# 2R - 301

# APPROVALS

# 2008

New Mexico Energy, Minerals and Natural Resources Department

**Bill Richardson**
Governor
**Joanna Prukop**
Cabinet Secretary
**Reese Fullerton**
Deputy Cabinet Secretary

**Mark Fesmire**
Director
**Oil Conservation Division**

May 5, 2009

Mr. Chris Biagi
Devon Energy Company
20 North Broadway
Oklahoma City, Oklahoma 73102

**Re: Approval of Restoration Protocol**
**Historic Drilling Pit at Hawk 9G Federal 9 Wellsite (2R-301)**
**Unit Letter G, Section 9, Township 18 South, Range 27 East, NMPM**
**Eddy County, New Mexico**

Mr. Biagi:

The Oil Conservation Division (OCD) approves the amended protocol for restoration of the historic drilling pit at the Hawk 9G Federal 9 wellsite as proposed by your contractor, Whole Earth Environmental, in their most recent submission (PR-106E). In particular, the restoration effort includes:

- The area of the historic drill pit measuring approximately 150 by 250 feet will be excavated to a minimum depth of 4 feet below surface. Those excavated soils with a field-measured chloride concentration greater than 10,000 milligrams per kilogram will be transported off-site for disposal at an approved facility. Twice the volume of clean topsoil will be transported to the site.

- The entirety of the excavated area will be underlain before any backfilling with a manufactured bentonite mat incorporating 6-inch overlap at all seams.

- The remainder of the excavated materials shall be mixed with the imported fill to a relatively uniform state such that the saturated paste electrical conductivity is less than 22 microsiemens per centimeter then reintroduced into the excavation. Additional clean soils may be added as necessary.

- The adjacent pad will be broken up and the entire area contoured to match the existing terrain and seeded with a BLM-approved mixture.

- Devon shall submit a written report to the OCD within 30 days of completion of field activities. In the future, please include reference to this project by the OCD Environmental Bureau designation "2R-301".

The objectives of this effort are ground water protection, seedbed preparation with like soils, contouring, and re-vegetation as per the surrounding landscape. If these objectives are unfulfilled, additional corrective actions may be required. Approval of this protocol does not relieve Devon Energy Company of responsibility if these efforts, or the presence of remaining contaminated soils result in pollution of surface water, ground water or the environment. Nor does this approval relieve Devon Energy Company or Whole Earth Environmental of their responsibilities to comply with any other applicable governmental authority's rules and regulations.

If you have any questions, please feel free to contact Jim Griswold at (505) 476-3465 or by email at *jim.griswold@state.nm.us*. On behalf of the staff at the OCD, I wish to thank you and your staff for your cooperation during this review process.

Sincerely,

Glenn VonGonten
Acting Environmental Bureau Chief

GVG/jg

cc: Larry Johnson, OCD District I
Jim Amos, BLM Carlsbad Office
Mike Griffin, Whole Earth Environmental

# Executive Summary

**Location**

The site is located approximately thirty-five miles northeast of the City of Artesia, Eddy County, New Mexico on BLM lands. The primary land use is grazing of cattle however extensive oil and gas operations are prevalent in the area. The area is semi-arid with a net precipitation / evaporation amount of –73" per year. The legal description is: **S9, T18S, R27E.**

**Investigation Activities**

Whole earth collected soil samples from the pad area and conducted a series of field electrical conductivity tests on the apparently affected areas. The EM-38 survey revealed high chloride concentrations generally at depths less than three feet below ground surface. Coring the site revealed chloride concentrations of less than 495 ppm at a depth of 10' below ground surface and 242 ppm at 15'. Depth to groundwater is estimated to be between 100-125' below ground surface.

**Restoration Activities**

The high chloride concentrations preclude dilution or organic supplements to achieve background agronomic potential. The reserve pit will be deep buried and the top surface restored with topsoil, and organics to promote re-vegetation.

