AP - 65

STAGE 1 & 2 WORKPLANS

DATE:

June 20, 2003

TRIDENT ENVIRONMENTAL

June 20, 2003

Mr. Wayne Price
Environmental Bureau - New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Work Plan for EME M-9 SWD Station
T20S, R37E, SEC 9, Unit Letter M
Lea County, New Mexico

Dear Mr. Price:

Trident Environmental has been retained by Rice Operating Company (Rice) to develop and submit this work plan for further actions regarding the chloride and total dissolved solids (TDS) -impacted groundwater at the EME M-9 saltwater disposal (SWD) station. NMOCD approval of this work plan will be necessary so that Rice can obtain an authorization for expenditure (AFE) from their system partners prior to initiating the activities specified herein.

Due to the low concentrations of chloride (376 mg/L) and TDS (1,540 mg/L) relative to the New Mexico Water Quality Control Commission (WQCC) standards of 250 mg/L and 1,000 mg/L, respectfully, we recommend the actions described below be taken.

Potential Receptors

A topographic map with the site location indicated is included in Attachment A. No residence or manned facilities are located within one half mile of the site. Numerous oil and gas operations are in the site area including active oil/gas wells located approximately 1,000 feet southeast of the site. Based on a review of water well records listed on the New Mexico State Engineer Office and United States Geological Survey (USGS) websites, windmills marked on the USGS Hobbs SW topographic map, and subsequent field verification, only one water supply well was identified within 1,000 feet of the site. The well, located approximately 200 feet east of the site, has been abandoned and appears typical of a former water supply well used for past oil well drilling operations. The well is adjacent to a power utility pole, has 10-inch steel casing that is level with the ground surface, and has no cover for wellhead protection. The well should be plugged and abandoned unless it is put back into service as a water supply or monitoring well in which case the casing should be extended at least 2 feet above ground surface and sealed with a suitable cover for wellhead protection.

Installation of Groundwater Monitoring Wells

A monitoring well (MW-1) was installed on site in April 2002 and sampled for major ions (chloride, sulfate, bicarbonate, carbonate, calcium, magnesium, sodium, potassium, and TDS) and benzene, toluene, ethylbenzene, and xylenes (BTEX). Since the well had to be destroyed during excavation operations a replacement well (MW-1A) was installed at the same location in October 2002 prior to backfilling and lining the excavation. A summary of the historical groundwater analytical data for the monitoring wells is presented in the following table.

Summary of Groundwater Analytical Results for MW-1A

Date Sampled	Depth to Groundwater	Chloride (mg/L)	TDS (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
04/08/02	---	348	1512	<0.002	<0.002	<0.002	<0.006
05/13/02	21.02	354	1540	<0.001	<0.001	<0.001	<0.001
08/20/02	22.45	376	1517	<0.002	<0.002	<0.002	<0.006
10/28/02	19.10	372	1470	<0.001	<0.001	<0.001	<0.001
02/28/02	18.48	372	1500	0.002	0.002	0.002	0.003

Trident recommends the installation of additional monitoring wells to delineate the horizontal extent of the chloride/TDS plume and determine the magnitude and direction of the groundwater gradient. The suspected direction of groundwater flow is to the southeast, therefore Trident recommends the installation of the following additional monitoring wells:

- MW-2 approximately 140 feet southeast of MW-1A in the presumed down gradient direction.
- MW-3 approximately 120 feet northwest of MW-1in the presumed upgradient direction
- MW-4 approximately 100 feet down gradient from MW2 *only if* MW2 indicates that groundwater is impacted with greater than 250 mg/l chlorides or 1000 mg/l TDS

A site map with the proposed well locations is included in Attachment A. During drilling operations, soil samples will be collected periodically (five feet intervals) and field-tested for chloride content using the titration method (QP-03 in Attachment B). Monitoring wells will be completed as described in the well construction diagram in Attachment B.

