

**FIELD REPORT:
VACUUM ASSISTED OIL SKIMMING PILOT TEST
FIRE TRAINING AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT - CALVERTON
RIVERHEAD, NEW YORK**

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1.0 INTRODUCTION

The Northern Division of the Naval Facilities Engineering Command has issued Delivery Order (DO) No. 0033 to Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) under Remedial Action Contract (RAC) No. N62472-94-D-0398 for the installation, startup and operation and maintenance (O&M) of two Free Product Removal (FPR) systems for a period of 12 months at the Naval Weapons Industrial Reserve Plant (NWIRP), located in Calverton, New York. One FPR system is proposed to be installed within the Fire Training Area (Site 2) and the other within the Fuel Calibration Area (Site 6A).

To evaluate the feasibility of using Vacuum Assisted Oil Skimming (VAOS) techniques to recover free product, Foster Wheeler proposed a pilot test in each area. These pilot tests were authorized by modification 07 to the Delivery Order.

Due to a change in field conditions (higher than normal water table), the pilot test was only performed in the Fire Training Area (FTA) and not in the Fuel Calibration Area (FCA). This report presents and evaluates the data collected during the pilot test, and presents recommendations for the final recovery system.

1.1 Site Description

The NWIRP-Calverton facility is located in Suffolk County, approximately 70 miles east of New York City primarily within the municipality of Riverhead, New York. The facility occupies approximately 6,000 acres, bordered by Middle Country Road (Route 25) to the north, agricultural land to the east, River Road to the south, and Wading River Road to the west as presented on Figure 1.

The FTA is located on the eastern side of a 9-acre clearing in the south central portion of the facility as presented in Figure 2. The FCA (Figure 2) is located approximately 2,000 feet north of River Road and 2,000 feet west of the south gate of the facility, also in the south central portion of the facility.

1.2 Site History

The FTA is located on the eastern side of a 9-acre clearing as presented in Figure 3. A circular, concrete ring in the southeast corner of the clearing was used to contain liquids for fire training exercises. The ring is approximately 50 feet in diameter and is located about 750 feet north and 1,000 feet west of the NWIRP South Gate. An 8-inch concrete curb forms the wall of the ring. A 6,000-gallon underground storage tank (UST) was located north of the training area. In 1982, a 1,000-gallon aboveground storage tank (AST) was installed approximately 75 feet north of the ring to replace the 6,000-gallon UST. The AST was subsequently removed in 1996.

The FTA was used by Northrop Grumman and Navy crash rescue crews as a training area since 1955, and possibly as early as 1952 during the Korean War. The Initial Assessment Study (IAS) reports that up to 450 gallons of waste solvents were mixed with up to 2,100 gallons of waste

fuel per year for use in training exercises. After 1975, waste solvents were reportedly no longer mixed with the waste fuels and oils. Fire fighting materials used in the training exercises included aqueous fire fighting foam (AFFF), gaseous Halon 1301, water, and dry chemical extinguishers.

1.3 Geology & Hydrogeology

Based on previous subsurface investigations, the FTA is underlain by three distinct lithofacies. The upper lithofacies range from one to seven feet thick and consist of predominantly dark brown, brown, and orange, silty fine-grained sand with varying amounts of peat and clay. Fill encountered at the site is always associated with the upper lithofacies. The middle lithofacies range from 54 to 78 feet thick and consist of light brown and tan fine-grained sand with varying amounts of medium-grained sand and pebbles. The middle lithofacies probably represent undisturbed glacial deposits. The lower lithofacies consist of gray, silty clay. The subsurface geology of the FTA is consistent with that found in other areas of the facility.

Groundwater in the glacial deposits occurs under unconfined conditions. The depth the groundwater ranged from 11.68 to 29.90 feet below ground in 1995. The elevation of the water table ranges from 41.08 to 39.8 feet above mean sea level. Groundwater elevation data was derived from static water level measurements of wells FT-MW-01-I/S through FT-ME-07-S. Based on water level measurements collected concurrent with free product monitoring between 1990 and 1996, depth to water across the site ranged between 12 and 20 feet. Seasonal fluctuations in the water table on the order of three feet are normal. The seasonal high water table occurs in spring, between March and May. The seasonal low water table occurs in late fall and early winter.

The direction of groundwater flow is to the south-southeast. Based upon previous water level measurements, there is no vertical gradient present. The hydraulic conductivity calculated for glacial deposits ranges from 55 ft/day to 111 ft/day for sediments shallower than 28 feet and from 35 ft/day to 81 ft/day for sediments deeper than 64 feet.

Surface water runoff from the FTA flows to the southeast. The nearest potential receiving water is Swan Pond, located 2,000 feet to the southeast.

1.4 Previous Studies

1.4.1 Fire Training Area

During the 1980's, 18 shallow groundwater monitoring wells were installed to identify the location of free product. The majority of the wells are located to the east and southeast of the training ring.

According to the "Engineering Evaluation/Cost Evaluation for Sites 2, 6A, 7 and 10B" prepared by C. F. Braun Engineering Corporation and dated May 1998, a free product recovery and oil-water separation system was installed at the FTA in December of 1987 to the southeast of the

fire training ring. The system consisted of a pumping well which utilized a submersible pump and a separate recovery well with a filter scavenger pump to collect free floating product. Both wells were 4 inches in diameter. The system was shut down in 1993, but free product recovery from the shallow monitoring wells via hand bailing continued until 1996. As of December 1993, approximately 270 gallons of petroleum product had been removed from the site.

Various soil remediation and investigation activities have also occurred. Excavation of limited soil areas has occurred in response to releases from the on-site storage tanks. As part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) soil and soil gas sampling was performed in order to characterize the nature and extent of soil contamination. Also, a pilot-scale air sparging/soil vapor extraction (AS/SVE) was installed at the FTA in 1995.

The presence of free product in the FTA was observed to be greatest in the late fall and early winter months when the water table is at seasonal low elevations. Product thickness has been observed to decrease to low trace levels in the spring as the water table rises. In the round of product-thickness measurements conducted at the FTA, by CF Braun in August 1998, five wells, W1, W9, W10, W13, and FT-MW-02-S contained measurable product. The product thickness in these wells ranged from a sheen in W9 to 0.14 ft. in W13 (Engineering Evaluation/Cost Analysis {EE/CA} For Sites 2, 6A, 7 and 10B, Tetra Tech NUS Corporation, September 1998).

1.4.2 Fuel Calibration Area

Eighteen monitoring wells were placed south and southeast of the existing fuel calibration pad between March 1984 and November 1987.

A free product recovery system including a pumping well, a free product recovery well, and an oil/water separator tank was installed in 1987. The tank is connected to a pipe that follows the drainage ditch paralleling the southern edge of the concrete pad. Red iron staining was observed in the ditch adjacent to the oil/water separator at the end of the culvert. The staining in the ditch near the oil/water separator occurred in 1990 as a result of a pipe breaking (CF Braun, 1998b). The free product recovery system was shut down in 1993. Free product recovery, via hand bailing continued after the system was shut down. As of February 1996, approximately 1,900 gallons of petroleum product had been removed from the site.

A RFI was conducted in 1994 and 1995 at the FCA. As part of this investigation, soil was evaluated to determine nature and extent of contamination. A soil gas survey was also performed.

1.4.3 Recent Product Recovery Tests

CF Braun conducted product recovery tests (without groundwater depression) in both the FTA and FCA in March 1998. At the FTA two wells, FT-MW-02-S and W13 were tested for product recovery. For the test, product was removed from both wells and subsequent product recovery was measured. In FT-MW-02-S a product recovery rate of 0.006 ft. per hour was recorded over a period of 20 hours and W13 exhibited a product recovery rate 0.004 ft. per hour over 18 hours. (Tetra Tech NUS Corp., 1998). The conclusion drawn by CF Braun was that free product was present in wells at the area and free product removal was a viable remedial measure for the area.

The two wells tested at the FCA, FC-MW-02-S and 4/CG exhibited product recovery rates of 0.005 ft. per hour (over 22.5 hours) and 0.002 ft. per hour (over 21.5 hours) respectively. The conclusion for the FCA was the same as the conclusion for the FTA, product recovery was/is a viable measure for the area.

Laboratory analyses of free product samples collected by CF Braun in August 1998, within site monitoring wells indicate the presence of chlorinated solvents, pesticides, polychlorinated biphenyls (PCBs) and metals.

2.0 VAOS PILOT TEST

VAOS utilizes standard oil skimming techniques performed in a well that is placed under vacuum. The system is similar to bioslurping, although, virtually no groundwater is extracted. As with bioslurping, the induced vacuum provides a greater "driving force" for free-floating light non-aqueous phase liquids (LNAPLs) to flow into the well than pumping with no vacuum. In addition to an increase in recovery efficiency of free product, the introduction of a vacuum on unsaturated soils may also allow the removal of product trapped in small pores within the capillary fringe¹. Therefore, the proposed system should capture LNAPLs via the skimmer and simultaneously perform remediation of the vadose zone via bioventing. The vacuum should aspirate soil gas that may contain volatile hydrocarbons and aspirate ambient air, which stimulates indigenous bacteria to induce bioremediation in the vadose zone and the smear zone. VAOS should achieve recovery of phase-separated hydrocarbon (PSH) and remediate the vadose zone and the smear zone.

The system is intended to operate with minimal fluid drawdown in the aquifer, thereby reducing problems associated with LNAPL smearing and entrapment. Bioventing of the vadose zone is achieved by withdrawing soil gas from the recovery well. The soil gas that is extracted is dependent on the rate of LNAPL recovery.

2.1 Pilot Test Objectives

The objectives of the VAOS pilot study as detailed in the Work Plan were:

Estimate zone of vacuum influence - The zone of influence will be determined based on pressure readings taken at monitoring points adjacent to the vacuum well. The relationship between distance and pressure will be established and the zone of influence will be defined as the distance that 5 percent of the applied vacuum extends to. For example, if the applied vacuum is 20 inches water, the limit of the zone of influence will be considered the distance resulting in 1 inch of water vacuum.

Measure the airflow rates versus vacuum and product recoverability - The recovered product will be measured in the recovery drum for each step vacuum

¹ Miller, Ralinda R., "Bioslurping" Groundwater Remediation Technologies Analysis Center, October 1996, Pg 3.

level during the test. This will establish the relationship between applied vacuum and recoverable product. The optimum rate will be estimated from this data to determine the vacuum rate for the final design.

Develop the required configuration for a full-scale VAOS system in each area -

The final design for a full-scale VAOS system will be determined. Based on the optimum vacuum vs. recovery rate, and the resulting zone of influence, the well spacing can be found. The recovery rate and required vacuum will be used to size recovery tanks and necessary blowers for the final system.

Establish the concentration of hydrocarbons in the venting system effluent and the atmospheric hydrocarbon mass loading - Based on the air sampling results, the carbon usage will be estimated and the carbon requirements can be determined for the final system.

2.2 Pilot Test Implementation

Pilot tests were proposed for both the FCA and FTA. The presence of free product in these areas have historically been observed to be greatest in the late summer to fall months when the water table is at seasonal low elevations.

Product measurements performed by Foster Wheeler staff on November 3, 1999 to establish pre-test conditions for well selection revealed less than expected levels of product in both areas as shown on attached Table 1A and Table 1B. No significant product for testing purposes was found at the FCA and small amounts of product were found in two wells at the FTA. The lack of product was determined to be the result of an elevated water table due to higher than normal rains from Hurricane Floyd and other tropical storms in September of 1999.

After discussion with the Navy, it was decided to proceed with the VAOS test at the FTA. It was expected that the lack of product would not affect the data regarding the vacuum influence, although it may impact determination of product recovery rates and hydrocarbon loading.

2.3 Equipment Configuration

As discussed above, the proposed pilot system consisted of a single extraction well placed under vacuum and fitted with a product skimmer. Product from the skimmer was discharged to a drum and extracted vapor processed through carbon treatment before being discharged to the atmosphere. The general equipment layout for the pilot recovery test is presented in attached Figure 4.