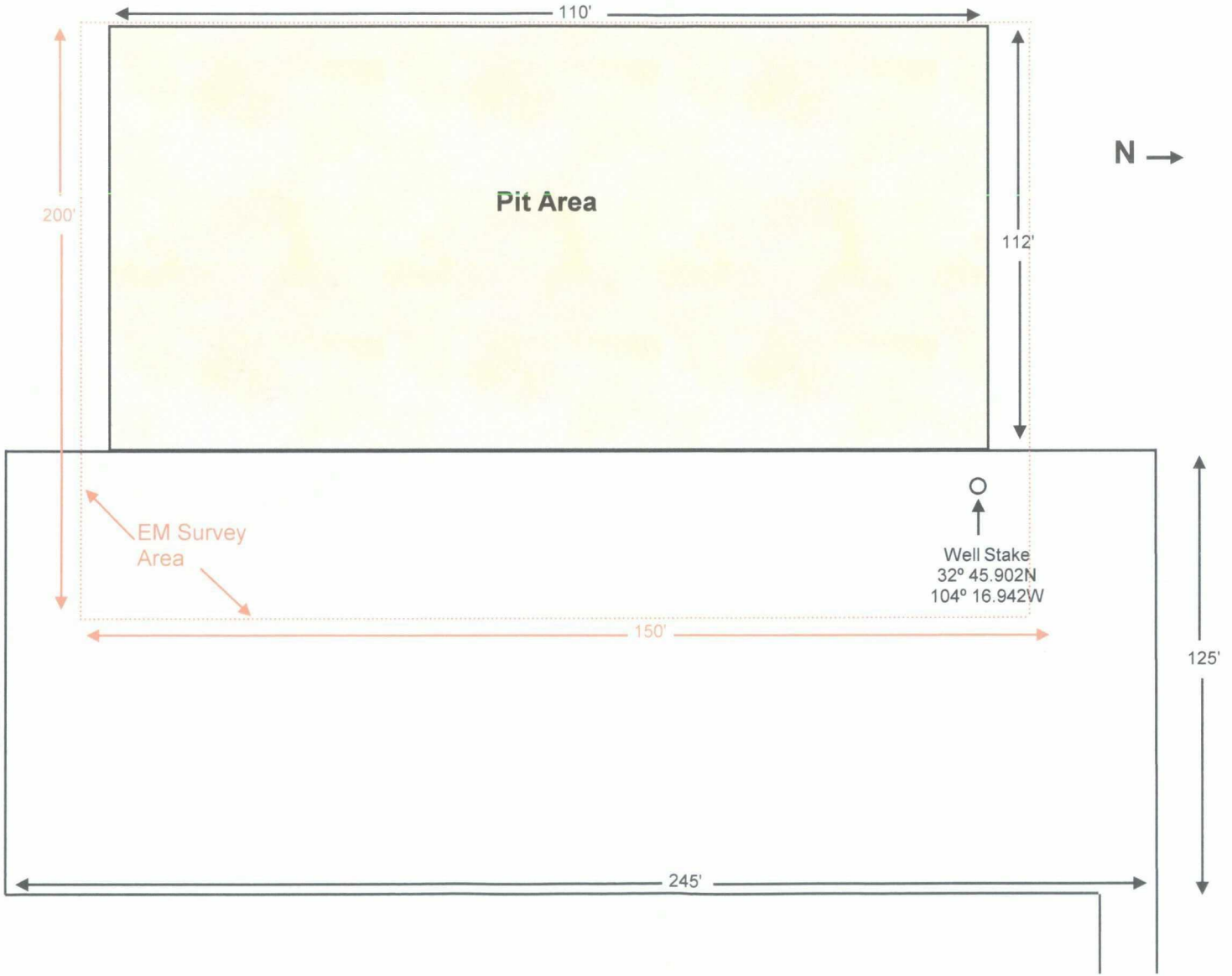
# Exhibit Index

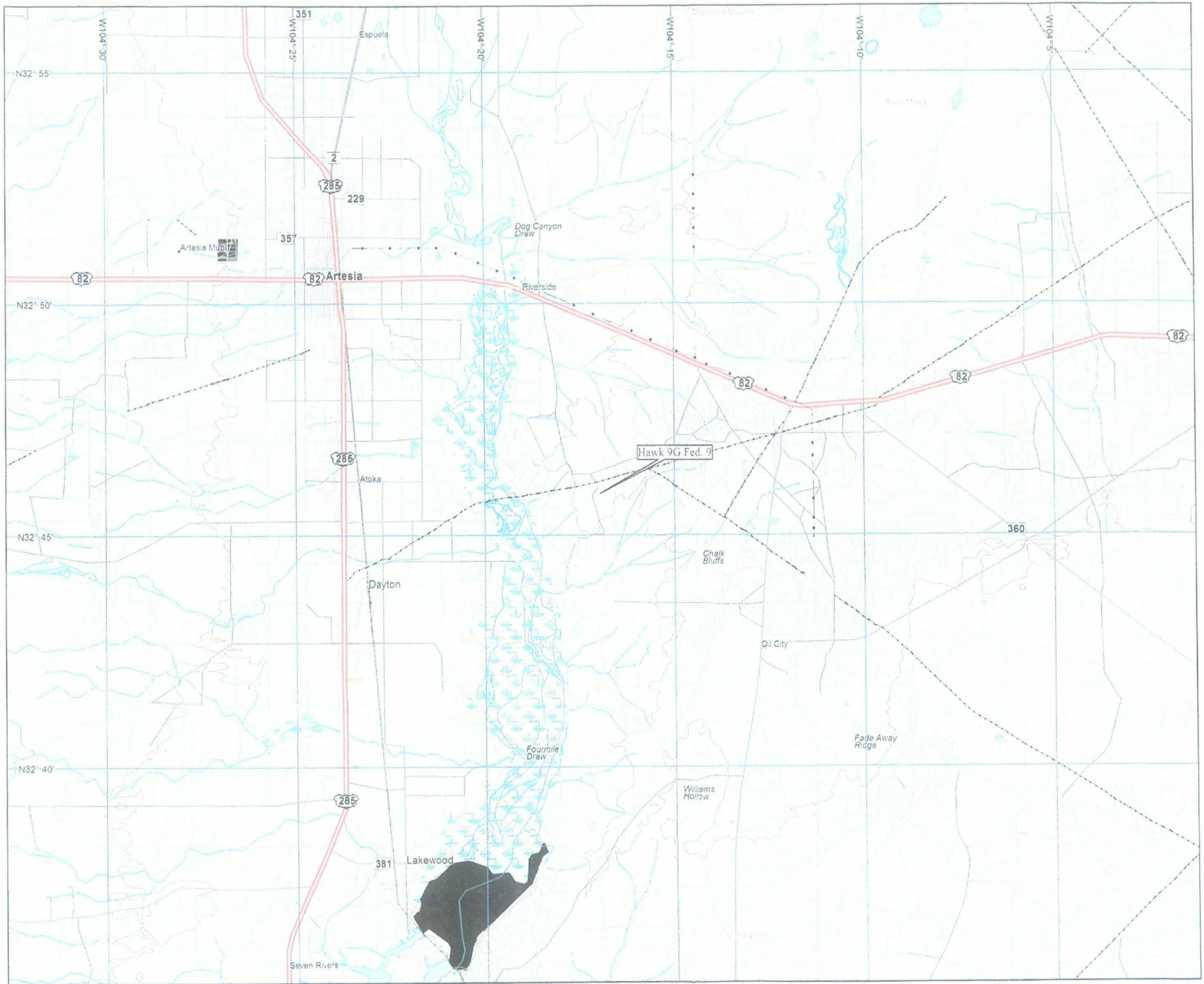
A. Driving Instructions
B. Plat Map of Location
C. U.S.G.S. 7.5' map zoom out
D. U.S.G.S. 7.5' map zoom in
E. Satellite View of Location – Zoom out
F. Satellite View of Location – Zoom in
G. EM-38 Electromagnetic Survey 0-2.5'
H. EM-38 Electromagnetic Survey 0-5'
I. Boring Log
J. BLM Letter