Monitoring Well Sampling Procedures

Prior to sampling, the monitoring will be gauged for depth to groundwater using an electronic water level indicator. Immediately prior to collecting groundwater samples, each monitoring well will be purged of a minimum of three well casing volumes of water using a new, clean, decontaminated disposable bailer. Water samples will be collected with the disposable bailer and transferred into appropriately preserved containers for analysis of major ions and BTEX. Chain-of-custody (COC) forms documenting sample identification numbers, collection times, and delivery times to the laboratories will be completed for each set of samples. The water samples will be placed in an ice-filled cooler immediately after collection and transported to Environmental Lab of Texas in Odessa, Texas, or other approved laboratory, for analysis of the aforementioned constituents. Purging and water sampling procedures are described in further detail in Attachment B (QP-04 and QP-05).

Fate and Transport Modeling

If chloride concentrations in upgradient areas indicate that past operations at the EME M-9 site have impaired groundwater quality to levels above background levels, then fate and transport modeling is appropriate. The data obtained from the on site monitoring wells with other site specific information will be input into a fate and transport model such as WinTran (Version 1.3) to determine if the chloride/TDS plume will eventually attenuate by dispersion and dilution to levels below WQCC standards without risk to the human health and the environment.

Reporting Requirements

Depth to water measurements and groundwater samples will be obtained on a quarterly frequency for one year beginning immediately after the installation of the proposed new monitoring wells and annually thereafter if no significant seasonal variations in data are apparent. An annual groundwater investigation and monitoring report describing the monitoring well construction, sampling procedures, analytical results, modeling results, and conclusions of the investigation will be submitted to the New Mexico Oil Conservation Division (NMOCD). The following elements will be included in the annual report:

- A lithologic description and well completion diagram of the subsurface soils encountered, conditions observed, and construction details of each monitoring well.
- Groundwater elevation data and chloride and TDS concentrations for each monitoring event will be summarized in tabular format.
- Groundwater elevation map depicting the water table elevations and direction of groundwater flow for each sampling event.
- Chloride and TDS concentration maps for each sampling event.
- Maps displaying the modeled fate and transport of the chloride/TDS plume with respect to time.
- Identification of potential receptors
- Recommended further actions.

The proposed activities will be performed in accordance with NMOCD *"Guidelines for Remediation of Leaks, Spills, and Releases"* (August 13, 1993). Notice will be provided to the NMOCD at least one week prior to each sampling event.

NMOCD approval of this work plan is hereby requested so that Rice can obtain an AFE from their system partners prior to initiating these activities. We appreciate the opportunity to work with you on this project. Please feel free to call me at 432-682-0808, or Carolyn Haynes at 505-393-9174, if you have any questions.

Sincerely,

Gilbert J. Van Deventer, REM, NMCS
Project Manager

cc: Carolyn Haynes (Rice Operating Company – Hobbs, NM)