Existing wells and piezometers were used for the VAOS pilot study. The extraction wells and pressure monitoring points selected were screened above the water table to allow collection of product and movement of interstitial air in the vadose zone to the extraction well. Based on recent product plume data, monitoring well FT-MW-2S was selected to be the extraction well for the pilot test. As indicated in attached Table 1A, FT-MW-2S has consistently indicated the presence of product since March of 1999. Prior to the start of the test on November 2, 1999,

only one other location, PZ-T3, indicated the presence of a product layer. Pressure monitoring points were selected at different distances from the extraction well to evaluate the relationship between distance and vacuum influence. Selected wells and piezometers are presented on attached Figure 3. The following are the distances of existing well and piezometers in the vicinity of the extraction well selected as pressure monitoring points:

<u>Location</u>	<u>Distance from FT-MW-2S</u>
PRW2	15.6 ft
PZ2T	20.2 ft
PZT3	25.0 ft
PZT1	35.6 ft

Table 2 presents the screened depths for the vacuum extraction well and the pressure monitoring points. All wells and piezometers selected for the pilot test were inspected and redeveloped, if required, prior to the pilot test.

The extraction well was equipped with a pneumatically operated product skimmer and fitted with an air tight well cap with fittings for the skimmer tubing and an additional fitting to allow connection of a vacuum hose. Figure 5 presents the extraction well configuration used for the pilot test.

The vacuum fitting on the well cap was attached to a throttling valve used for fine adjustment of well head pressure. Vacuum gauges were placed before and after the valve to measure well and line vacuum respectively. The throttling valve was then connected with a flexible hose to a moisture knockout canister. Rigid PVC piping connected the moisture knockout canister to a make-up air line consisting of a "Y" fitting and valve which allowed the introduction of ambient air to the vacuum stream. Use of the make-up air tube allowed a much larger range of well head pressures from the same blower unit. Piping then continued to another throttling valve located just before the blower unit with a vacuum gauge on the blower side of the valve. This valve was used for course adjustment of system vacuum.

The blower had a 2 horsepower motor powered by a portable gas-operated generator. Air exited the blower and continued through two vapor phase activated carbon units for treatment prior to atmospheric discharge. The resulting system was capable of applying between 5 to 50 inches water at the well head allowing a full range vacuum.

The pneumatic skimmer at the extraction well was powered by a pressurized gas cylinder of nitrogen. The operation of the skimmer was regulated by an adjustable timer also powered by the generator. Product recovered by the oil skimmer at the vacuum extraction well was pumped directly into a 55-gallon drum. The drum was equipped with automatic shut-off valve which suspended skimmer pumping if the drum was full.

Each of the selected pressure monitoring points were fitted with an air tight cap with a sampling valve. The sampling valve had a barb to allow connection of 1/4" flexible tubing. A portable electronic manometer with a range of 0 to 20 inches water vacuum was used to measure vacuum

at the pressure monitoring points. The manometer was connected to the sampling valve with a flexible tube, and then the valve would be opened and a vacuum measurement taken.

2.4 Pre-Test Conditions

As presented in Table 1A, Water levels and product thickness measurements were performed in the selected test wells and piezometers, and other surrounding wells and piezometers prior to the start of pilot test activities (November 8, 1999) to establish pre-test conditions. Pressure measurements were also taken at each pressure monitoring point to confirm the pressure within the wells to be equal to ambient pressure.

2.5 Baildown Test

Pre-test monitoring was performed to determine the baseline conditions prior to the start of the pilot test. A baildown test was performed at the proposed extraction well and measurements taken for subsurface depth to water and product thickness at the extraction well.

The baildown test was conducted on the extraction well using conventional bailers and an interface probe under static and equilibrium conditions. Table 3A shows the start time of the test, the volume bailed, and the product thickness. As noted in the table, there was an insignificant amount of product recovery. After ceasing the bailing of product, the well was gauged continuously using an oil/water interface probe in order to determine the recharge rate for product. The gauging was stopped after the level of water and product in the well has reached equilibrium. Table 3B lists the product thickness and calculated recharge rate.

Product measured at the start of the baildown test consisted of a distinct product layer underlain by a thin layer of mixed product/water having a hazy appearance. The baildown test removed the majority of the distinct product layer. After recovery only a sheen of distinct product remained and increased layer of mixed product. Measurements taken before the start of the skimmer test, the following day, showed the mixed layer had disappated. The mixed layer, having a slightly heavier specific gravity than the product, may have resided in the filter pack. This type of mixed material can not be removed by skimming techniques.

2.6 Vacuum Influence Evaluation

Following the first portion of the step test (Section 2.7), skimmer test without vacuum, a vacuum influence test was performed to determine the range of response in adjacent pressure monitoring to applied vacuum at the extraction well. The range of response was used to establish the range of vacuum to be used for the step test. Data collected during the vacuum influence test is presented in Table 4. Product was not skimmed during this evaluation.

To start the system was adjusted to a low vacuum of approximately 10 inches water at the wellhead. The vacuum level was increased every hour by 10 inches of water (*i.e.*, 10, 20, 30, 40, and 50 inches H₂O). Throughout the vacuum influence evaluation, pressure measurements were obtained at the pressure monitoring points. Also groundwater level in the extraction well was

monitored using a Telog type pressure transducer to indicate any groundwater lift due to the applied vacuum. Recorded measurements are detailed in Table 4.

Vacuum measurements were taken at the pressure monitoring points for each vacuum step. A flame ionization detector (FID) and combustible gas indicator (CGI) were used to monitor air quality exiting the system and in the vicinity of the test.

The test established the general relationship between applied vacuum, vacuum influence and aquifer response (the rise in the aquifer due to the applied vacuum). The initial zone of influence test will establish the range of vacuum that causes measurable reaction in the adjacent monitoring points. This range will be used to determine the steps to be used in the pilot test. The data will be used to establish the step pressures to be used for the Step Recovery Test. The pressure range will be between the lowest vacuum causing influence in an adjacent well and the vacuum required to cause a rise in the aquifer.

During the vacuum influence evaluation, vapor stream samples were collected in Summa canisters for laboratory evaluation using the EPA method T014. Vapor stream samples were collected before (sample-ID FTAV-01P) and after the carbon (sample ID FTAV-01A) treatment at the highest vacuum (also highest flow rate) to evaluate worst case conditions. Only PCE at low levels was indicated in the Summa canister samples taken before carbon treatment. No contamination was detected in the sample taken after carbon treatment. Results are attached in Appendix D.

The results of the influence test indicated a measurable influence in adjacent wells from an applied vacuum of as little as 10 inches water at the extraction well. The area of influence can be defined as the area in which there is measurable vacuum attributable to the applied vacuum at the extraction well.

Vacuum levels in adjacent wells increased as the vacuum in the extraction well was increased to 20 then 30 inches of water. Increasing the vacuum to 40 then 50 inches water showed little change in the vacuum at the monitoring points indicating a potential short circuiting of air through the ground surface.

Based on collected measurements, vacuum over 30 inches water resulted in little change in the influence on adjacent monitoring points. Therefore, the upper range for the vacuum influence test was selected to be 30 inches water. To give an intermediate valve between no vacuum and the upper range, 15 inches of water was also selected for the step test.

The radius of vacuum influence required for VAOS systems is very site specific. Based on field observations, the limit of influence was determined to be the limit at which a sustained vacuum was measured at the pressure monitoring points. Field observations concluded that readings under 0.15 inches water vacuum tended to fluctuate and be erratic while readings above 0.15 trended to be more consistent and varied slowly. Therefore the radius of vacuum influence for the FTA is selected based on an average influence of 0.15 inches water vacuum. The radius of influence for each applied vacuum was interpolated based on average vacuum readings at pressure monitoring points.

<u>Vacuum</u>	<u>Radius of Influence</u>
10 inches	16 ft
20 inches	19 ft
30 inches	21 ft
40 inches	21 ft
50 inches	21 ft

It should be noted that vacuum levels unexpectedly decreased in monitoring point PZT3 at 40 and 50 inches of vacuum.

2.7 Step Recovery Test

Based on the vacuum range established in the vacuum influence test, the step test was planned to be performed in three steps:

- Step 1 - No vacuum
- Step 2 - 15" water vacuum
- Step 3 - 30" water vacuum

The first step, no vacuum, was performed following the bail down test, but before the vacuum influence test. This was to ensure that recovered product was not the result of any applied vacuum.

Based on the lack of product recovery resulting from Step 1 through 3, an additional step (Step 4) was added of 36" water vacuum.

2.7.1 No Vacuum

After completion of the baildown testing, a skimmer product-recovery test was applied with no vacuum. Skimmer activity and discharge was continuously monitored. The next day after a total of 28 hours of skimming, no product had been recovered. Therefore, the skimming without vacuum was ceased. An inspection of the water surface at the extraction well following the skimming test indicated only a sheen of product.

2.7.2 Vacuum

Based on the range of vacuum established in the vacuum influence evaluation, vacuum testing was performed to evaluate the relationship between applied vacuum and product recovery. Step 2 of the test applied a vacuum of 15 " water vacuum to the extraction well.

Prior to the start of the test only a sheen was identified within the extraction well and 0.03 feet of product in PZT3. Pressure readings were taken at pressure monitoring points to ensure that pressure in the surrounding wells prior to the start of the test were equal to ambient conditions.

After the application of vacuum to the extraction well, vacuum measurements were taken at pressure monitoring points as presented on attached Table 5. Pressure measurements stabilized quickly as expected due to the course grain soils at the Site. Measured vacuum at monitoring

points ranged from 0.08 inches water at the furthest monitoring point (PZT1) to 0.33 inches at the closest (PRW2). Stack discharge and recovered product measurements were also taken.

A FID and CGI was be used to monitor air quality before, between, and after carbon units. Summa canister samples were collected before (FTAV-02P) and after carbon treatment (FTAV02P). Summa canister samples were evaluated by TO-14 analysis for volatile organic compounds. Only PCE at low levels was indicated in the Summa canister samples taken before carbon treatment. No contamination was detected in the sample taken after carbon treatment. Laboratory analysis results are attached in Appendix D.

The system was run through the night at 15 inches water vacuum. No product was collected by the skimmer. Water within the extraction well showed only a sheen at the completion of the step.

The next morning the vacuum at the wellhead was increased to 30 inches water. Measurements and monitoring data presented in Table 5 were collected in the same manner as the previous step. Summa canister samples were collected before (FTAV-03P) and after carbon treatment (FTAV03P). Summa canister samples were evaluated by TO-14 analysis for volatile organic compounds. Only PCE at low levels was indicated in the Summa canister samples taken before carbon treatment. No contamination was detected in the sample taken after carbon treatment. Laboratory analysis in Appendix D.

The system was run through the night at 30 inches water vacuum. No product was collected by the skimmer. Water within the extraction well showed only a sheen at the completion of the step.

Due to the lack of recovered product and additional step was added, Step 4. For Step 4 the vacuum was increased to 36 inches water vacuum at the well head. Measurements and monitoring data presented in Table 5 were collected in the same manner as the previous step. Summa canister samples were collected before (FTAV-04P) and after carbon treatment (FTAV04P). Summa canister samples were evaluated by TO-14 analysis for volatile organic compounds. Laboratory analysis in Appendix D.

The system was run through the night at 36 inches water vacuum. No product was collected by the skimmer. Water within the extraction well showed only a sheen at the completion of the step.

3.0 RESULTS

The following are results in response to the goals of the pilot test:

Estimate zone of vacuum influence - Even under the lowest applied vacuum, 10 inches water, vacuum influence was indicated in the furthest pressure monitoring point. The effectiveness of the influence for the collection of product needs to be evaluated based on resulting pooling of product in the area due to the applied vacuum. Since no significant product was encountered, the effect can not be fully defined.

Measure the airflow rates versus vacuum and product recoverability - No product was recovered under vacuum.

Develop the required configuration for a full-scale VAOS system in each area - See Section 4.0, Conclusions and Recommendations.

Establish the concentration of hydrocarbons in the venting system effluent and the atmospheric hydrocarbon mass loading - Only small amounts of tetrachloroethene (PCE) were measured entering the carbon and none was measured leaving the carbon.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Product measurements taken prior to the start of the pilot test indicated unusually low product levels for the season. Historical measurements had indicated that product levels increased in the fall during seasonal lows in the groundwater table and decreased in the spring due to rise in the groundwater table. The rise of the groundwater table causes product to be trapped in soil pores by the rising groundwater. As the groundwater drops, the product collects again on the water table.

Due to the heavy rainfall that occurred in September of 1999 from hurricane Floyd and other tropical storms, the groundwater table was approximately two feet higher than expected. Product measurements before the start of the test (November 2, 1999) showed significant product in only two locations in the FTA (FT-MW-2S and PZT3) and no product levels were identified in the FCA. Compared to a year before in August of 1998, five wells in the FTA, W1, W9, W10, W13, and FT-MW-02-S contained measurable product. The product thickness in these wells ranged from a sheen in W9 to 0.14 ft. in W13.

