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WORKPLANS

DATE:

3-17-08

R. T. HICKS CONSULTANTS, LTD.

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March 17, 2008

2008 MAR 20 PM 2 18

Mr. Edward Hansen
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Investigation Characterization Plan:
Vacuum Salt Water Disposal System: F-33 Boot, C-33 Boot
T17S, R35E, Section 33

Dear Mr. Hansen:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is pleased to submit this Investigation Characterization Plan (ICP) for the above- referenced sites within the Vacuum Salt Water Disposal System. Plate 1 is a map showing the sites relative to major roads in the area, nearby ROC sites and nearby USGS monitoring wells. GPS coordinates for the site are approximately: 32° 47' 48.79" N, 103° 27' 56.63" W (C-33) and 32° 47' 35.44" N, 103° 27' 55.46" W (F-33).

Both sites were initially addressed as part of Vacuum System abandonment and excavated to 30L x 30W x 12D feet and backfilled with blended dirt to the surface. The surface was contoured to the surrounding area and an identification plate was placed at the site to mark the location of the former junction box.

The following work elements are either complete or proposed to characterize this site sufficiently to develop an appropriate corrective action plan:

1. ROC has identified and documented the location of all current and historic equipment and pipelines associated with the site.
2. ROC has conducted initial trench sampling adjacent to the former junction boxes.
3. ROC and Hicks Consultants will use a drilling rig to install one soil boring at the center of the source area to delineate the vertical extent of chloride in the soil.
4. Soil samples employed for delineation will be obtained from regular intervals below ground surface in each boring, if possible from split spoon samples at 5-foot intervals.
5. If field analysis of hydrocarbon vapors and observations of staining show that hydrocarbon impact is unlikely at the site or below 20-feet, collection of samples from cuttings may be substituted for split spoon sampling (chloride only).
6. A representative number of the soil samples will be sent to a laboratory to allow for verification of the field results.

7. General soil texture descriptions will be provided for each sample boring.
8. The criteria to delineate the maximum vertical extent of impact is the shallowest of the following:
 - a. After three consecutive samples demonstrate <250 ppm chloride using field analyses and <100ppm total hydrocarbon vapors using the headspace method (see attached ROC Quality Procedure in Appendix A), or
 - b. After five consecutive samples show a decreasing trend of chloride and hydrocarbons and the last sample shows chloride < 250 ppm and total hydrocarbon vapors <100 ppm (Appendix A).
 - c. Soil boring to capillary fringe should neither (a) or (b) apply
9. If the boring penetrates the capillary fringe, a monitoring well will be completed with a 2 or 4" diameter 25 feet down gradient from the source for use during possible corrective actions. Plate 2 presents a potentiometric surface map for the site area.

The ROC trench characterization has not identified the lateral extent of chloride at either site. Plates 3 and 4 present figures showing the excavation, locations of previous trenching activities, and our proposed borings to complete lateral characterization at each site. These borehole locations have been selected because they are 20 feet beyond the furthest trenches where the soil data has an average chloride concentration greater than 1,000 mg/kg. The total depth of borings installed to characterize lateral extent shall be 20 feet below ground surface with soil samples for delineation taken at 5 foot intervals.

Rice Operating Company (ROC) is the service provider (agent) for the Vacuum Saltwater Disposal System and has no ownership of any portion of pipeline, well, or facility. A consortium of oil producers who own the Vacuum System (System Partners) provide all operating capital on a percentage ownership/usage basis. Major projects require System Partner authorization for expenditures (AFE) approval and work begins as funds are received. We will implement the work outlined herein after NMOCD approval and subsequent authorization from the System Partners. The Vacuum SWD system is in abandonment.

For all environmental projects, ROC will choose a path forward that:

1. Protects public health.
2. Provides the greatest net environmental benefit.
3. Complies with NMOCD Rules.
4. Is supported by good science.

The last criteria employed when evaluating any proposed remedy or investigative work is confirming that there is a reasonable relationship between the benefits created by the proposed remedy or assessment and the economic and social costs.

March 17, 2008

Page 3

Each site shall have three submissions or a combination of:

1. This Investigation and Characterization Plan (ICP), which is a proposal for data gathering, and site characterization and assessment (this submission).
2. Upon evaluation of the data and results from the ICP, a recommended remedy will be submitted in a Corrective Action Plan (CAP).
3. Finally, after implementing the remedy, a closure report with final documentation will be submitted.