# Driving Instructions To:
# Hawk 9 Fed. 9

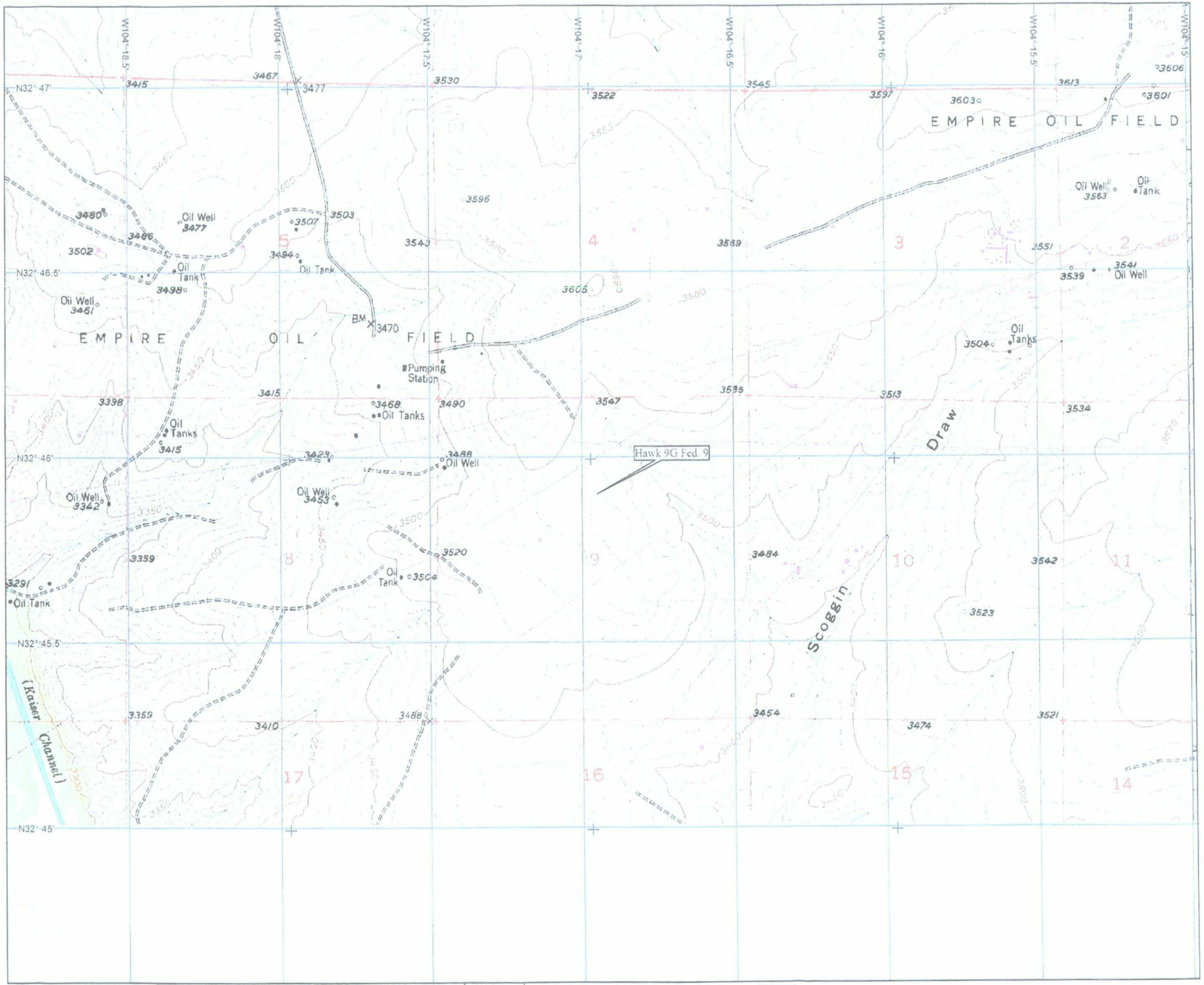
From the intersection of Hwy-82 & Illinois Camp Rd. turn left (west) and go 2.6 miles to CR-204 and turn right. Go .2 miles to CR-225 and turn left. Proceed 2 miles to CR-227 and turn right. Go 1.6 miles to Duke Energy Booster sign and turn left. Follow main road .3 miles and turn left. Drive .1 mile to 4-way split and turn right. Proceed .1 mile to road leading into location.

# Hawk 9 Fed. 9


110'
Pit Area
112'
N
200'
EM Survey
Area
Well Stake
32° 45.902N
104° 16.942W
150'
125'
245'




 1 NM Scale: 1 : 200,000 Detail: 10-0 Datum: NAD27




 1000 ft Scale: 1 : 25,000 Detail: 13-0 Datum: NAD27

PR-106E

**Remediation & Site Restoration Protocol**
**Devon Energy Co., LLC**
**Hawk 9 Fed. 9**

## 1.0 Purpose

This protocol is to provide a detailed outline of the steps to be employed in the remediation and final site restoration of the Hawk 9 Fed. 9 site.

## 2.0 Scope

This protocol is site specific for the above stated location.

## 3.0 Preliminary

Prior to any field operations, Whole Earth Environmental shall conduct the following activities:

### 3.1 Client Review

3.1.1 Whole Earth shall meet with designated personnel within Devon Energy Company (DEC) to review this protocol and make any requested modifications or alterations prior beginning any work.

3.1.2 Changes to this protocol will be documented and submitted for final review by DEC prior to work commencement.

### 3.2 BLM Review

3.2.1 Whole Earth shall meet with designated personnel within the United States Bureau of Land Management (BLM) Carlsbad office to review this protocol and make any requested modifications or alterations prior beginning any work.

