 092338  
**Date Submitted to Lab:** 09/23/1999  

- COLLECTION INFORMATION -  

**Date/Time/By:** 09/21/1999 9:26 AM  

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Report Approved By: [Signature]

Arizona Lab License No. AZ0009

Lab Number 092399038: Page 1
- CERTIFICATE OF ANALYSIS -

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn:

Phone: (505) 344-3777   Ext:
FAX: (505) 344-4413

Our Lab #: 092399039
Date Logged-In: 9/23/99
Matrix: Other/Undefined
Project #: 

Your Sample ID: 909062-02
Sample Source: Other/Undefined
Client Project #: 
Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999  9:20 AM

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End of Report

Report Approved By: [Signature]

Arizona Lab License No. AZ0009
- CERTIFICATE OF ANALYSIS -

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn: 

Our Lab #: 092399040
Date Logged-In: 9/23/99
Matrix: Other/Undefined
Project #: 

Your Sample ID: 909062-03
Sample Source: Other/Undefined
Client Project #: PO#: 092338
Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 10:35 AM

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End of Report

Report Approved By: [Signature]

Arizona Lab License No. AZ0009
**- CERTIFICATE OF ANALYSIS -**

**Client #:** T0499  
**Report Date:** 29-Oct-99  
**Pinnacle Laboratories, Inc.**  
**2709-D Pan American Freeway, NE**  
**Albuquerque, NM 87107-**  
**Attn:**  
**Phone:** (505) 344-3777  
**Ext:**  
**FAX:** (505) 344-4413  
**Our Lab #:** 092399041  
**Your Sample ID:** 909062-04  
**Date Logged-In:** 9/23/99  
**Sample Source:** Other/Undefined  
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**Client Project #:** 092338  
**Date Submitted to Lab:** 09/23/1999  
**Date/Time/By:** 09/21/1999 11:50 AM  
**Analysis**  

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_End of Report_

**Report Approved By:** 

---

**Arizona Lab License No. AZ0009**  
**2700 E. BILBY ROAD • BUILDING A • TUCSON, AZ 85706**  
**PHONE 620-573-6565 • 1-800-879-2835 • FAX 620-573-6550**
- CERTIFICATE OF ANALYSIS -

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn:

Our Lab #: 092399042
Date Logged-In: 9/23/99

Client #: 092399042

Date Logged-In: 9/23/99
Matrix: Soil/Sludge

Date Submitted to Lab: 09/23/1999

Your Sample ID: 909062-05
Sample Source: Other/Undefined

Client Project #: 092338

Report Date: 29-Oct-99

Phone: (505) 344-3777 Ext:
FAX: (505) 344-4413

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 10:15 AM

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Report Approved By: [Signature]

End of Report
- CERTIFICATE OF ANALYSIS -

Client #: T0499

Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn:

Our Lab #: 092399043
Date Logged-In: 9/23/99
Matrix: Soil/Sludge
Project #: 

Your Sample ID: 909062-06
Sample Source: Other/Undefined
Client Project #: PO#: 092338
Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 9:00 AM

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Report Approved By: ____________________________

End of Report

Arizona Lab License No. AZ0009

Lab Number 092399043:Page
- CERTIFICATE OF ANALYSIS -

Client #:  T0499
Client: Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM  87107-

Attn: Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM  87107-

Phone: (505) 344-3777   Ext:
FAX: (505) 344-4413

Our Lab #: 092399044
Date Logged-In: 9/23/99
Matrix: Soil/Sludge

Your Sample ID: 909062-07
Sample Source: Other/Undefined

Client Project #: PO#: 092338

Project #: Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999   11:30 AM

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End of Report

Report Approved By: [Signature]

ATEL
Aqua Tech Environmental Laboratories, Inc.

Arizona Lab License No. AZ0009
2700 E. BILBY ROAD • BUILDING A • TUCSON, AZ 85706
PHONE 520-573-6565 • 1-800-579-2835 • FAX 520-573-6550

Lab Number 092399044/Page 1
- CERTIFICATE OF ANALYSIS -

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn:

Our Lab #: 092399045
Date Logged-In: 9/23/99
Matrix: Soil/Sludge
Project #: 

Sample Source: Other/Undefined
Client Project #: PO#: 092338
Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 11:15 AM

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End of Report

Report Approved By: [Signature]

Arizona Lab License No. AZ0069

Lab Number 092399045: Page 1
- CERTIFICATE OF ANALYSIS -

Client #: T0499

Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107-

Attn:

Our Lab #: 092399046
Date Logged-In: 9/23/99
Matrix: Soil/Sludge
Project #: 

Report Date: 02-Nov-99

Client Project #: PO#: 092338

Date Submitted to Lab: 09/23/1999

Below is the analysis for the sample:

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 10:20 AM

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Report Approved By: [Signature]

Arizona Lab License No. AZ0009
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, New Mexico 87107
(505) 344-3777  Fax (505) 344-4413

Sample 09 is a rocket residue. Please treat as a soil. Analyze for Perchlorate but be aware that rocket fuel may remain in sample.