Despite the lack of product, The Navy authorized that the pilot test to be performed. It was hoped that the application of vacuum would cause collection of localized product if present. Performance of the pilot test indicated very little product in the area. Product in the extraction well appeared to be only accumulation product and did not represent a product layer. The rise in the groundwater table appears to have smeared any available product into the soil pores as the groundwater table rose.

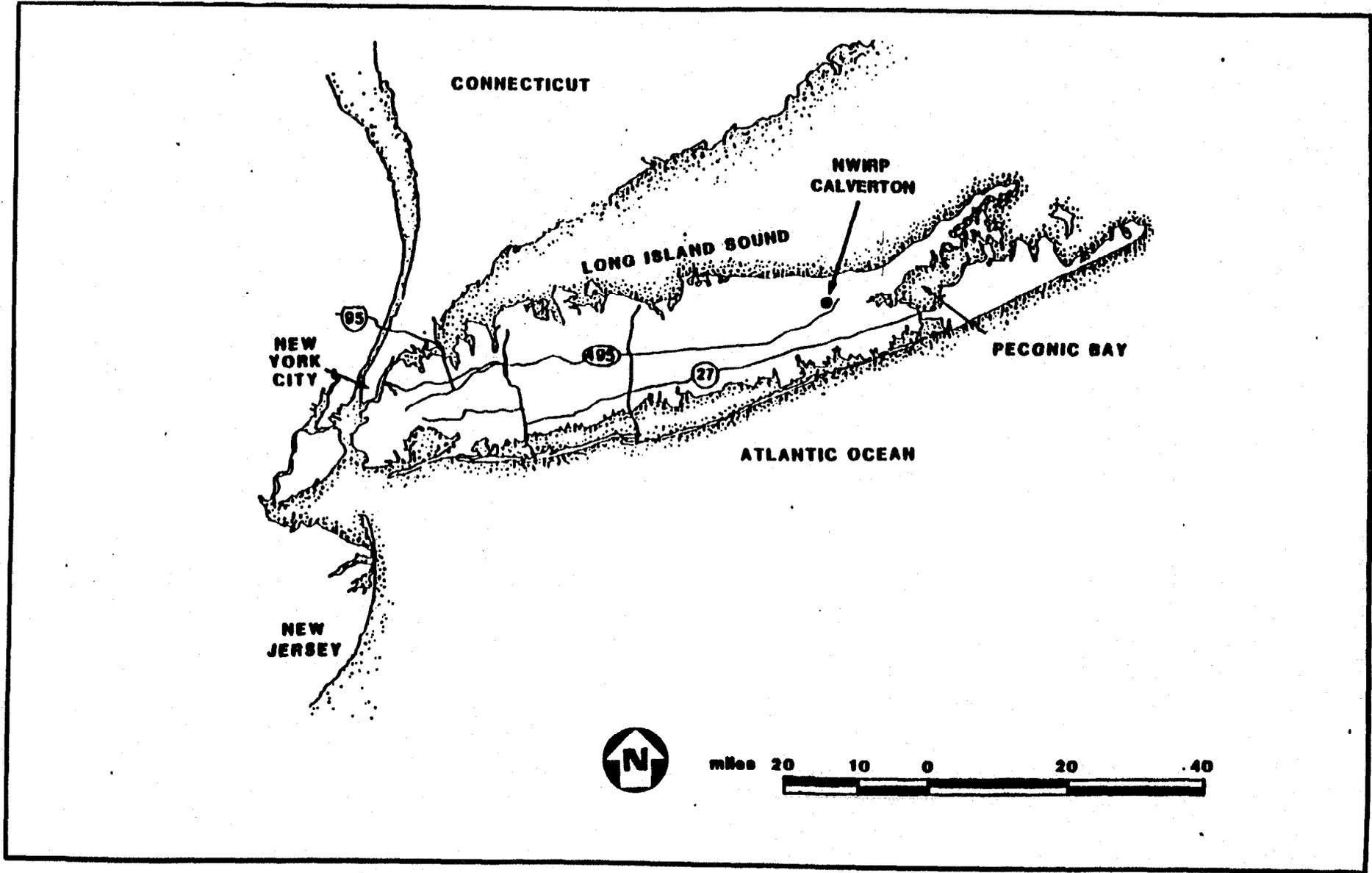
Based on these findings, Foster Wheeler Environmental can not recommend the use of VAOS for recovery of product at this time. The pilot test has demonstrated that the volume of product available for recovery is too small and inconsistent for this type of system. Foster Wheeler Environmental recommends that oil absorbent material be placed in wells/piezometers containing as little as a sheen and wells/piezometers without product directly down gradient of wells/piezometers with product. Absorbent should be inspected on a monthly basis and replaced as required.

Due to the small amount of product apparently present in each area and the effect of seasonal groundwater fluctuation smearing the remaining product, additional removal of product during high groundwater periods is difficult. To remove additional product beyond the use of absorbent material would require depression of groundwater levels in the area of product contamination to

consistently expose the smear zone. Extracted groundwater would then require treatment to meet discharge requirements. Based on chemical characterization of groundwater in both the FTA and FCA, costs for groundwater treatment would be expensive. The high of cost groundwater treatment required for depression of the groundwater table compared to the small amounts of identified product does not appear to be practical.

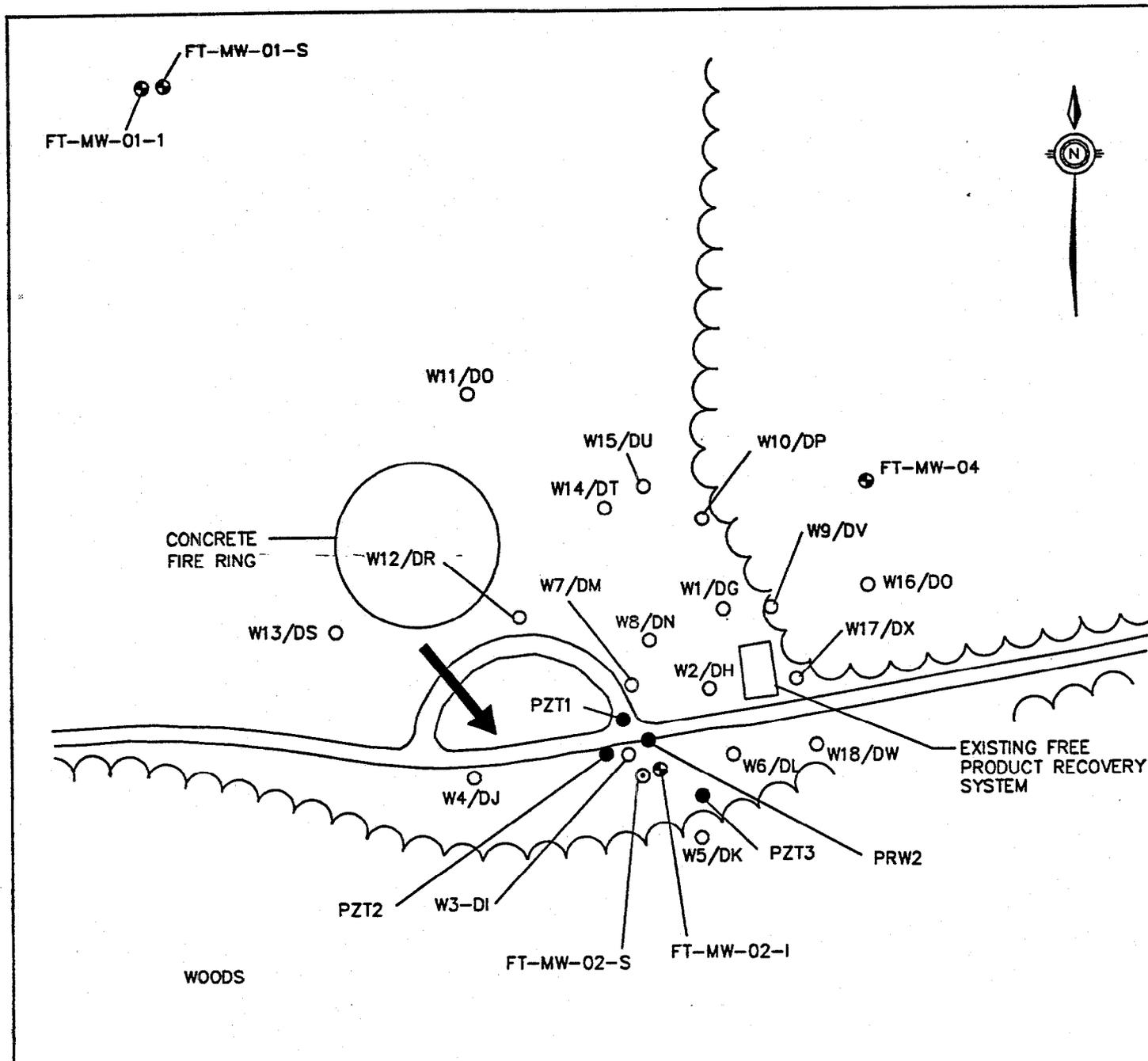
APPENDIX A

Figures



GENERAL LOCATION MAP
NWIRP, CALVERTON, NEW YORK

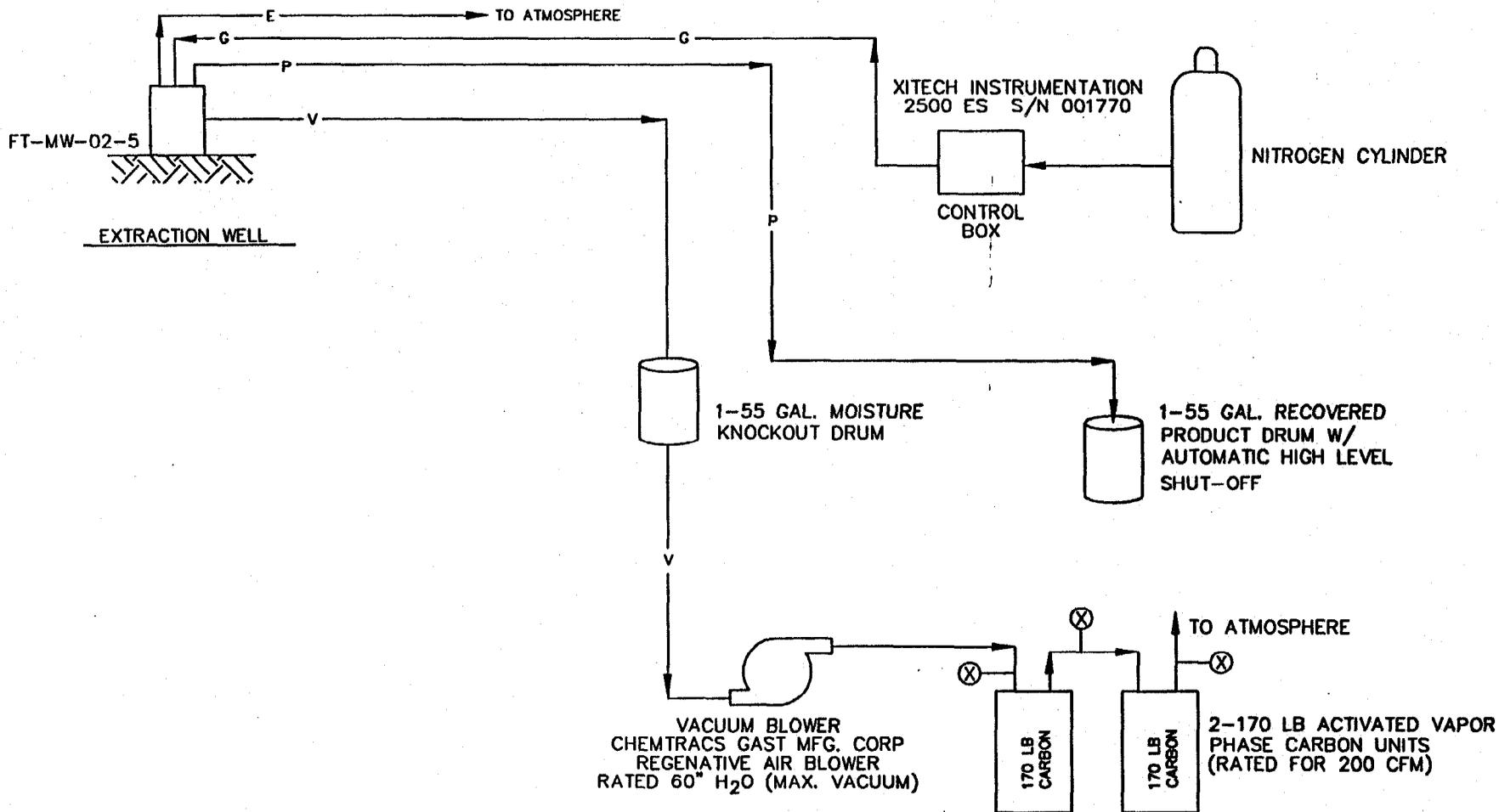
FIGURE 1



LEGEND:

-  TREE LINE
-  GROUNDWATER FLOW DIRECTION
-  VACUUM EXTRACTION WELL
-  PRESSURE MONITORING POINT
-  WELL
-  MONITORING WELL

DEPARTMENT OF THE NAVY LESTER, PA
SITE 2 - FIRE TRAINING AREA NMRP, CALVERTON, N.Y.
FIGURE 3
WELL AND PIEZOMETER LOCATIONS FOR THE VAOS SYSTEM
 FOSTER WHEELER ENVIRONMENTAL CORPORATION <small>LIVINGSTON, NEW JERSEY</small>



LEGEND:

GAS LINE — G —

PRODUCT DISCHARGE — P —

VACUUM — V —

EXHAUST — E —

SAMPLING PORT (X)

DEPARTMENT OF THE NAVY

LESTER, PA

SITE 2 - FIRE TRAINING AREA
NWRP-CALVERTON

FIGURE 4

SCHMATIC OF VAOS SYSTEM USED
AT FIRE TRAINING AREA

F

FOSTER WHEELER ENVIRONMENTAL CORPORATION
LIVINGSTON, NEW JERSEY

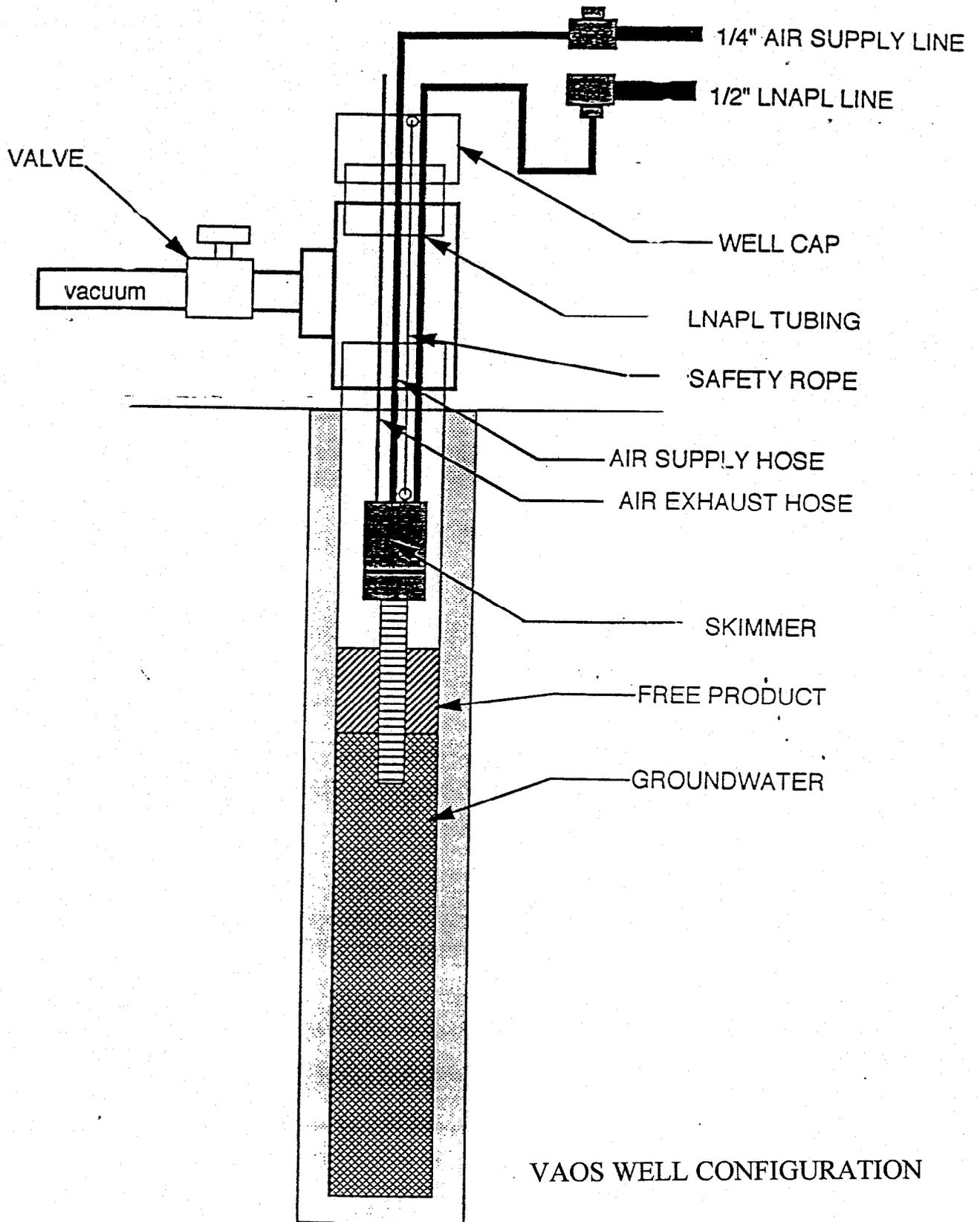


FIGURE 5

APPENDIX B

Tables

TABLE 1 A
 NWIRP CALVERTON
 PRODUCT/WATER LEVEL MEASUREMENTS FOR 1999
 SITE 2 - FIRE TRAINING AREA

WELL ID	MARCH 1999		APRIL 1999			AUGUST 1999			02-Nov-99		08-Nov-99		15-Nov-99		18-Nov-99	
	DTP	DTW	DTP	DTW	TDW	DTP	DTW	TDW	DTP	DTW	DTP	DTW	DTP	DTW	DTP	DTW
DQ	cap stuck		cap stuck			-	-	-	-	-	-	-	-	-	-	-
DT	NP	15.84	NP	15.25	-	-	-	-	-	-	NP	16.54	-	-	-	-
DU	NP	15.28	NP	14.72	-	-	-	-	-	-	-	-	-	-	-	-
DV	NP	17.41	NP	16.87	-	-	-	-	-	-	-	-	-	-	-	-
DO	NP	17	NP	16.48	-	-	-	-	-	-	-	-	-	-	-	-
DX	NP	13.42	NP	12.91	-	-	-	-	-	-	NP	14.14	-	-	-	-
DW	NP	12.14	NP	11.64	-	-	-	-	-	-	NP	12.88	NP	12.93	NP	13
DL	NP	12.67	NP	12.13	-	NP	13.98	19.47	NP	13.48	NP	13.39	NP	13.46	NP	13.52
DK	NP	13.89	NP	13.36	-	-	-	-	NP	14.58	NP	14.58	NP	14.67	NP	14.74
DH	12.89	12.88	12.34	12.35	-	sheen	14.19	19.65	-	-	NP	13.61	NP	13.67	NP	13.74
DI	NP	12.81	NP	12.36	-	NP	14.11	19.82	-	-	NP	14.54	-	-	NP	13.66
DJ	NP	15.12	NP	14.53	-	-	-	-	-	-	-	-	NP	15.9	-	-
DS	NP	15.75	15.15	15.18	-	trace	17.04	20.4	-	-	NP	16.49	NP	16.55	NP	16.61
DR	NP	15.18	NP	15.58	-	trace	16.45	19.88	-	-	NP	15.9	NP	15.96	-	-
DM	NP	13.52	NP	12.97	-	NP	14.8	19.39	-	-	NP	14.25	NP	14.31	-	-
DN	NP	14.31	NP	13.75	-	trace	15.62	19.48	-	-	NP	15.05	15.13	15.14	-	-
DP	NP	14.28	sheen	13.72	-	trace	15.35	19.37	-	-	-	-	-	-	-	-
DG	NP	13.86	sheen	13.35	-	trace	15.58	19.4	-	-	-	-	-	-	-	-
FTMW02	13.91	14.01	13.38	13.41	20.5	15.16	15.19	22.28	14.64	14.71	14.64	14.86	-	-	NP	14.86
FTMW02I	NP	14.05	NP	6.89	80	-	-	-	-	-	-	-	-	-	-	-
FTMW01I	NP	22.24	NP	7.1	78	-	-	-	-	-	-	-	-	-	-	-
FTMW01	NP	21.94	NP	5.73	28.5	-	-	-	-	-	-	-	-	-	-	-
FTMW04	NP	19.83	NP	19.3	27	-	-	-	-	-	-	-	-	-	-	-
PRW2	-	-	NP	13.85	28.84	15.715	15.719	-	sheen	15.07	NP	15.12	-	-	sheen	15.25
PZT1	-	-	13.66	13.97	21.02	15.08	15.09	-	NP	14.44	NP	15.42(TIC)	-	-	NP	14.61
PZT2	-	-	NP	13.4	21.4	15.45	15.49	-	NP	14.82	NP	14.9(TIC)	-	-	14.99	15.05
PZT3	-	-	12.83	12.84	21.15	14.58	14.7	-	13.94	13.97	14.14(TIC)	14.17(TIC)	-	-	14.11	14.12

NOTES:

TIC = Top of inner casing.

TABLE 1 B
 NWIRP CALVERTON
 PRODUCT/WATER LEVEL MEASUREMENTS FOR 1999
 SITE 2 - FUEL CALIBRATION AREA

WELL ID	MARCH 1999		APRIL 1999			AUGUST 1999			02-Nov-99		09-Nov-99	
	DTP	DTW	DTP	DTW	TDW	DTP	DTW	TDW	DTP	DTW	DTP	DTW
CK	NP	7.1	NP	7.06	-	-	-	-	-	-	-	-
CL	5.23	5.45	6.23	6.44	-	8.78	8.82	11.1	7.67	7.68	NP	7.65
CM	NP	6.13	NP	6.09	-	NP	8.6	11.03	NP	6.97	NP	7.02
CN	NP	6.68	NP	6.65	-	NP	9.1	9.86	-	-	-	-
CG	6.71	6.76	6.67	6.73	-	9.16	9.19	11.31	NP	7.9	NP	8.27
CH	NP	7.06	NP	7.01	-	-	-	-	-	-	-	-
CS	NP	7.57	NP	7.47	-	NP	9.93	16.31	NP	8.68	NP	8.69
CO	NP	6.56	NP	6.52	-	NP	8.96	11.05	-	-	-	-
CP	NP	6.75	NP	6.72	-	*damaged casing - no water			-	-	-	-
CR	NP	8.28	NP	8.22	-	NP	10.63	16.94	NP	9.41	NP	9.44
CQ	NP	8.38	NP	8.37	-	10.74	10.78	16.8	NP	9.55	NP	9.58
CF	NP	4.91	NP	5.02	-	NP	7.49	11.21	-	-	-	-
CE	NP	4.45	NP	4.42	-	NP	8.05	10.6	-	-	-	-
CD	6.71	6.73	5.33	5.35	-	NP	8.69	11.41	NP	7.44	NP	7.54
CJ	NP	7.37	NP	7.32	-	-	-	-	-	-	-	-
CU	NP	6.26	NP	6.24	-	-	-	-	-	-	-	-
CB	-	-	sheen ?	6.31	-	-	-	-	-	-	-	-
FCMW02S	7.46	7.69	7.42	7.64	13.5	9.79	9.95	14.79	NP	8.66	sheen	8.66
FCMW02I	NP	6.93	NP	6.89	52.5	-	-	-	-	-	-	-
FCMW03S	NP	7.13	NP	7.1	13.5	NP	9.51	15.25	NP	8.33	NP	8.33
FCMW04I	NP	5.76	NP	5.73	80	-	-	-	-	-	-	-
FCMW04S	NP	5.84	NP	5.82	13.5	-	-	-	-	-	-	-
MW?	NP	9	-	-	-	-	-	-	-	-	-	-
PRW1	-	-	6.96	6.98	24	NP	9.25	-	sheen	8	NP	8.03
PZC1	-	-	NP	6.35	13.4	NP	9.44	-	NP	7.21	NP	7.21
PZC2	-	-	NP	7.38	13.56	NP	8.47	-	NP	8.19	NP	8.22
PZC3	-	-	NP	7.8	15.22	9.87	9.88	-	NP	8.62	NP	8.65