3.2.2 Changes to this protocol will be documented and submitted for final review by BLM prior to work commencement.

### 3.3 NMOCD Review

3.3.1 Whole Earth shall meet with designated personnel within the New Mexico Oil Conservation Division (OCD) Artesia office to review this protocol and make any requested modifications or alterations prior beginning any work.

3.3.2 Changes to this protocol will be documented and submitted for final review by BLM prior to work commencement.

**4.0 Safety**

**4.1** Prior to work on the site, Whole Earth shall obtain the location and phone numbers of the nearest emergency medical treatment facility. We will review all safety-related issues with the appropriate client personnel, sub-contractors and exchange phone numbers.

**4.2** A tailgate safety meeting shall be held and documented each day. All sub-contractors must attend and sign the daily log-in sheet.

**4.3** Anyone allowed on to location must be wearing sleeved shirts, steel-toed boots, and long pants. Each vehicle must be equipped with two-way communication capabilities.

**4.4** Prior to any excavation, the area shall be surveyed with a line finder. If lines are discovered within the area to be excavated, they shall be marked with pin flags on either side of the line at maximum five-foot intervals. The area will be photographed prior to any excavation.

**4.5** Each pit area will be swept with a Ludlam 2350 to determine if NORM is present in concentrations greater than 40μr / hr.

**5.0 Excavation & Remediation**

* whole pit
150 x 250 x 4
* mat
* SPEC < 22 mS/cm
* x 35 → ppm Chloride

**5.1** Soils containing a chloride concentration exceeding 10,000 ppm shall be excavated and sent to commercial disposal. Twice the volume of commercially disposed soils shall be replaced with fresh topsoil. The affected area shall be excavated to a minimum depth of 4' below ground surface and a bentonite mat placed atop the excavation. The mat shall be overlapped a minimum 6" at the seams and shall be slightly domed and angled to the south to insure proper drainage.

**5.2** The remainder of the excavated materials shall be mixed and blended with native soils to achieve a saturated paste electrical conductivity of <22 mmhos/cm. The SPEC shall and moisture percentage analyses shall be used to determine the amount of additional soils and organics necessary to achieve background fertility. A copy of the organic loading calculation worksheet within the BLM / Devon Work Plan shall be considered a part of this protocol.

**5.3** The pad material shall be broken up and pushed from the north to the south to cover and contour the entire location to original natural conditions. Additional soils may need to be brought in to accommodate the loss of some topsoil southeast of the pad area due to severe erosion.

**5.4** We will construct earthen berms for erosion control and seed with BLM seed mix # 3 & 4.

**6.0 Site Restoration**

After remediation, the site will be re-contoured and seeded in accordance with the BLM letter dated may 2, 2008, (ref. 1310 NMNM025604).

**7.0 Documentation & Reporting**

At the conclusion of the pit remediation project, Whole Earth will prepare a closure report to include the following information:

- A plat map of the location showing the location of the pits, the dimensions prior to excavation and the actual excavated dimensions.
- Photographs of the pit prior to excavation, at the point of maximum excavation and final contouring of each burial site
- Seed sack tags of the BLM approved seed mixture selected for the site
- Boring Logs
- Laboratory analytical results

## Devon / BLM Site Restoration
## Development of Remediation and Restoration Plan
## Organic Loading Calculations

**1. Determination of Topical Treatment Efficacy**

A. Apply the following formula:

1. saturated paste EC of highest sample point X 10 = sodium meq/l
2. sodium meq/l *moisture %/100 = sodium meq in liters/kg of soil
3. divide sodium meq (l/kg) by 3,000 meq organics
4. multiply by 2,000,00 lbs. / acre 6" to determine total organic requirements per acre
5. divide by 2,000 to convert to tons/acre
   a. **IF NUMBER HIGHER THAN 40 TONS/ACRE - DO NOT CONTINUE**
6. multiply calculated organic loading (tons/acre) by acreage of affected area to determine project requirements