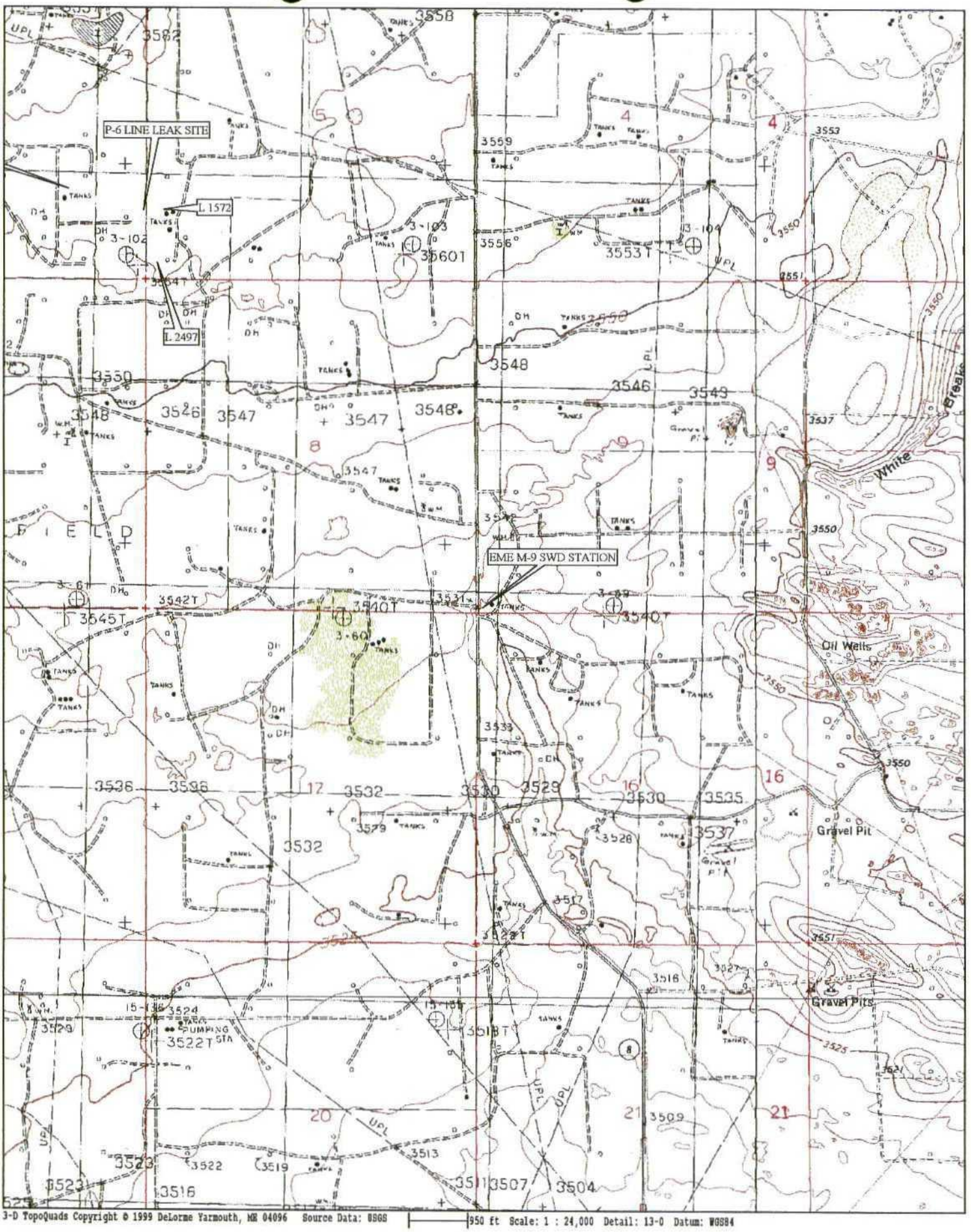
Attachments

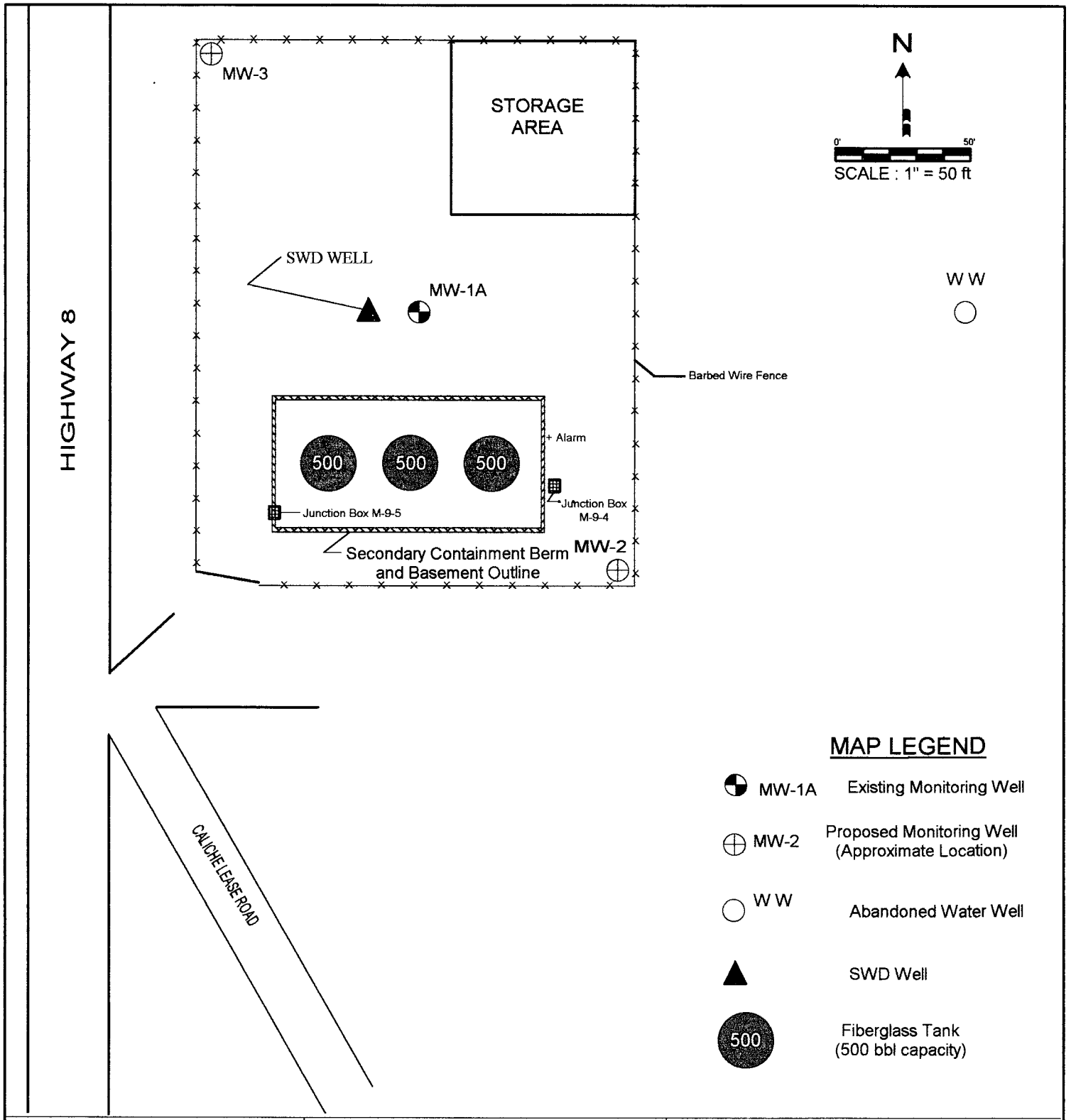
ATTACHMENTS

ATTACHMENT A

TOPOGRAPHIC MAP AND

PROPOSED MONITORING WELL LOCATION MAP


P-6 LINE LEAK SITE
L 1572
L 2497
EME M-9 SWD STATION
FIELD
Oil Wells
Gravel Pit
Gravel Pits
White
3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS
950 ft Scale: 1 : 24,000 Detail: 13-0 Datum: WGS84



TRIDENT ENVIRONMENTAL

Site: EME M-9 SWD Station	SITE MAP
Date: May 19, 2003	
Author: GJV Checked By: DTL	PROPOSED MONITORING WELL LOCATIONS
File: Projects/Rice/EME/M-9/M9SiteMap	