NOTES:
 TIC = Top of Inner Casing

TABLE 2
 NWIRP CALVERTON
 PRODUCT/WATER LEVEL MEASUREMENTS FOR 1999
 SITE - 2 FIRE TRAINING AREA

Monitoring Well Number	Total Depth (feet)	Ground Surface Elevation		Approximate Depth to Water (feet)	Screened Interval Depth (feet)	Filter Pack Interval Depth (feet)	Distance from Extraction well (feet)
		Top Concrete Pad	Top Standpipe				
FT-MW-02-S	20.5	53.34	55.98	12.5	10 - 20	-20.5	0
PRW2	28	53.6	56.21	13.8	8 - 28	7 - 28	15.6
PZT1	19	53.6	55.39	14	9 - 19	8 - 19	56.6
PZT2	19	53.7	55.75	13.4	9 - 19	8 - 19	20.2
PZT3	19	53.7	55.75	12.9	9 - 19	8 - 19	25

TABLE 3 A
 NWIRP CALVERTON
 PRODUCT BAILODOWN TEST AT FTMW-02S
 SITE 2 - FIRE TRAINING AREA

TIME	VOL BAILED(1) (gallons)	DTP(2) (ft bgs)	DTW(3) (ft bgs)	COMMENTS
12:03	0	14.71	14.94	brown sheen on outside of bailer, mixed to 15.25
12:14	2 gal	14.71	14.97	
12:20	3.5 gal	14.71	14.74	
12:30	5.0 gal	14.71	14.83	
12:39	6.5 gal	14.71	14.72	
12:44	8 gal	14.71	14.72	mixed water/product layer to 14.74
12:49	10 gal	14.71	14.75	
13:01	12.5 gal	14.71	sheen	
13:08	13.5 gal	14.71	sheen	
13:11	15 gal	14.71	sheen	

Product recovery from baildown test:

Only a sheen was noted in 5 gallon collection buckets. Viscous material mixed in throughout the water column. An attempt to skim off product layer into 1 liter graduated collection vessel resulted in a sheen with sparse viscous material throughout.

TABLE 3 B
 NWIRP CALVERTON
 PRODUCT RECOVERY TEST AT FTMW-02S
 SITE 2 - FIRE TRAINING AREA

TIME	PRODUCT THICKNESS (feet)	DTP(2) (ft bgs)	DTW(3) (ft bgs)	COMMENTS
13:20	0	14.71	sheen	
13:22	0	14.71	sheen	mixed water/product signal to 14.81ft bgs
13:23	0	14.71	sheen	mixed water/product signal to 14.89 ft bgs
13:24	0	14.71	sheen	mixed water/product signal to 15.25 ft bgs
13:26	0	14.71	sheen	mixed water/product signal to 15.25 ft bgs
13:28	0.03	14.71	14.74	mixed water/product signal to 15.25 ft bgs
13:30	-	14.71	15:05	mixed water/product signal
13:34	-	14.71	15:13	mixed water/product signal
13:38	-	14.71	15:15	mixed water/product signal
13:43	0.24	14.7	14.94	solid signal to 14.94, mixed to 15.25

Recharge Rate for product into well:

.24 feet / 20 minutes = .012 ft/min from the surrounding aquifer.

Notes:

1. Vol Bailed - cumulative totals in gallons.
2. DTP - Depth to product measured in feet from top of inner well casing.
3. DTW - Depth to water measured in feet from top of inner well casing.

TABLE 4
 NWIRP CALVERTON
 VACUUM INFLUENCE TEST
 SITE 2 - FIRE TRAINING AREA

TIME	ELAPSED TIME(min)	PRW2 (in H2O)	PZT2	PZT3	PZT1	PRE VALVE	POST VALVE	STACK GAUGE	TELOG (feet)
11:35	0	-0.2	-0.07	-0.02	-0.06	-10	-14	7250 fpm	6.97 - 7.02
11:40	5	-0.16	-0.06	-0.02	-0.04	-10.5	-14	"	"
11:45	10	-0.19	-0.08	-0.01	-0.03	-10.5	-14	"	"
11:50	15	-0.17	-0.08	-0.01	-0.03	-10.5	-14	"	"
11:55	20	-0.21	-0.05	-0.01	-0.02	-10	-14	"	"
12:00	25	-0.17	-0.06	-0.01	-0.08	-10.5	-13.5	"	"
12:05	30	-0.18	-0.06	-0.01	-0.04	-10.5	-13.5	"	"
Average		-0.18	-0.07	-0.01	-0.04				
Vacuum Pressure = 20 in H2O									
12:05	0	-0.27	-0.09	-0.03	-0.08	-20	-24	6500 FPM	6.97 - 7.02
12:10	5	-0.28	-0.13	-0.01	-0.09	-20	-24	"	"
12:15	10	-0.3	-0.13	-0.03	-0.08	-20	-24	"	"
12:20	15	-0.33	-0.09	-0.03	-0.07	-20	-24	"	"
12:25	20	-0.21	-0.05	-0.01	-0.02	-20	-23.8	"	"
12:30	25	-0.28	-0.12	0	-0.06	-20	-24	"	"
12:35	30	-0.25	-0.14	-0.03	-0.05	-20	-24	"	"
Average		-0.27	-0.11	-0.02	-0.06				
Vacuum Pressure = 30 in H2O									
12:35	0	-0.36	-0.13	-0.09	-0.08	-30	-34	5900 fpm	6.97 - 7.02
12:40	5	-0.38	-0.12	-0.13	-0.08	-30	-34	"	"
12:45	10	-0.36	-0.18	-0.13	-0.11	-30	-34	"	"
12:50	15	-0.39	-0.19	-0.09	-0.1	-30	-34	"	"
12:55	20	-0.38	-0.16	-0.05	-0.13	-30	-34	"	"
13:00	25	-0.4	-0.15	-0.12	-0.11	-30	-34	"	"
13:05	30	-0.39	-0.2	-0.14	-0.11	-30	-34	"	"
Average		-0.38	-0.16	-0.11	-0.10				
Vacuum Pressure = 40 in H2O									
13:10	0	-0.39	-0.18	-0.06	-0.09	-40	-42	5100 fpm	6.97 - 7.02
13:15	5	-0.43	-0.2	-0.05	-0.12	-40	-43	"	"
13:20	10	-0.39	-0.16	-0.05	-0.1	-39.5	-42	"	"
13:25	15	-0.39	-0.18	-0.07	-0.12	-39	-42	"	"
13:30	20	-0.4	-0.16	-0.05	-0.11	-39	-42	"	"
13:35	25	-0.38	-0.16	-0.06	-0.12	-39.5	-42	"	"
13:40	30	-0.39	-0.17	-0.04	-0.1	-39.5	-42	"	"
Average		-0.40	-0.17	-0.05	-0.11				
Vacuum Pressure = 50 in H2O									
13:42	0	-0.39	-0.17	-0.06	-0.1	-51	-54	400 fpm	6.97 - 7.02
13:47	5	-0.39	-0.16	-0.06	-0.12	-52	-55	"	"
13:52	10	-0.39	-0.16	-0.05	-0.1	-52	-55	"	"
13:57	15	-0.39	-0.15	-0.04	-0.11	-52	-55	"	"
14:02	20	-0.37	-0.18	-0.05	-0.1	-52	-55	"	"
14:07	25	-0.39	-0.18	-0.05	-0.11	-52	-55	"	"
14:12	30	-0.38	-0.18	-0.05	-0.1	-52	-55	"	"
Average		-0.39	-0.17	-0.05	-0.11				

TABLE 5
 NWIRP CALVERTON
 VACUUM STEP TEST
 SITE 2 - FIRE TRAINING AREA

Vacuum Pressure: 15" of H₂O (pre valve)

Vacuum on Blower : 30" of H₂O

Date: 16 November, 1999

TIME	Vacuum Monitoring Points				Extraction Well	Post Valve	Stack Discharge (FPM)	Recovered Product
	PRW2	PZT3	PZT1	PZT2				
11:25					15	21	3.6" of H ₂ O	0
11:45	0.28	0.13	0.1	0.19	15	21	3.6" of H ₂ O	0
13:25	0.29	0.05	0.09	0.17	16	21	3.8" of H ₂ O	0
15:22	0.28	0.03	0.08	0.13	16	21	3.8" of H ₂ O	0
17:47	0.32	0.09	0.1	0.1	15	20	3.8" of H ₂ O	0
20:27	0.33	0.06	0.11	0.16	15	23	3.7" of H ₂ O	0

Vacuum Pressure: 30" of H₂O (pre valve)

Vacuum on Blower : 46" of H₂O

Date: 17 November, 1999

TIME	Vacuum Monitoring Points				Extraction Well	Post Valve	Stack Discharge (FPM)	Recovered Product
	PRW2	PZT3	PZT1	PZT2				
8:32	-0.39	-0.06	-0.12	-0.19	30	36	2.8" of H ₂ O	0
10:32	-0.4	-0.06	-0.15	-0.15	30	37	3.0" of H ₂ O	0
14:31	-0.41	-0.08	-0.13	-0.17	29.5	36	3.0" of H ₂ O	0
18:30	-0.45	-0.08	-0.15	-0.18	30	36	3.0" of H ₂ O	0

TABLE 5
 NWIRP CALVERTON
 VACUUM STEP TEST
 SITE 2 - FIRE TRAINING AREA

Vacuum Pressure: 36" of H₂O (pre valve)

Vacuum on Blower : 48" of H₂O

Date: 18 November, 1999

TIME	Vacuum Monitoring Points				Extraction Well	Post Valve	Stack Discharge (FPM)	Recovered Product
	PRW2	PZT3	PZT1	PZT2				
10:51	-0.45	-0.09	-0.17	-0.21	36	41	2.8" of H ₂ O	0
11:15	-0.02	0.01	0.01	-0.01	38	44	-	0
12:51	-0.5	-0.21	-0.21	-0.27	39	44	2.7" of H ₂ O	0
14:51	-0.45	-0.08	-0.15	-0.18	39	44	2.7" of H ₂ O	0