Following the site characterization described above, a Corrective Action Plan with the data and analysis supportive of a procedure for site closure will be submitted. Quality Procedures for characterization work are provided in Appendix A.

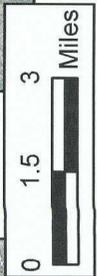
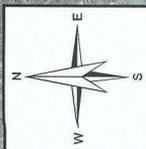
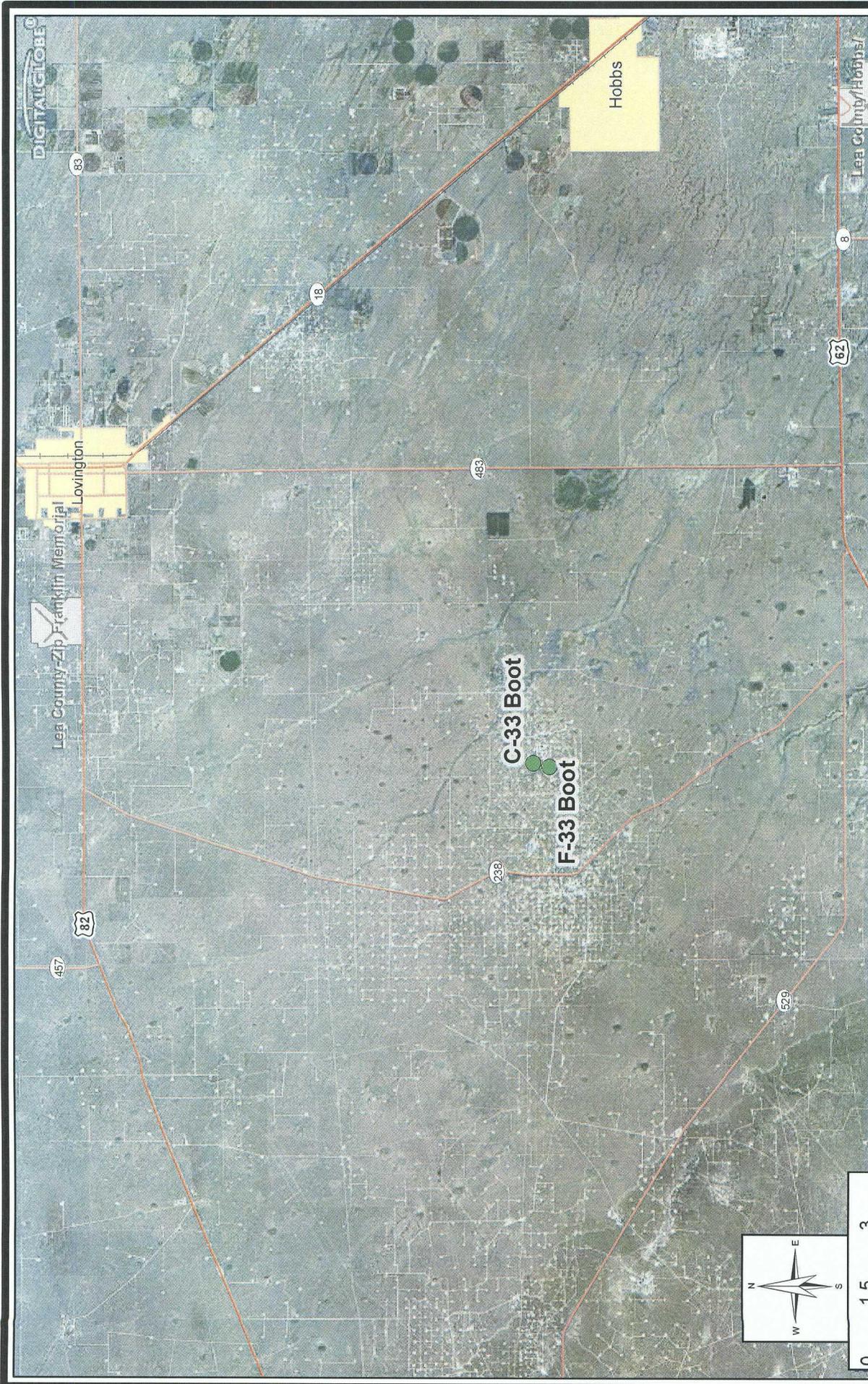
If you have any questions or comments regarding this ICP, please contact Kristin Pope of Rice Operating Company as she has reviewed and approved this submission.