**2. OR Insert values into the space provided below**

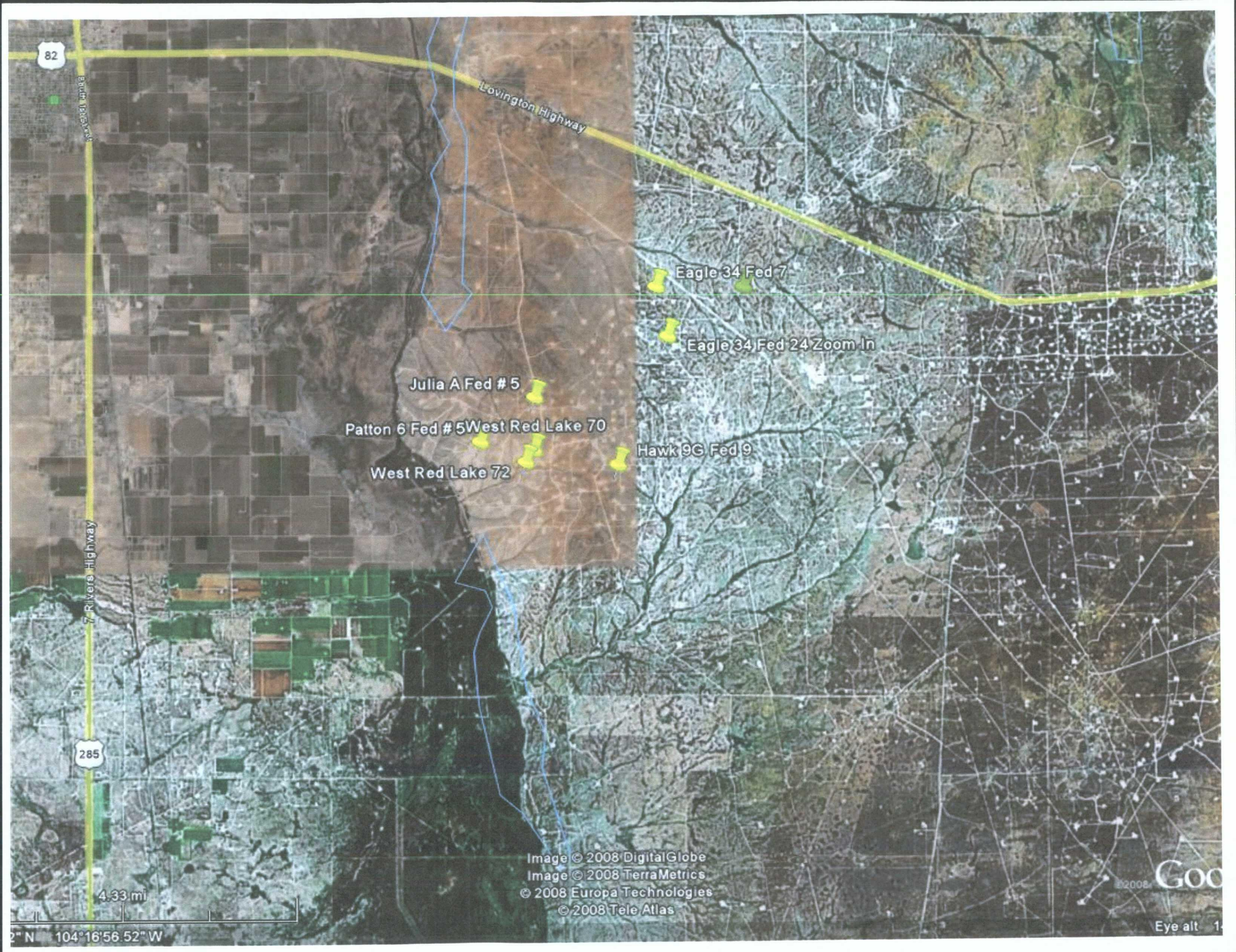
| SP EC (mmhos/cm) | SP EC Moisture % | Length | Width |
|---|---|---|---|
| 24 | 50 | 50 | 75 |

240 sodium meq/l

120 sodium meq/kg soil

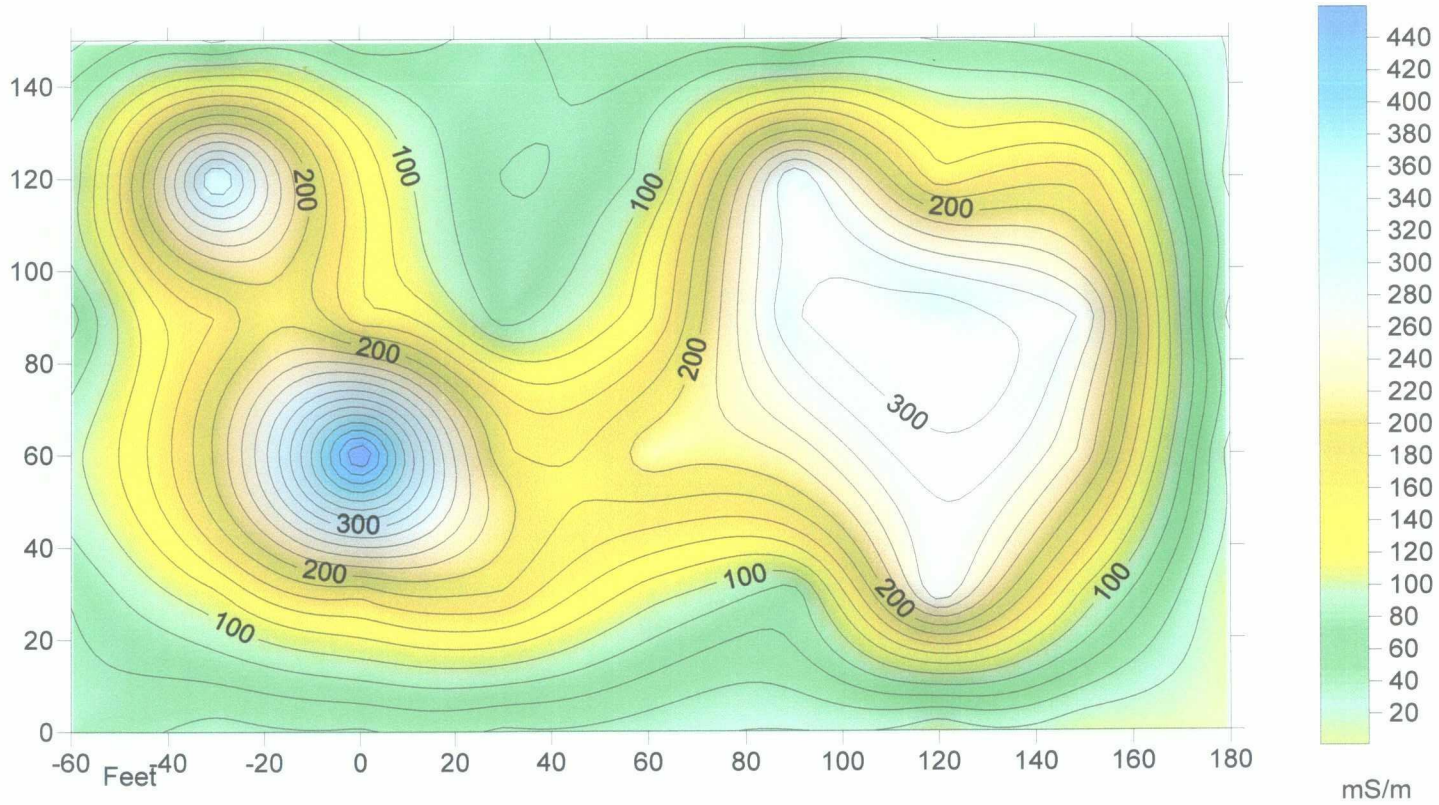
0.04

| | |
|---|---|
| **40.00** | **required tons per acre of organics** |
| **3.44** | **tons of organics required for project** |