APPENDIX C

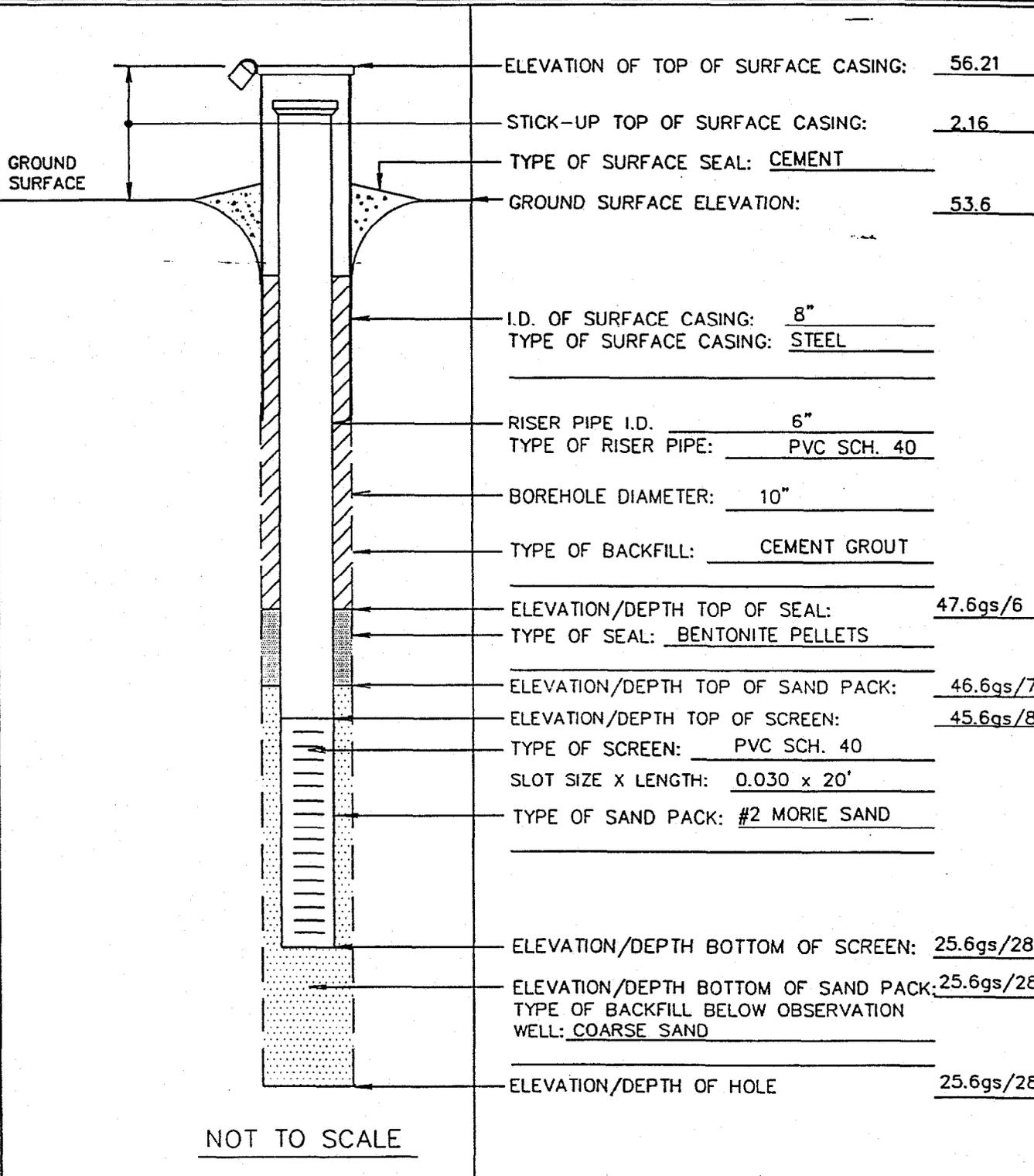
Well Construction Logs

UNCONSOLIDATED MONITORING WELL CONSTRUCTION DIAGRAM

WELL NO. PRW2

PROJECT NWRP CALVERTON FPRS
 PROJECT NO. DO 33
 ELEVATION 53.6 G.S. DATE 4/15/99
 FIELD GEOLOGIST LEE HAYMON AND ADREW PROPHETE

DRILLER DELTA WELL & PUMP
 DRILLING METHOD HSA
 DEVELOPMENT METHOD SURGE AND PUMP



- ELEVATION OF TOP OF SURFACE CASING: 56.21
- STICK-UP TOP OF SURFACE CASING: 2.16
- TYPE OF SURFACE SEAL: CEMENT
- GROUND SURFACE ELEVATION: 53.6
- I.D. OF SURFACE CASING: 8"
- TYPE OF SURFACE CASING: STEEL
- RISER PIPE I.D.: 6"
- TYPE OF RISER PIPE: PVC SCH. 40
- BOREHOLE DIAMETER: 10"
- TYPE OF BACKFILL: CEMENT GROUT
- ELEVATION/DEPTH TOP OF SEAL: 47.6gs/6
- TYPE OF SEAL: BENTONITE PELLETS
- ELEVATION/DEPTH TOP OF SAND PACK: 46.6gs/7
- ELEVATION/DEPTH TOP OF SCREEN: 45.6gs/8
- TYPE OF SCREEN: PVC SCH. 40
- SLOT SIZE X LENGTH: 0.030 x 20'
- TYPE OF SAND PACK: #2 MORIE SAND
- ELEVATION/DEPTH BOTTOM OF SCREEN: 25.6gs/28
- ELEVATION/DEPTH BOTTOM OF SAND PACK: 25.6gs/28
- TYPE OF BACKFILL BELOW OBSERVATION WELL: COARSE SAND
- ELEVATION/DEPTH OF HOLE: 25.6gs/28

CAD FILE NAME: NWRP2.DWG
 DATE: 8/5/99
 PLOT SCALE: TO FIT
 TIME: 1:30 PM

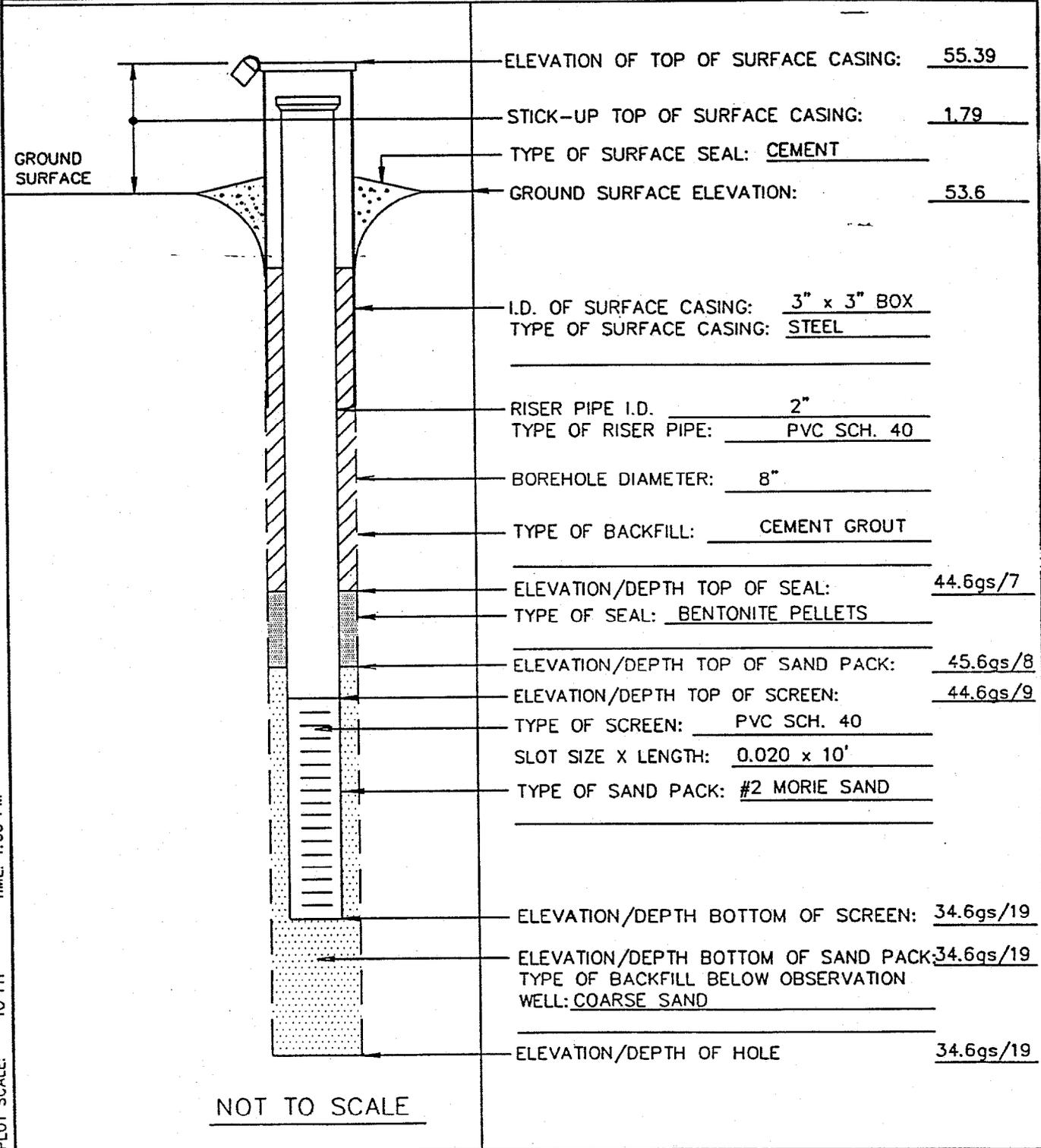
NOT TO SCALE

UNCONSOLIDATED MONITORING WELL CONSTRUCTION DIAGRAM

WELL NO. PZT1

PROJECT NWRP CALVERTON FPRS
 PROJECT NO. DO 33
 ELEVATION 53.6 G.S. DATE 4/22/99
 FIELD GEOLOGIST LEE HAYMON AND ADREW PROPHETE

DRILLER DELTA WELL & PUMP
 DRILLING METHOD HSA
 DEVELOPMENT METHOD SURGE AND PUMP



- ELEVATION OF TOP OF SURFACE CASING: 55.39
- STICK-UP TOP OF SURFACE CASING: 1.79
- TYPE OF SURFACE SEAL: CEMENT
- GROUND SURFACE ELEVATION: 53.6
- I.D. OF SURFACE CASING: 3" x 3" BOX
- TYPE OF SURFACE CASING: STEEL
- RISER PIPE I.D.: 2"
- TYPE OF RISER PIPE: PVC SCH. 40
- BOREHOLE DIAMETER: 8"
- TYPE OF BACKFILL: CEMENT GROUT
- ELEVATION/DEPTH TOP OF SEAL: 44.6gs/7
- TYPE OF SEAL: BENTONITE PELLETS
- ELEVATION/DEPTH TOP OF SAND PACK: 45.6gs/8
- ELEVATION/DEPTH TOP OF SCREEN: 44.6gs/9
- TYPE OF SCREEN: PVC SCH. 40
- SLOT SIZE X LENGTH: 0.020 x 10'
- TYPE OF SAND PACK: #2 MORIE SAND
- ELEVATION/DEPTH BOTTOM OF SCREEN: 34.6gs/19
- ELEVATION/DEPTH BOTTOM OF SAND PACK: 34.6gs/19
- TYPE OF BACKFILL BELOW OBSERVATION WELL: COARSE SAND
- ELEVATION/DEPTH OF HOLE: 34.6gs/19

NOT TO SCALE

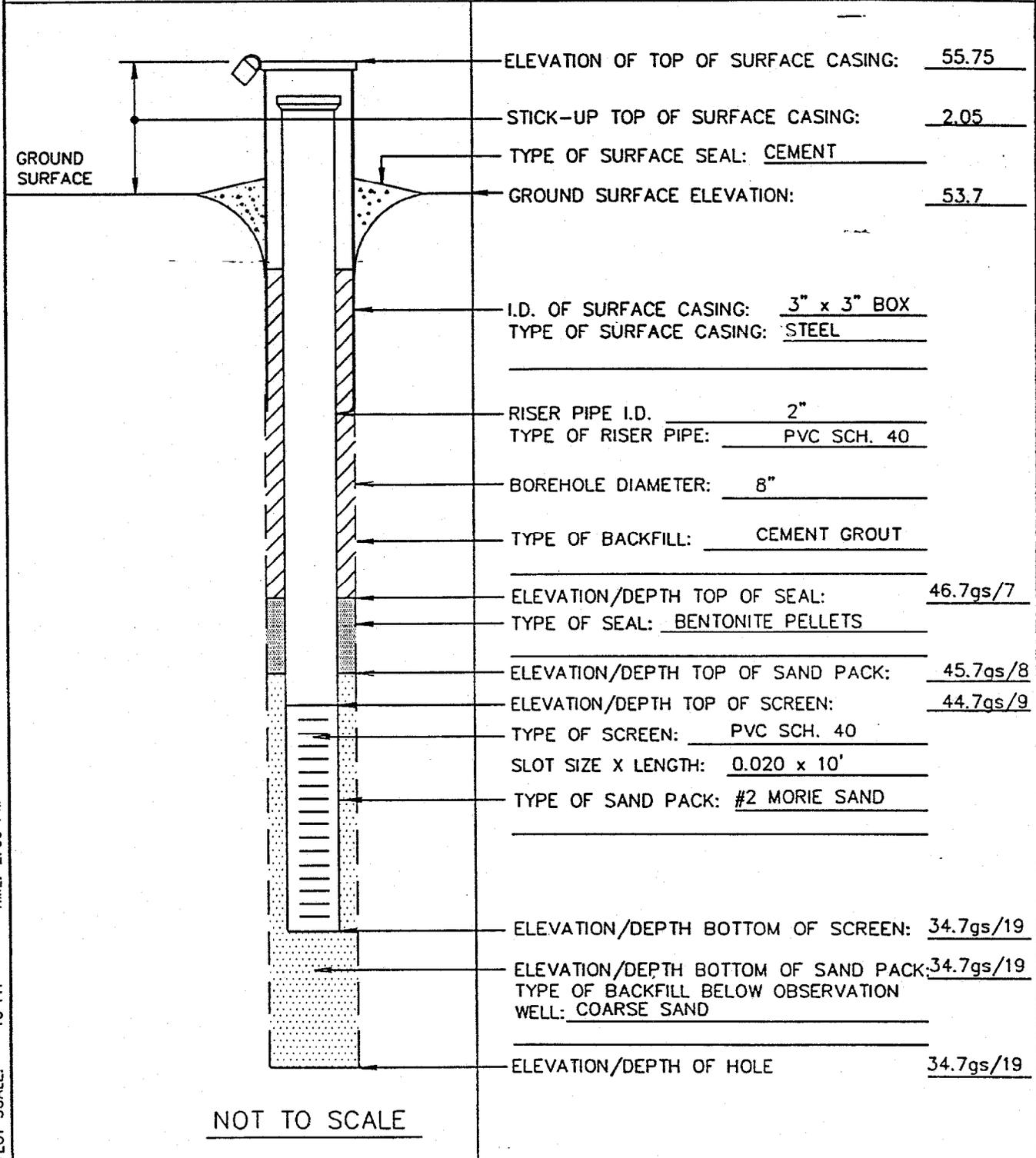
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 PLOT SCALE: TO FIT TIME: 1:55 PM