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**NETWORK PROJECT MANAGER:** Kimberly D. McNell
- CERTIFICATE OF ANALYSIS -

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107

Client #: T0499
Pinnacle Laboratories, Inc.
2709-D Pan American Freeway, NE
Albuquerque, NM 87107

Attn: 
Our Lab #: 092399047
Date Logged-In: 9/23/99
Matrix: Soil/Sludge
Project #: Project #: 092338

Your Sample ID: 909062-10
Sample Source: Other/Undefined
Date Submitted to Lab: 09/23/1999

- COLLECTION INFORMATION -

Date/Time/By: 09/21/1999 3:00 PM

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<th>Result</th>
<th>Units</th>
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<th>Analyst W</th>
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<tr>
<td>PER-S</td>
<td>SM4110B</td>
<td>Perchlorate, soil</td>
<td>&lt;1000</td>
<td>ug/Kg</td>
<td>10/28/1999</td>
<td>RAM 1931</td>
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Report Approved By: ___________
## Pinnacle Laboratories Inc.

**Project Information**
- **Project No.:** N/A
- **Project Name:** Lost River
- **PO No.:** N/A
- **Shipped Via:** N/A
- **Scope/Budget:** N/A
- **Certification Required:** N/A
- **Methanol Preservation:** N/A
- **Comments:** Fixed Fee

### Analysis Details
- **Petroleum Hydrocarbons (418.1) RPH**
  - (MOD 8015) Diesel/Direct Inject
- **(MOS15) Gas/Purge & Trap**
- **(8021) BTX/Gasoline MTBE**
- **(8021) BTX/CCL**
- **(8021) HALO**
- **(8021) VC**
- **(5041) EOB/DEB**

### Analysis Requirements
- **Herbicides (616A/616C)**
- **Pesticides (616A/616C)**
- **Polynuclear Aroetes (406/407/SMS)**
- **RCRA Metals (9h)**
- **Target Analyte List Metals (13)**
- **Polymer Metals by TCLP (Method 1311)**

### Analysis Notes
- Sample F is a socked residue. Please treat as a soil. Analyze for organo-labile (C10W) but beware that sock fuel (solid) may remain in sample.

**Bill To:**
- **Company:** Hazardous and Radioactive Materials Bureau
- **Address:** New Mexico Environment Dept.
- **Phone:** (505) 827-1561 x 1034
- **Fax:** (505) 827-1544

**Address:** Santa Fe NM 87505

**Date:** 9/27/1999

**Page:** 1 of 1
MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

Attn: Hazardous and Radioactive Materials Bureau
Ms. Kirby Olsen
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502

FROM: 49 CES/CEV
550 Tabosa Avenue
Holloman AFB NM 88330-8458

SUBJECT: Perchlorate Sampling Report, Holloman AFB

1. Attached is the report on the Perchlorate Sampling conducted this summer at Holloman AFB.

2. If you have any questions, please contact Mr. Court Fesmire or Mr. Jose Gallegos at (505) 572-5395.

Attachment
Report
1.0 INTRODUCTION
This report presents the results of the perchlorate sampling event conducted at Holloman Air
Force Base (AFB), New Mexico, to determine if elevated levels of perchlorate, potentially
associated with solid propellants for rockets and missiles, exist. In 1998, perchlorate was
reported in a surface water sample the National Park Service collected at the White Sands Missile
Range. As a result, the New Mexico Environment Department (NMED) collected a limited
number of soil and water samples at Holloman AFB. Foster Wheeler Environmental
Corporation (Foster Wheeler) collected split samples for Holloman AFB and submitted them to
an independent laboratory for analysis. The following sections describe the sampling, analysis,
and data evaluation performed for the project.

2.0 FIELD ACTIVITIES
Foster Wheeler and NMED personnel collected four water and six soil/solid samples for
perchlorate analysis. In addition, Foster Wheeler collected one groundwater and two soil
samples for background comparison, and one soil field duplicate sample to assess sampling and
analysis precision. Samples were collected at Holloman AFB from the vicinity of the Missile
Test Track, Lost River Pup Fish ponds, and Installation Restoration Program site SS-39, missile
fuel spill area. The perchlorate sampling locations, which were identified by NMED, are
presented in Figure 1 of this report.

3.0 ANALYTICAL RESULTS
Perchlorate analysis was performed by Montgomery Watson Laboratories, Pasadena, California,
in accordance with a modified United States Environmental Protection Agency (EPA) Method
300.0, anions in water by ion chromatography. The modified method has been approved by the
State of California for perchlorate analysis.