82
Lovington Highway
Eagle 34 Fed 7
Eagle 34 Fed 24 Zoom In
Julia A Fed # 5
Patton 6 Fed # 5
West Red Lake 70
West Red Lake 72
Hawk 9G Fed 9
W Rivers Highway
285
Image © 2008 DigitalGlobe
Image © 2008 TerraMetrics
© 2008 Europa Technologies
© 2008 Tele Atlas
4.33 mi
104°16'56.52" W
Eye alt

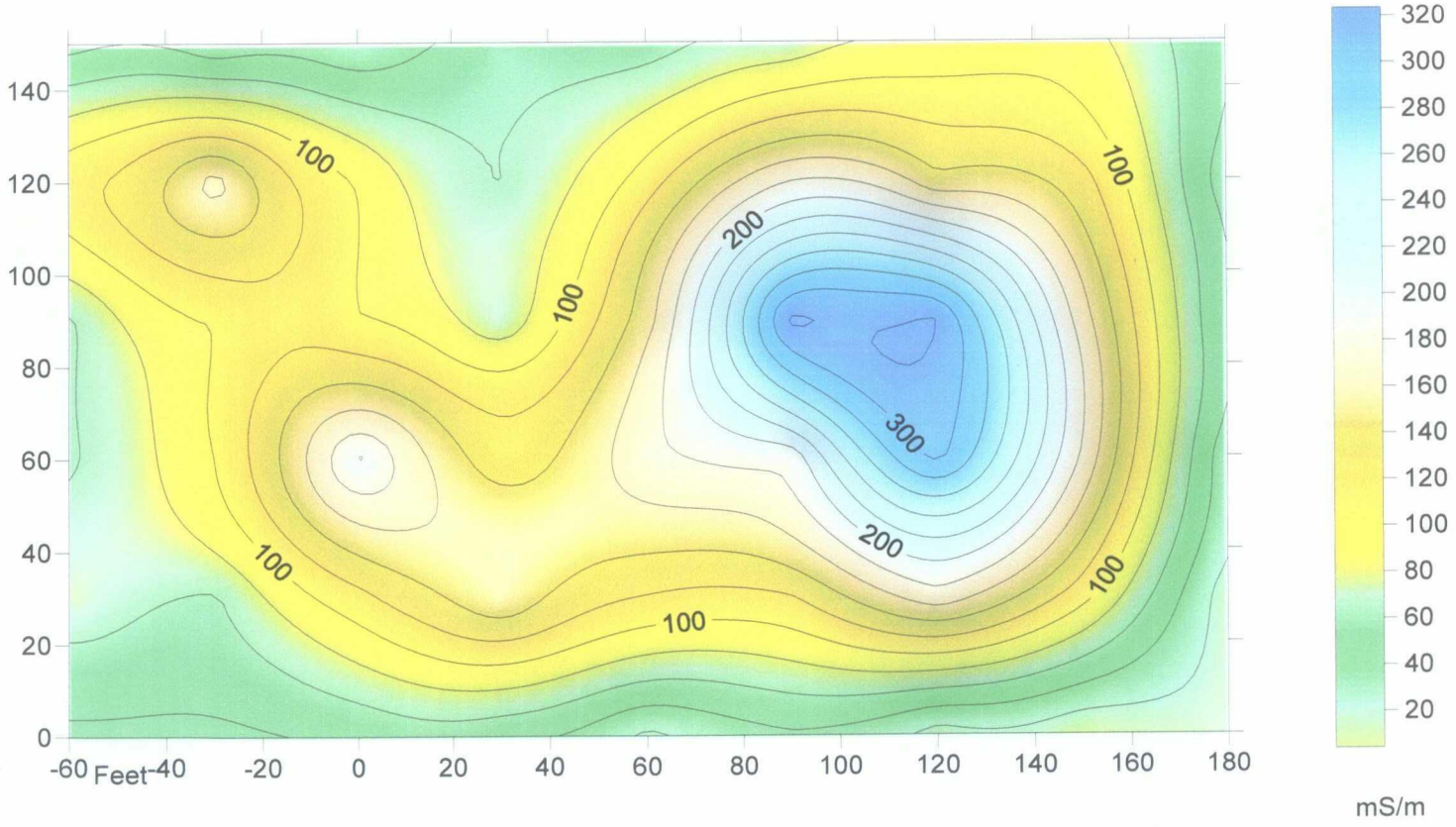

Hawk 9G Fed 9
702 ft
104°16'56.52" W
Image © 2008 DigitalGlobe
© 2008 Tele Atlas

# Hawk 9
# EM Conductivity Survey
# May 2008




## 0 to 2-1/2 Feet Depth

# Hawk 9
# EM Conductivity Survey
# May 2008



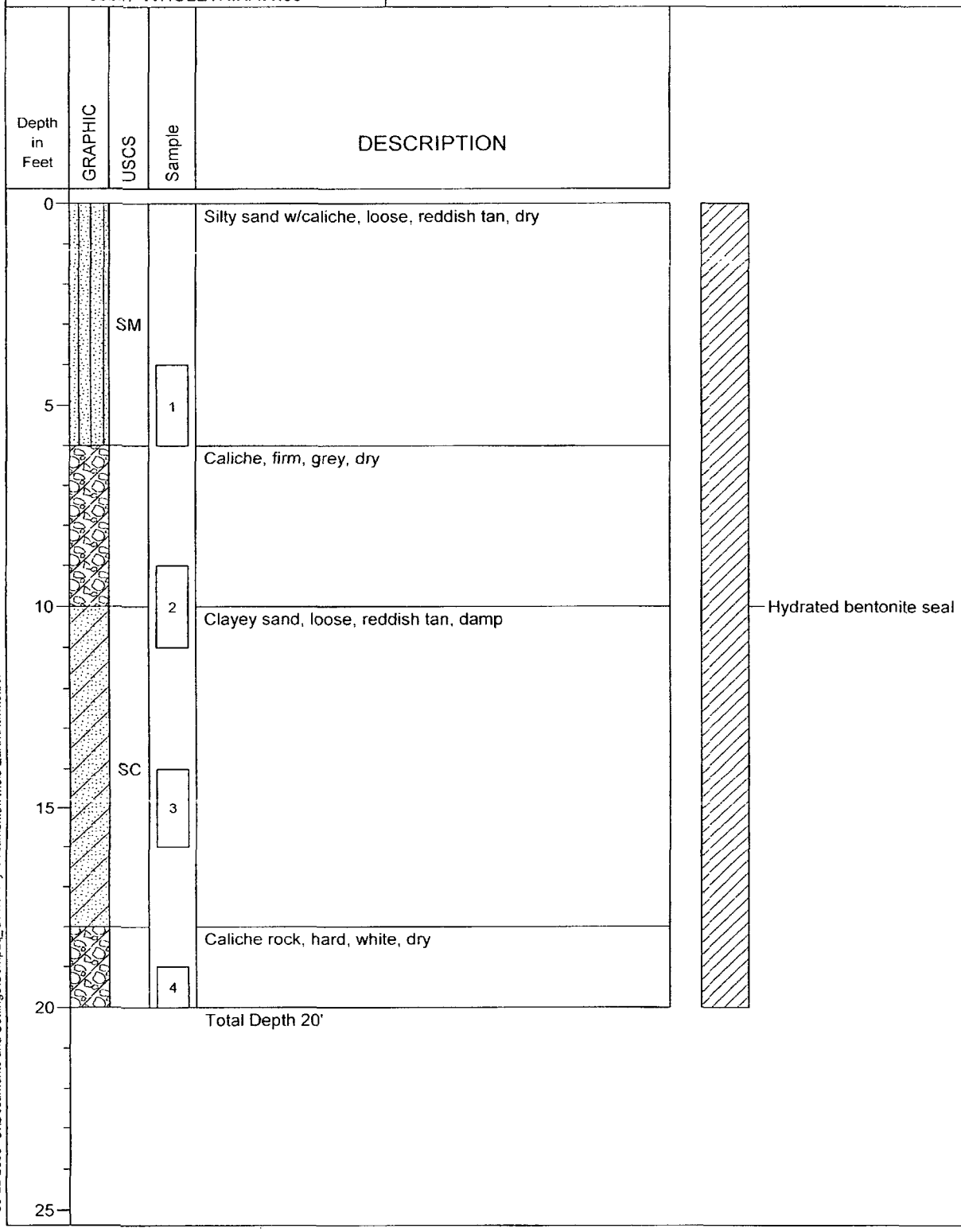

0 - 5 Feet

ATKINS ENGINEERING ASSOCIATES, INC.
*Professional Engineering Land Surveying*
*Water Resources Environmental Science*

# Log of Boring Devon Hawk #9, Fed 9

Whole Earth Environmental
2103 Arbor Cove
Katy, Texas 77494
Contact: Roy Rascon
Job#: WHOLETH.HAW.08

| | | | |
|---|---|---|---|
| Date | : 08/21/08 | Auger Type | : Hollow Stem |
| Drill Start | : 09:00 | Logged By | : Mort Bates |
| Drill End | : 10:00 | | |
| Boring Location | : Center of pit | | |
| Site Location | : Devon Hawk #9, Fed 9 | | |




08-22-2008 C:\Documents and Settings\Compaq_Owner\My Documents\Whole Earth\Hawk9.bor

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
WHOLE EARTH ENVIRONMENTAL
ATTN: ROY R. RASCON
2103 ARBOR COVE
KATY, TX 77494
FAX TO: (281) 394-2051

Receiving Date: 08/22/08
Reporting Date: 09/03/08
Project Owner: DEVON
Project Name: DEVON HAWK 9 G FED #9
Project Location: EDDY COUNTY, NM

Sampling Date: 08/21/08
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: AM

| LAB NUMBER | SAMPLE ID | E.C. (mmhos/cm) | Moisture % |