UNCONSOLIDATED MONITORING WELL CONSTRUCTION DIAGRAM

WELL NO. PZT2

PROJECT NWRP CALVERTON FPRS
 PROJECT NO. DO 33
 ELEVATION 53.7 G.S. DATE 4/22/99
 FIELD GEOLOGIST LEE HAYMON AND ADREW PROPHETE

DRILLER DELTA WELL & PUMP
 DRILLING METHOD HSA
 DEVELOPMENT METHOD SURGE AND PUMP



NOT TO SCALE

CAD FILE NAME: NWRP7.DWG DATE: 8/5/99
 PLOT SCALE: TO FIT TIME: 2:05 PM

UNCONSOLIDATED MONITORING WELL CONSTRUCTION DIAGRAM

WELL NO. PZT3

PROJECT NWRP CALVERTON FPRS

PROJECT NO. DO 33

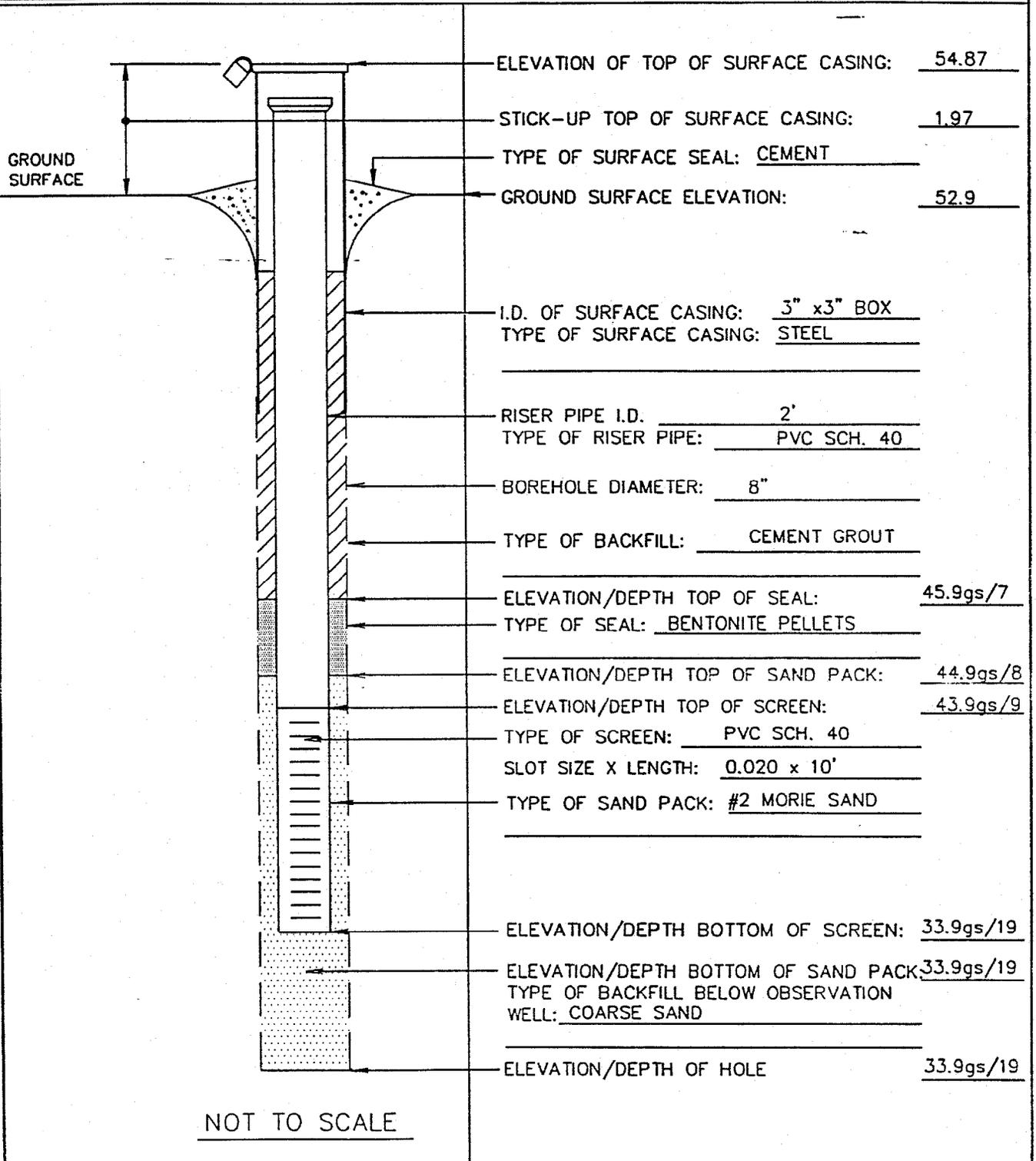
ELEVATION 52.9 G.S. DATE 4/22/99

FIELD GEOLOGIST LEE HAYMON AND ADREW PROPHETE

DRILLER DELTA WELL & PUMP

DRILLING METHOD HSA

DEVELOPMENT METHOD SURGE AND PUMP



ELEVATION OF TOP OF SURFACE CASING: 54.87

STICK-UP TOP OF SURFACE CASING: 1.97

TYPE OF SURFACE SEAL: CEMENT

GROUND SURFACE ELEVATION: 52.9

I.D. OF SURFACE CASING: 3" x 3" BOX
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 2'
TYPE OF RISER PIPE: PVC SCH. 40

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 45.9gs/7
TYPE OF SEAL: BENTONITE PELLETS

ELEVATION/DEPTH TOP OF SAND PACK: 44.9gs/8

ELEVATION/DEPTH TOP OF SCREEN: 43.9gs/9

TYPE OF SCREEN: PVC SCH. 40

SLOT SIZE X LENGTH: 0.020 x 10'

TYPE OF SAND PACK: #2 MORIE SAND

ELEVATION/DEPTH BOTTOM OF SCREEN: 33.9gs/19

ELEVATION/DEPTH BOTTOM OF SAND PACK: 33.9gs/19
TYPE OF BACKFILL BELOW OBSERVATION WELL: COARSE SAND

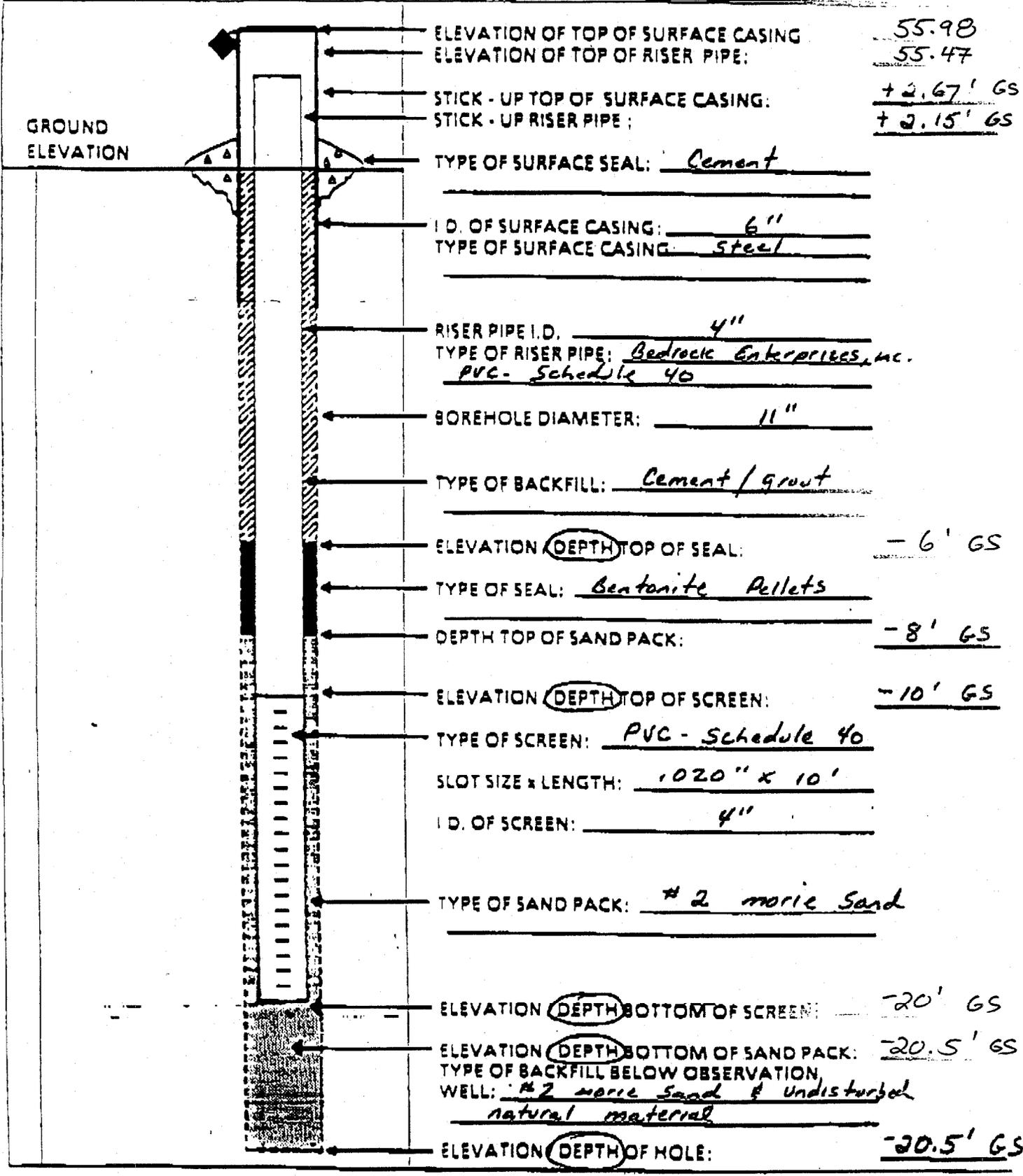
ELEVATION/DEPTH OF HOLE: 33.9gs/19

CAD FILE NAME: NWRP8.DWG DATE: 8/5/99 TIME: 2:10 PM
PLOT SCALE: TO FIT



OVERBURDEN MONITORING WELL SHEET

PROJECT <u>NWIRP - Calverton</u>	LOCATION <u>Calverton, NY.</u>	DRILLER <u>AOT</u>
PROJECT NO. <u>0206</u>	BORING <u>FT-MW02-5</u>	DRILLING METHOD <u>HSA</u>
ELEVATION <u> </u>	DATE <u>7-05-94.</u>	DEVELOPMENT <u>Submer.</u>
FIELD GEOLOGIST <u>Paul Davis</u>		METHOD <u> </u>



APPENDIX D

Laboratory Data

CHEMTECH

SUMMA CANNISTER ANALYSIS BY GC/MS VOA

CLIENT: FOSTER WHEELER ENVIRO.
 SAMPLE ID: FTAV-01P
 PROJECT: CALVERTON
 SAMPLE VOL: 0.025L
 DATA FILE: H8937.D
 NJDEP LAB ID: 12531