ATTACHMENT B

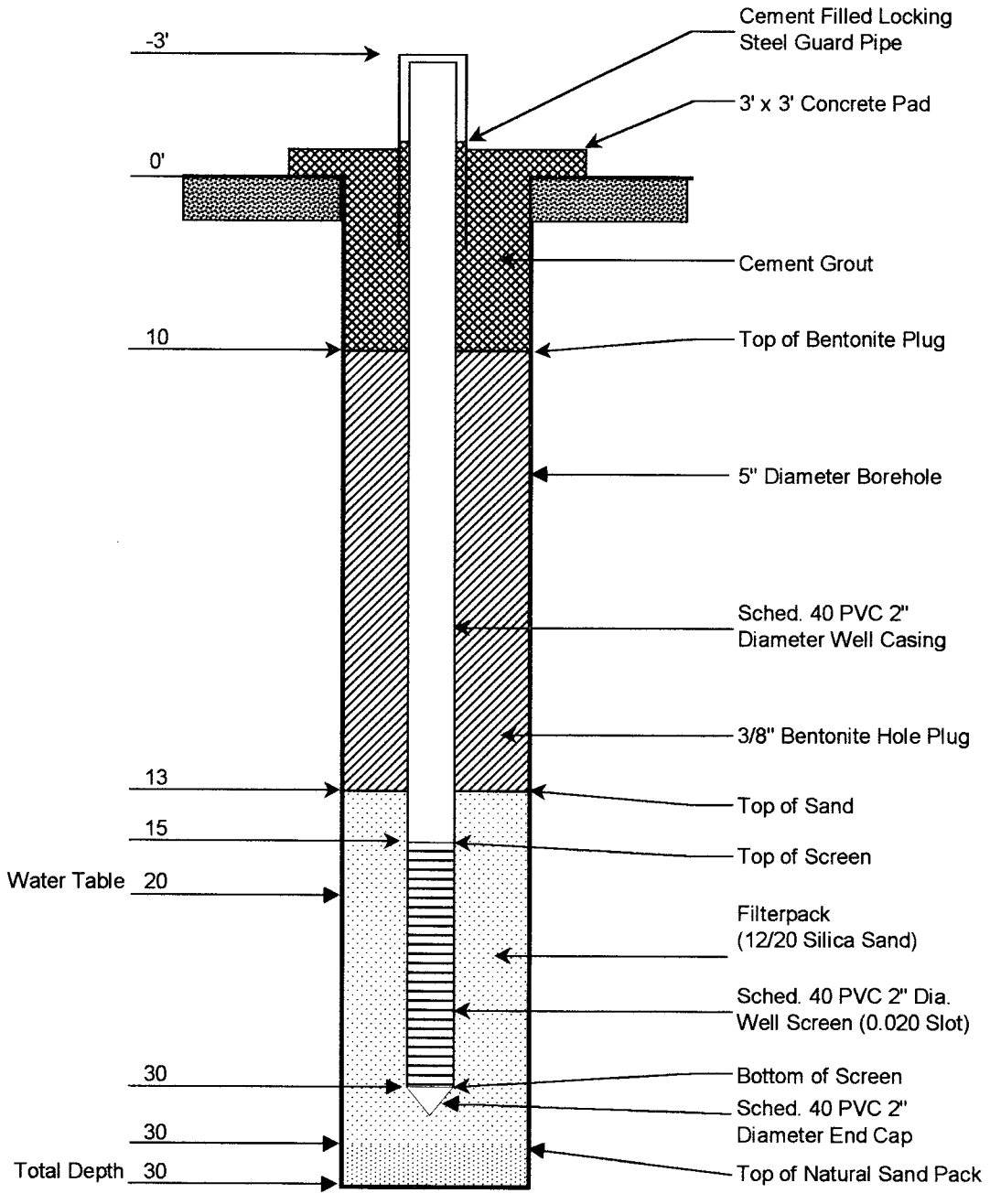
MONITORING WELL CONSTRUCTION DIAGRAM

SAMPLING AND TESTING PROTOCOL FOR CHLORIDE TITRATION

PROCEDURE FOR DEVELOPING CASED WATER MONITORING WELLS

PROCEDURE FOR OBTAINING WATER SAMPLES (CASED WELLS)

MONITORING WELL CONSTRUCTION DIAGRAM



TRIDENT ENVIRONMENTAL	SITE: EME M-9 SWD FACILITY		**Monitoring Well Construction Diagram**
	DATE: 03/20/03	REV. NO.: 1	
	AUTHOR: GJV	DRAWN BY: GJV	
	CK'D BY: DTL	FILE: Well Bore Diagram	

Rice Operating Company

QUALITY PROCEDURE

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 larger 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 (H_2O_2) to mixture.

5.4 Using a 1 ml pipette, carefully add .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:

$$\frac{.282 \times 35{,}450 \times \text{ml } AgNO_3}{\text{ml water extract}} \times \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

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

Procedure for Developing Cased Water Monitoring Wells

1.0 Purpose

This procedure outlines the methods to be employed to develop cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Sample Collection and Preparation

3.1 Prior to development, the static water level and height of the water column within the well casing will be measured with the use of an electric D.C. probe or a steel engineer's tape and water sensitive paste.