|---|---|---|---|
| ANALYSIS DATE: | | 08/28/08 | 08/28/08 |
| H15794-1 | B1 5' BGS GRAB | 16.9 | 16.2 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Quality Control | | NR | NR |
| True Value QC | | NR | NR |
| % Recovery | | NR | NR |
| Relative Percent Difference | | NR | NR |

METHOD: LDNR Lab Procedures for Analysis of E & P waste

Samples were subcontracted to Green Analytical Laboratories, a subsidiary of Cardinal Laboratories.

Hope L Mathis
Chemist

09-4-08
Date

H15794SPEC% WEE

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
WHOLE EARTH ENVIRONMENTAL
ATTN: MIKE GRIFFIN
2103 ARBOR COVE
KATY, TX 77494
FAX TO: (281) 394-2051

Receiving Date: 05/15/08
Reporting Date: 05/19/08
Project Number: NOT GIVEN
Project Name: HAWK 9 FED 9
Project Location: NOT GIVEN

Sampling Date: 05/15/08
Sample Type: SOIL
Sample Condition: INTACT
Sample Received By: ML
Analyzed By: CK/HM/KS

| LAB NUMBER | SAMPLE ID | E.C. (mmhos/cm) | Saturation % | $Cl^-$* (mg/kg) |
|---|---|---|---|---|
| ANALYSIS DATE: | | 05/16/08 | 05/16/08 | 05/16/08 |
| H14818-1 | HAWK 9 S1 6" | 190 | 25.2 | 20,400 |
| H14818-2 | HAWK 9 S2 24" | 106 | 33.4 | 11,000 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Quality Control | | 1.404 | NR | 500 |
| True Value QC | | 1.413 | NR | 500 |
| % Recovery | | 99.4 | NR | 100 |
| Relative Percent Difference | | 0.1 | NR | < 0.1 |

| METHOD: LDNR Lab Procedures for Analysis of E & P waste | SM4500-Cl⁻B |
|---|---|

Note: Analyses performed on 1:1 w:v extracts and adjusted for the saturated paste percentage.
* Analyses performed on 1:4 w:v aqueous extracts.