Low-level detections of perchlorate were reported in monitoring well samples 39-MW-02 and
39-MW-03 at concentrations of 15 micrograms per liter (µg/L) and 40 µg/L, respectively.
Perchlorate was also detected in the background well sample, 39-MW-01, at a concentration of
33 µg/L. Perchlorate was not detected in the two Lost River surface water samples, LR-1 and
LR-2. The detection limit for perchlorate in water samples is 8 µg/L.
Perchlorate was detected in one soil sample, PC-B, at a concentration of 90 micrograms per kilogram (μg/kg). No perchlorate was detected in the two soil background samples, PC-BG-01 and PC-BG-02. The reporting limit for perchlorate in soil was 40 μg/kg; however, elevated levels of total dissolved solids inherent to Holloman AFB and surrounding areas, resulted in analytical matrix interference. As a result of the matrix interference, sample dilution and elevated reporting limits were required for samples PC-B, PC-C, PC-D, and SRF-1. The elevated reporting limits for these samples were 80 μg/kg, 80 μg/kg, 2000 μg/kg, 2000 μg/kg, respectively. Analytical results are provided in Attachment A.

4.0 DATA REVIEW

One hundred percent of the perchlorate data have undergone data review in accordance with the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 1994). Data review included the following items:

- Chain-of-custody record
- Holding times
- Detection limits
- Method blanks
- Laboratory control sample recovery
- Matrix spike/matrix spike duplicate recovery
- Field duplicate sample precision

The perchlorate data review determined the following: (1) sample receipt requirements and holding times were met, (2) method-specific detection limits were achieved and required analytical methods were used, (3) method blank samples were nondetect for perchlorate, (4) spike sample recoveries were within method acceptance criteria for precision and accuracy, and (5) field duplicate sample data were comparable and within precision criteria.

Review of the quality control and field sample data indicates project measurement data are reliable and achieve project objectives. Precision and accuracy for the perchlorate sampling event are acceptable and valid conclusions may be drawn from the field sample data.
5.0 CONCLUSIONS

Based on the results of the September 21, 1999 perchlorate sampling event, Foster Wheeler recommends the following: 1) a confirmational sample be collected at well 39-MW-01, as a result of the low-level detection, and 2) an additional background well be identified for sampling and analysis.

Perchlorate data collected by Foster Wheeler and NMED at Holloman AFB during the September 1999 sampling event will be compared to evaluate sampling and analysis precision and accuracy. At present, EPA is in the process of developing an ecological toxicity standard for perchlorate. Ultimately, the perchlorate data will be compared to the toxicity standard to determine if elevated concentrations of perchlorate exist at the Base.

6.0 REFERENCES

EPA (United States Environmental Protection Agency)

ATTACHMENT A

Laboratory Analytical Results
Laboratory Report

for

Foster Wheeler Environmental - Denver
143 Union Blvd
Suite 1010
Lakewood, CO 80228
Attention: Pam Moss
Fax: 303-980-3713

ADE Andy Eaton

Report#: 58247
CLO4
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<th>QC Batch</th>
<th>Method</th>
<th>Analyte</th>
<th>Result</th>
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Group Comments

(Perchlorate) Samples are pre treated with silver and H cartridges, prior to analysis, due to high EC levels.

(990923083)
CLO4
This sample was spiked for MS/MSD.

(990923086)
CLO4
Sample is diluted due to matrix interference. Sample contains a trace hit at 0.06mg/Kg.

(990923088)
CLO4
Sample is diluted due to matrix interference.

(990923089)
CLO4
Sample is diluted due to matrix interference.
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Spikes which exceed Limits and Method Blanks with positive results are highlighted by **Underlining**.
Criteria for MS and DPF are advisory only and not applicable for ICR monitoring.
# Chain of Custody Record

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**Project Job #**

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**Signature:** David L. Riehen  
**Print Name:** David L. Riehen  
**Company/Title:** Fwene - Env. Spc.  
**Date:** 09/21/10  
**Time:** 16:20

**Relinquished By:** David L. Riehen  
**Received By:** David L. Riehen  
**Date:** 09/21/10  
**Time:** 16:20

**Relinquished By:**  
**Received By:**  
**Relinquished By:**  
**Received By (Lab):**
LEGEND
• SAMPLE LOCATIONS
--- ROADS
* WATER BODIES
--- RUNWAY
--- INSTALLATION BOUNDARY

PERCHLORATE SAMPLING EVENT
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FIGURE 1

FOSTER WHEELER
ENVIRONMENTAL CORPORATION
MEMORANDUM

To: Dr. Richard Mosher, Aqua Tech Environmental Labs, Inc.

From: Dr. Kirby Olson, NMED (505) 827-1561 ext. 1034

Subject: perchlorate samples

Date: September 28, 1999

Dan at the EPA lab in Cincinnatti called me with conductivities for the water samples we sent to Pinnacle labs on 9/22 to be sent to you. The surface water samples (which we designated LR-1 and LR-2, Pinnacle recorded these on our chain of custody as 01 and 02) have conductivities of 30,000 microsiemens. The groundwater samples (we designated them as MW-39-02-1 and MW-39-03, Pinnacle recorded these as 03 and 04) have conductivities of 15,000 microsiemens. I wanted to make sure I got these numbers to you since they may be higher than you were expecting (can you believe fish live in that surface water?). Please let me know if the samples are presenting problems for you in analysis.