Sincerely,
R.T. Hicks Consultants, Ltd.



Randall T. Hicks
Principal

Copy: Rice Operating Company

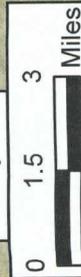
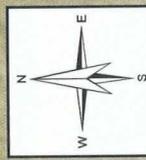
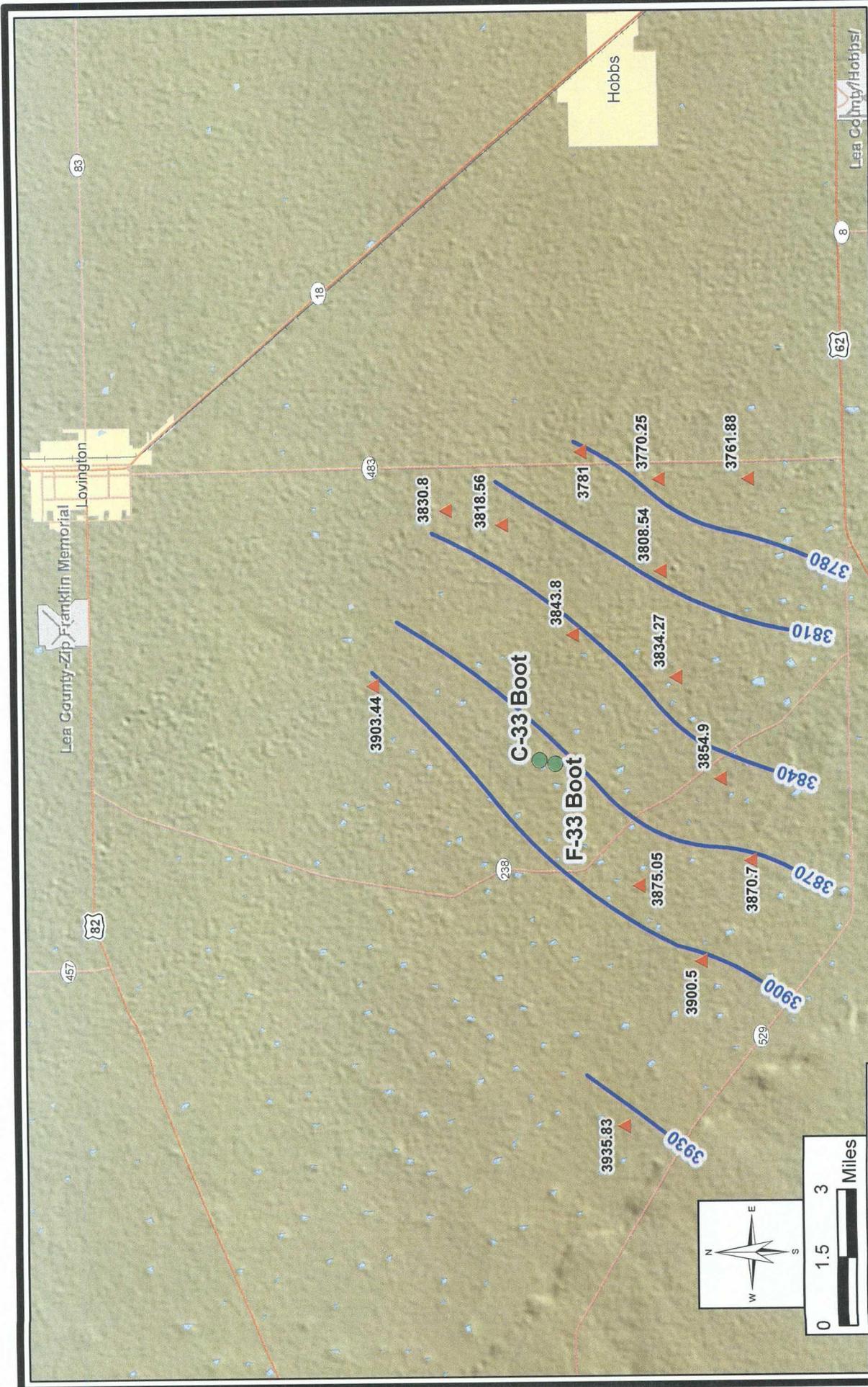


Explanation	
●	ICP Site (Vacuum System)

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Site Environs near the Vacuum System
 ROC: Investigation Characterization Plan - Vacuum System