Kristy Sproles
Chemist

05/19/08
Date

H14818SPECL WEE

# CARDINAL LABORATORIES

## CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

| | | | |
|---|---|---|---|
| Company Name: | Whole Earth Environmental | **BILL TO** | |
| Project Manager: | Mike Griffin | P.O. #: | |
| Address: | | Company: | |
| City: | State: Zip: | Attn: | |
| Phone #: | Fax #: | Address: | |
| Project #: | Project Owner: | City: | |
| Project Name: | Hawk 9 Fed 9 | State: Zip: | |
| Project Location: | | Phone #: | |
| Sampler Name: | MG | Fax #: | |

**ANALYSIS REQUEST**

Chlorides
Ec Paste Extract

| FOR LAB USE ONLY Lab I.D. | Sample I.D. | (G)RAB OR (C)OMP. | # CONTAINERS | MATRIX: GROUNDWATER | WASTEWATER | SOIL | OIL | SLUDGE | OTHER : | PRESERV.: ACID/BASE: | ICE / COOL | OTHER : | SAMPLING: DATE | TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H14818 | | | | | | | | | | | | | | |
| S1 -1 | Hawk 9 S1 6" | C | 1 | | | ✓ | | | | | | ✓ | 3-5-08 | 10:00 |
| S2 -2 | Hawk 9 S2 24" | C | 1 | | | ✓ | | | | | | ✓ | " | 10:00 |

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

| | | | |
|---|---|---|---|
| Relinquished By: | Date: 3-5-08 | Received By: | Misty LeBut |
| | Time: 3:07 | | |
| Relinquished By: | Date: | Received By: | |
| | Time: | | |

Delivered By: (Circle One)
Sampler - UPS - Bus - Other:

Sample Condition: Cool ☐ Yes ☐ No; Intact ☑ Yes ☐ No

CHECKED BY: (Initials) MG/B

Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:

REMARKS:
email Results to
wheath@msn.com

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
WHOLE EARTH ENVIRONMENTAL INC.
ATTN: ROY R. RASCON
2103 ARBOR COVE
KATY, TX 77494
FAX TO: (281) 394-2051

Receiving Date: 08/22/08
Reporting Date: 08/25/08
Project Owner: DEVON
Project Name: DEVON HAWK 9 G FED #9
Project Location: EDDY COUNTY, NM

Analysis Date: 08/22/08
Sampling Date: 08/21/08
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: HM

| LAB NO. | SAMPLE ID | $Cl^-$ (mg/kg) |
|---|---|---|
| H15794-1 | B1 5' BGS GRAB | 6,240 |
| H15794-2 | B1 10' BGS GRAB | 384 |
| H15794-3 | B1-15' BGS GRAB | 64 |
| H15794-4 | B1-20' BGS GRAB | 224 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Quality Control | | 510 |
| True Value QC | | 500 |
| % Recovery | | 102 |
| Relative Percent Difference | | 2.0 |

| METHOD: Standard Methods | 4500-ClˉB |
|---|---|

Note: Analyses performed on 1:4 w:v aqueous extracts.

Chemist

08-26-08
Date

H15794 WEE

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240

(325) 673-7001 FAX (325)673-7020 (505) 393-2326 FAX (505) 393-2476

| | | | |
|---|---|---|---|
| Company Name: | WHOLE EARTH ENVIRONMENTAL INC. | BILL TO | |
| Project Manager: | ROY R. RASCON | P.O. #: | |
| Address: | | Company: | |
| City: | State: Zip: | Attn: | |
| Phone #: | Fax #: | Address: | |
| Project Owner: | DEVON | City: | |
| Project Name: | DEVON HAWK 9 G FED #9 | State: Zip: | |
| Project Location: | EDDY COUNTY, NM | Phone #: | |
| Sampler Name: | ROY R. RASCON | Fax #: | |

| FOR LAB USE ONLY LAB ID # | SAMPLE I.D. | (G)RAB OR (C)OMP. | # CONTAINERS | MATRIX: GROUNDWATER | WASTEWATER | SOIL | OIL | SLUDGE | PRESERV.: OTHER : | ACID/BASE: | ICE / COOL | OTHER : | SAMPLING: DATE | TIME | ANALYSIS REQUEST: SPEC | CL- | MOISTUTE % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H15794-1 | B1 5'bgs grab | G | | | | X | | | | | X | | 8/21/2008 | 910 | X | X | X |
| -2 | B1 10'bgs grab | G | | | | X | | | | | X | | 8/21/2008 | 925 | | X | |
| -3 | B1-15' BGS Grab | G | | | | X | | | | | X | | 8/21/2008 | 930 | | X | |
| -4 | B1-20' BGS Grab | G | | | | X | | | | | X | | 8/21/2008 | 950 | | X | |

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| | | | |
|---|---|---|---|
| Relinquished By: Roy R. Rascon | Date: 8-22-08 Time: 748 | Received By: Mety LeBlanc | |
| Relinquished By: | Date: Time: | Received By: | |
| Delivered By: (Circle One) Sampler - UPS - Bus - Other: | Sample Condition: Cool (Yes) No; Intact (Yes) No | CHECKED BY: (Initials) MCB | |

| | | | |
|---|---|---|---|
| Phone Result: | Yes No | Add'l Phone #: | |
| Fax Result: | Yes No | Add'l Fax #: | |

**REMARKS: PLEASE E-MAIL TO: mcgriffin, royr & mikeg@vadose.us**

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476