3.2 All measurements will be recorded within a field log notebook.

3.3 All equipment used to measure the static water level will be decontaminated after each use by means of Liquinox, a phosphate free laboratory detergent, and water to reduce the possibility of cross-contamination. The volume of water in each well casing will be calculated.

4.0 Purging

4.1 Wells will be purged by using a 2" decontaminated submersible pump or dedicated one liter Teflon bailer. Wells should be purged until the pH and conductivity are stabilized and the turbidity has been reduced to the greatest extent possible.

4.2 If a submersible is used the pump will be decontaminated prior to use by scrubbing the outside surface of tubing and wiring with a Liquinox water mixture, pumping a Liquinox-water mixture through the pump, and a final flush with fresh water.

5.0 Water Disposal

5.1 All purge and decontamination water will be temporarily stored within a portable tank to be later disposed of in an appropriate manner.

6.0 Records

6.1 Rice Operating Company will record the amount of water removed from the well during development procedures. The purge volume will be reported to the appropriate regulatory authority when filing the closure report.

Rice Operating Company

Quality Procedure

Procedure for Obtaining Water Samples (Cased Wells) Using One Liter Bailer

1.0 Purpose

This procedure outlines the methods to be employed in obtaining water samples from cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the water. The shipment should include a Certificate of Compliance from the manufacturer of the collection bottle or vial and a Serial Number for the lot of containers. Retain this Certificate for future documentation purposes.

3.2 The following table shall be used to select the appropriate sampling container, preservative method and holding times for the various elements and compounds to be analyzed.

Compound to be Analyzed	Sample Container Size	Sample Container Description	Cap Requirements	Preservative	Maximum Hold Time
BTEX	40 ml	VOA Container	Teflon Lined	HCl	7 days
TPH	1 liter	clear glass	Teflon Lined	HCl	28 days
PAH	1 liter	amber glass	Teflon Lined	Ice	7 days
Cation/Anion	1 liter	clear glass	Teflon Lined	None	48 Hrs
Metals	1 liter	HD polyethylene	Any Plastic	Ice/HNO_3	28 Days
TDS	300 ml	clear glass	Any Plastic	Ice	7 Days

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the well identification and the individual tests to be performed at that location. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label). Affix the labels to the jars.

5.0 Bailing Procedure

5.1 Identify the well from the sites schematics. Place pre-labeled jar(s) next to the well. Remove the plastic cap from the well bore by first lifting the metal lever and then unscrewing the entire assembly.

5.2 Using a dedicated one liter Teflon bailer, purge a minimum of three well volumes. Place the water in storage container for transport to a ROC disposal facility.

5.3 Take care to insure that the bailing device and string do not become cross-contaminated. A clean pair of rubber gloves should be used when handling either the retrieval string or bailer. The retrieval string should not be allowed to come into contact with the ground.

6.0 Sampling Procedure

6.1 Once the well has been bailed in accordance with 5.2 of this procedure, a sample may be decanted into the appropriate sample collection jar directly from the bailer. The collection jar should be filled to the brim. Once the jar is sealed, turn the jar over to detect any bubbles that may be present. Add additional water to remove all bubbles from the sample container.

6.2 Note the time of collection on the sample jar with a fine Sharpie.

6.3 Place the sample directly on ice for transport to the laboratory. The preceding table shows the maximum hold times between collection and testing for the various analyses.

6.4 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

7.0 Documentation

7.1 The testing laboratory shall provide the following minimum information:

A. Project and sample name.
B. Signed copy of the original Chain of Custody Form including the time the sample was received by the lab.
C. Results of the requested analyses
D. Test Methods employed
E. Quality Control methods and results

Calculation for Determining the Minimum Bailing Volume for Monitor Wells
Formula $V = (\pi r^2 h)$
2" well [V/231=gal] X 3 = Purge Volume

V=Volume
π=pi
r=inside radius of the well bore
h=maximum height of well bore in water table

Example:

π	r^2	h(in)	V(cu.in)	V(gal)	X 3 Volumes	Actual
3.1416	1	180	565.488	2.448	7.34 gal	>10 gal