Plate 1
 March 2008



Explanation

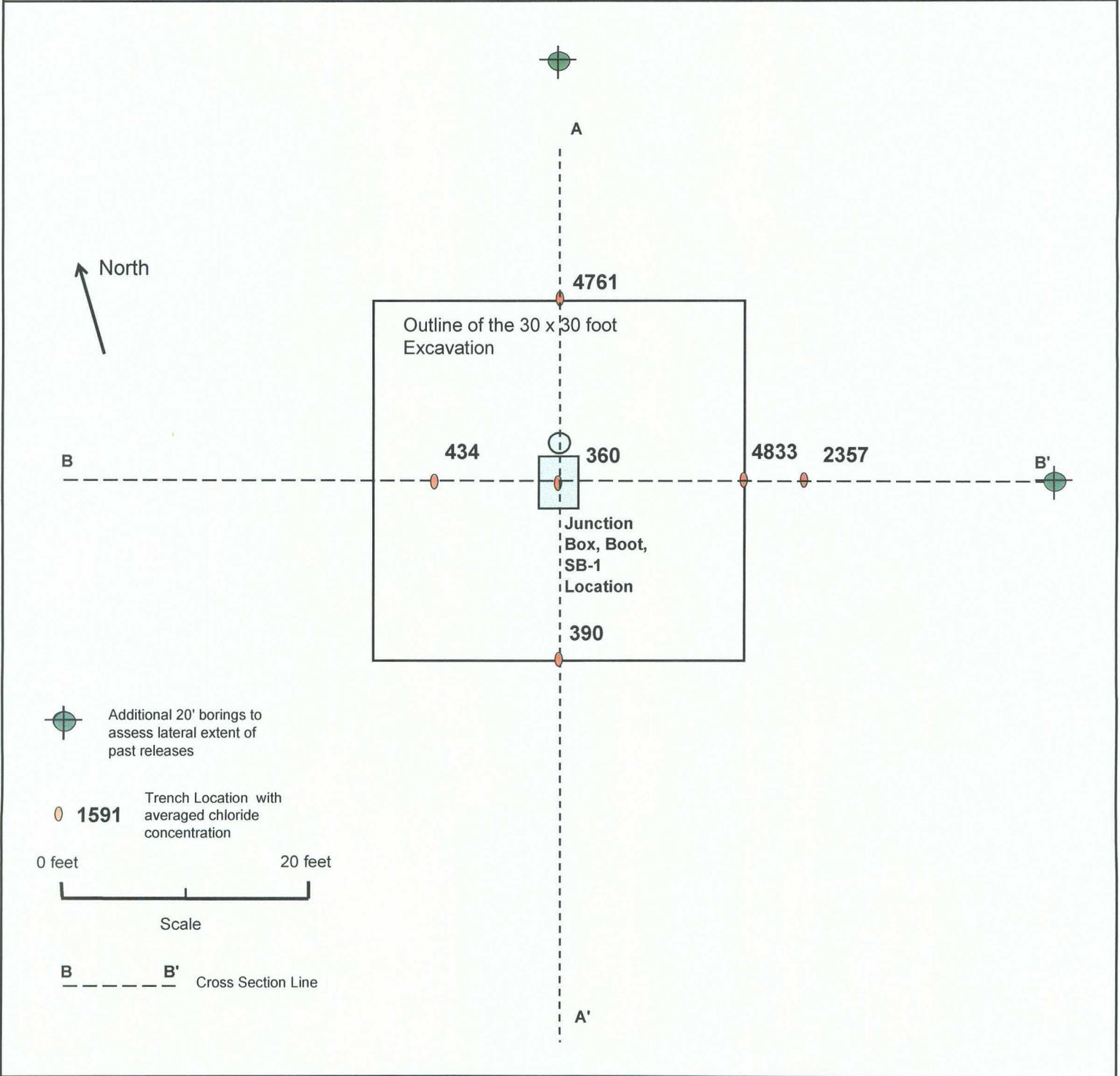
- Potentiometric surface (USGS 1996)
- ▲ USGS gauging well with ground water elevation (1996)
- ICP Site (Vacuum System)

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Regional Potentiometric Surface (USGS 1996)
 ROC: Investigation Characterization Plan
 Vacuum System

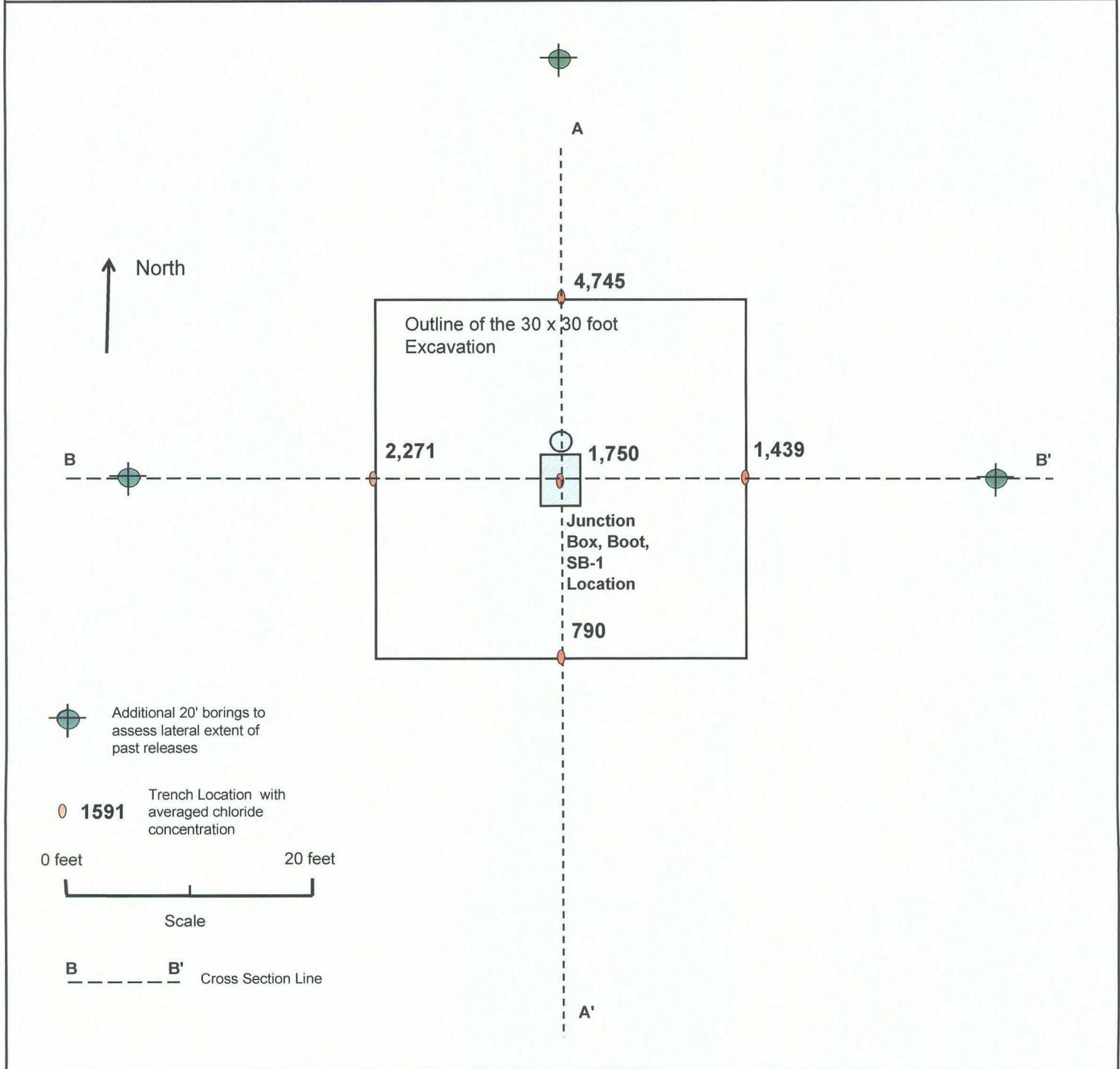
Plate 2
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Proposed locations of Lateral Characterization Borings	Client:	Location: Section 33, T17S, R35E
	Rice Operating Company	
	Project Name: Vacuum F-33 Boot	



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		March 2008

Proposed locations of Lateral Characterization Borings	Client:	Location: Section 33, T17S, R35E
	Rice Operating Company	
	Project Name: Vacuum C-33 Boot	



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		March 2008

Appendix A

Rice Operating Company

QUALITY PROCEDURE - 03

Sampling and Testing Protocol - Chloride Titration Using .282 Normal Silver Nitrate Solution

1.0 Purpose

This procedure is to be used to determine the concentration of chloride in soil.

2.0 Scope

This procedure is to be used as the standard field measurement for soil chloride concentrations.

3.0 Sample Collection and Preparation

3.1 Collect at least 80 grams of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample for soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.2 The soil sample(s) shall be immediately inserted into a one-quart or large polyethylene freezer bag. Care should be taken to insure that no cross-contamination occurs between the soil sample and the collection tools or sample processing equipment.

3.3 The sealed sample bag should be massaged to break up any clods.

4.0 Sample Preparation

4.1 Tare a clean glass vial having a minimum 40 ml capacity. Add at least 10 grams of the soil sample and record the weight.

4.2 Add at least 10 grams of reverse osmosis water to the soil sample and shake for 20 seconds.

4.3 Allow the sample to set for a period of 5 minutes or until the separation of soil and water.

4.4 Carefully pour the free liquid extract from the sample through a paper filter into a clean plastic cup if necessary.

5.0 Titration Procedure

5.1 Using a graduated pipette, remove 10 ml extract and dispense into a clean plastic cup.

5.2 Add 2-3 drops potassium chromate (K_2CrO_4) to mixture.

5.3 If the sample contains any sulfides (hydrogen or iron sulfides are common to oilfield soil samples) add 2-3 drops of hydrogen peroxide (H₂O₂) to mixture.

5.4 Using a 10 ml pipette, carefully add 0.282 normal silver nitrate (one drop at a time) to the sample while constantly agitating it. Stop adding silver nitrate when the solution begins to change from yellow to red. Be consistent with endpoint recognition.

- 5.5 Record the ml of silver nitrate used.

6.0 Calculation

To obtain the chloride concentration, insert measured data into the following formula:

$$\frac{0.282 \times 35,450 \times \text{ml AgNO}_3}{\text{ml water extract}} \quad \times \quad \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

Using Step 5.0, determine the chloride concentration of the RO water used to mix with the soil sample. Record this concentration and subtract it from the formula results to find the net chloride in the soil sample.

Record all results on the delineation form.

Rice Operating Company

QUALITY PROCEDURE -07

Sampling and Testing Protocol for VOC in Soil

1.0 Purpose

This procedure is to be used to determine the concentrations of Volatile Organic Compounds in soils.

2.0 Scope

This procedure is to be used as the standard field measurement for soil VOC concentrations. It is not to be used as a substitute for full spectrographic speciation of organic compounds.

3.0 Procedure

3.1 Sample Collection and Preparation

3.1.1 Collect at least 500 g. of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample of soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.1.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag and sealed. When sealed, the bag should contain a nearly equal space between the soil sample and trapped air. Record the sample name and the time that the sample was collected on the Field Analytical Report Form.

3.1.3 The sealed samples shall be allowed to set for a minimum of five minutes at a temperature of between 10-15 Celsius, (59-77° F). The sample temperatures may be adjusted by cooling the sample in ice, or by heating the sample within a generally controlled environment such as the inside of a vehicle. The samples should not be placed directly on heated surfaces or placed in direct heat sources such as lamps or heater vents.

3.1.4 The sealed sample bag should be massaged to break up any clods, and to provide the soil sample with as much exposed surface area as practically possible.

3.2 Sampling Procedure

3.2.1 The instrument to be used in conducting VOC concentration testing shall be an Environmental Instruments 13471 OVM / Datalogger or a similar prototype instrument. (Device will be identified on VOC Field Test Report Form.) Prior to use, the instrument shall be zeroed-out in accordance with the appropriate maintenance and calibration procedure

outlined in the instrument operation manual. The PID device will be calibrated each day it's used.

3.2.2 Carefully open one end of the collection bag and insert the probe tip into the bag taking care that the probe tip not touch the soil sample or the sidewalls of the bag.

3.2.3 Set the instrument to retain the highest result reading value. Record the reading onto the Field Test Report Form.

3.2.4 If the instrument provides a reading exceeding 100 ppm, proceed to conduct BTEX Speciation in accordance with QP-O2 and QP-O6. If the reading is 100 ppm or less, NMOCD BTEX guideline has been met and no further testing for BTEX is necessary. File the Field Test Report Form in the project file.

4.0 Clean-up

After testing, the soil samples shall be returned to the sampling location, and the bags collected for off-site disposal, IN NO CASE SHALL THE SAME BAG BE USED TWICE. EACH SAMPLE CONTAINER MUST BE DISCARDED AFTER EACH USE.