LAB SAMPLE ID: L5711-93821
 DATE SAMPLED: 11/15/99
 DATE RECEIVED: 11/16/99
 DATE ANALYZED: 11/18/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.146
74-83-3	BROMOMETHANE		U	0.077
75-01-4	VINYL CHLORIDE		U	0.117
75-00-3	CHLOROETHANE		U	0.114
75-09-2	METHYLENE CHLORIDE		U	0.086
75-35-4	1,1-DICHLOROETHENE		U	0.076
75-34-3	1,1-DICHLOROETHANE		U	0.074
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.076
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.076
67-66-3	CHLOROFORM		U	0.061
107-06-2	1,2-DICHLOROETHANE		U	0.074
71-55-6	1,1,1-TRICHLOROETHANE		U	0.055
56-23-5	CARBON TETRACHLORIDE		U	0.048
75-27-4	BROMODICHLOROMETHANE		U	0.045
78-87-5	1,2-DICHLOROPROPANE		U	0.065
79-01-6	TRICHLOROETHENE		U	0.056
75-69-4	TRICHLOROFLUOROMETHANE		U	0.073
71-43-2	BENZENE		U	0.094
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.066
124-48-1	DIBROMOCHLOROMETHANE		U	0.035
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.066
79-00-5	1,1,2-TRICHLOROETHANE		U	0.055
127-18-4	TETRACHLOROETHENE	0.196		0.044
108-88-3	TOLUENE		U	0.080
108-90-7	CHLOROBENZENE		U	0.065
100-41-4	ETHYL BENZENE		U	0.069
95-47-6	O-XYLENE		U	0.069
1330-20-7	M/P-XYLENE		U	0.069
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.050
95-50-1	1,3-DICHLOROBENZENE		U	0.050
106-46-7	1,4-DICHLOROBENZENE		U	0.050
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.083
75-65-0	TERT-BUTYL ALCOHOL		U	0.099
98-82-8	ISOPROPYLBENZENE		U	0.061
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.061
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.061
95-49-8	2-CHLOROTOLUENE		U	0.058
106-43-4	4-CHLOROTOLUENE		U	0.058
1045-10-8	N-BUTYLBENZENE		U	0.055
135-98-8	SEC-BUTYLBENZENE		U	0.055
99-87-6	P-ISOPROPYLTOLUENE		U	0.081
75-71-8	DICHLORODIFLUOROMETHANE		U	0.061
106-93-4	1,2-DIBROMOETHANE		U	0.039

000011

CHEMTECH

SUMMA CANNISTER ANALYSIS BY GC/MS VOA

CLIENT: FOSTER WHEELER ENVIRO.
 SAMPLE ID: FTA V-01A
 PROJECT: CALVERTON
 SAMPLE VOL: 0.05L
 DATA FILE: H8938.D
 NJDEP LAB ID: 12531

LAB SAMPLE ID: L5711-93822
 DATE SAMPLED: 11/15/99
 DATE RECEIVED: 11/16/99
 DATE ANALYZED: 11/18/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.073
74-83-3	BROMOMETHANE		U	0.039
75-01-4	VINYL CHLORIDE		U	0.059
75-00-3	CHLOROETHANE		U	0.057
75-09-2	METHYLENE CHLORIDE		U	0.043
75-35-4	1,1-DICHLOROETHENE		U	0.038
75-34-3	1,1-DICHLOROETHANE		U	0.037
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.038
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.031
107-06-2	1,2-DICHLOROETHANE		U	0.037
71-55-6	1,1,1-TRICHLOROETHANE		U	0.027
56-23-5	CARBON TETRACHLORIDE		U	0.024
75-27-4	BROMODICHLOROMETHANE		U	0.022
78-87-5	1,2-DICHLOROPROPANE		U	0.032
79-01-6	TRICHLOROETHENE		U	0.028
75-69-4	TRICHLOROFLUOROMETHANE		U	0.036
71-43-2	BENZENE		U	0.047
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.033
124-48-1	DIBROMOCHLOROMETHANE		U	0.018
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.033
79-00-5	1,1,2-TRICHLOROETHANE		U	0.027
127-18-4	TETRACHLOROETHENE		U	0.022
108-88-3	TOLUENE		U	0.040
108-90-7	CHLOROBENZENE		U	0.033
100-41-4	ETHYL BENZENE		U	0.035
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.025
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.042
75-65-0	TERT-BUTYL ALCOHOL		U	0.050
98-82-8	ISOPROPYLBENZENE		U	0.031
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.029
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.027
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.040
75-71-8	DICHLORODIFLUOROMETHANE		U	0.030
106-93-4	1,2-DIBROMOETHANE		U	0.020

000013

CHEMTECH**SUMMA CANNISTER ANALYSIS BY GC/MS VOA**

CLIENT: FOSTER WHEELER
 SAMPLE ID: FTAV-02P
 PROJECT: CALVERTON
 SAMPLE VOL: 0.025L
 DATA FILE: H8948.D
 NJDEP LAB ID: 12531

LAB SAMPLE ID: L5713-93825
 DATE SAMPLED: 11/16/99
 DATE RECEIVED: 11/17/99
 DATE ANALYZED: 11/22/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.146
74-83-3	BROMOMETHANE		U	0.077
75-01-4	VINYL CHLORIDE		U	0.117
75-00-3	CHLOROETHANE		U	0.114
75-09-2	METHYLENE CHLORIDE		U	0.086
75-35-4	1,1-DICHLOROETHENE		U	0.076
75-34-3	1,1-DICHLOROETHANE		U	0.074
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.076
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.076
67-66-3	CHLOROFORM		U	0.061
107-06-2	1,2-DICHLOROETHANE		U	0.074
71-55-6	1,1,1-TRICHLOROETHANE		U	0.055
56-23-5	CARBON TETRACHLORIDE		U	0.048
75-27-4	BROMODICHLOROMETHANE		U	0.045
78-87-5	1,2-DICHLOROPROPANE		U	0.065
79-01-6	TRICHLOROETHENE		U	0.056
75-69-4	TRICHLOROFLUOROMETHANE		U	0.073
71-43-2	BENZENE		U	0.094
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.066
124-48-1	DIBROMOCHLOROMETHANE		U	0.035
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.066
79-00-5	1,1,2-TRICHLOROETHANE		U	0.055
127-18-4	TETRACHLOROETHENE	0.071		0.044
108-88-3	TOLUENE		U	0.080
108-90-7	CHLOROBENZENE		U	0.065
100-41-4	ETHYL BENZENE		U	0.069
95-47-6	O-XYLENE		U	0.069
1330-20-7	M/P-XYLENE		U	0.069
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.050
95-50-1	1,3-DICHLOROBENZENE		U	0.050
106-46-7	1,4-DICHLOROBENZENE		U	0.050
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.083
75-65-0	TERT-BUTYL ALCOHOL		U	0.099
98-82-8	ISOPROPYLBENZENE		U	0.061
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.061
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.061
95-49-8	2-CHLOROTOLUENE		U	0.058
106-43-4	4-CHLOROTOLUENE		U	0.058
1045-10-8	N-BUTYLBENZENE		U	0.055
135-98-8	SEC-BUTYLBENZENE		U	0.055
99-87-6	P-ISOPROPYLTOLUENE		U	0.081
75-71-8	DICHLORODIFLUOROMETHANE		U	0.061
106-93-4	1,2-DIBROMOETHANE		U	0.039

000011

CHEMTECH**SUMMA CANNISTER ANALYSIS BY GC/MS VOA**

CLIENT: FOSTER WHEELER
SAMPLE ID: FTAV-02A
PROJECT: CALVERTON
SAMPLE VOL: 0.05L
DATA FILE: H8946.D
NJDEP LAB ID: 12531

LAB SAMPLE ID: L5713-93826
DATE SAMPLED: 11/16/99
DATE RECEIVED: 11/17/99
DATE ANALYZED: 11/22/99
DIL FACT: 1.5
ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.073
74-83-3	BROMOMETHANE		U	0.039
75-01-4	VINYL CHLORIDE		U	0.059
75-00-3	CHLOROETHANE		U	0.057
75-09-2	METHYLENE CHLORIDE		U	0.043
75-35-4	1,1-DICHLOROETHENE		U	0.038
75-34-3	1,1-DICHLOROETHANE		U	0.037
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.038
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.031
107-06-2	1,2-DICHLOROETHANE		U	0.037
71-55-6	1,1,1-TRICHLOROETHANE		U	0.027
56-23-5	CARBON TETRACHLORIDE		U	0.024
75-27-4	BROMODICHLOROMETHANE		U	0.022
78-87-5	1,2-DICHLOROPROPANE		U	0.032
79-01-6	TRICHLOROETHENE		U	0.028
75-69-4	TRICHLOROFLUOROMETHANE		U	0.036
71-43-2	BENZENE		U	0.047
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.033
124-48-1	DIBROMOCHLOROMETHANE		U	0.018
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.033
79-00-5	1,1,2-TRICHLOROETHANE		U	0.027
127-18-4	TETRACHLOROETHENE		U	0.022
108-88-3	TOLUENE		U	0.040
108-90-7	CHLOROBENZENE		U	0.033
100-41-4	ETHYL BENZENE		U	0.035
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.025
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.042
75-65-0	TERT-BUTYL ALCOHOL		U	0.050
98-82-8	ISOPROPYLBENZENE		U	0.031
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.029
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.027
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.040
75-71-8	DICHLORODIFLUOROMETHANE		U	0.030
106-93-4	1,2-DIBROMOETHANE		U	0.020

000013

CHEMTECH

SUMMA CANNISTER ANALYSIS BY GC/MS VOA

CLIENT: FOSTER WHEELER
 SAMPLE ID: FTAV-03P
 PROJECT: CALVERTON
 SAMPLE VOL: 0.05L
 DATA FILE: H8936.D
 NIDEP LAB ID: 12531

LAB SAMPLE ID: L5748-93963
 DATE SAMPLED: 11/17/99
 DATE RECEIVED: 11/18/99
 DATE ANALYZED: 11/19/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.073
74-83-3	BROMOMETHANE		U	0.039
75-01-4	VINYL CHLORIDE		U	0.059
75-00-3	CHLOROETHANE		U	0.057
75-09-2	METHYLENE CHLORIDE		U	0.043
75-35-4	1,1-DICHLOROETHENE		U	0.038
75-34-3	1,1-DICHLOROETHANE		U	0.037
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.038
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.031
107-06-2	1,2-DICHLOROETHANE		U	0.037
71-55-6	1,1,1-TRICHLOROETHANE		U	0.027
56-23-5	CARBON TETRACHLORIDE		U	0.024
75-27-4	BROMODICHLOROMETHANE		U	0.022
78-87-5	1,2-DICHLOROPROPANE		U	0.032
79-01-6	TRICHLOROETHENE		U	0.028
75-69-4	TRICHLOROFLUOROMETHANE		U	0.036
71-43-2	BENZENE		U	0.047
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.033
124-48-1	DIBROMOCHLOROMETHANE		U	0.018
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.033
79-00-5	1,1,2-TRICHLOROETHANE		U	0.027
127-18-4	TETRACHLOROETHENE	0.083		0.022
108-88-3	TOLUENE		U	0.040
108-90-7	CHLOROBENZENE		U	0.033
100-41-4	ETHYL BENZENE		U	0.035
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.025
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.042
75-65-0	TERT-BUTYL ALCOHOL		U	0.050
98-82-8	ISOPROPYLBENZENE		U	0.031
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.029
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.027
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.040
75-71-8	DICHLORODIFLUOROMETHANE		U	0.030
106-93-4	1,2-DIBROMOETHANE		U	0.020

CHEMTECH**SUMMA CANNISTER ANALYSIS BY GC/MS VOA**

CLIENT: FOSTER WHEELER
SAMPLE ID: FTAV-03A
PROJECT: CALVERTON
SAMPLE VOL: 0.05L
DATA FILE: H8951.D
NJDEP LAB ID: 12531

LAB SAMPLE ID: L5748-93984
DATE SAMPLED: 11/17/99
DATE RECEIVED: 11/18/99
DATE ANALYZED: 11/22/99
DIL FACT: 1.5
ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.073
74-83-3	BROMOMETHANE		U	0.039
75-01-4	VINYL CHLORIDE		U	0.059
75-00-3	CHLOROETHANE		U	0.057
75-09-2	METHYLENE CHLORIDE		U	0.043
75-35-4	1,1-DICHLOROETHENE		U	0.038
75-34-3	1,1-DICHLOROETHANE		U	0.037
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.038
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.031
107-06-2	1,2-DICHLOROETHANE		U	0.037
71-55-6	1,1,1-TRICHLOROETHANE		U	0.027
56-23-5	CARBON TETRACHLORIDE		U	0.024
75-27-4	BROMODICHLOROMETHANE		U	0.022
78-87-5	1,2-DICHLOROPROPANE		U	0.032
79-01-6	TRICHLOROETHENE		U	0.028
75-69-4	TRICHLOROFLUOROMETHANE		U	0.036
71-43-2	BENZENE		U	0.047
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.033
124-48-1	DIBROMOCHLOROMETHANE		U	0.018
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.033
79-00-5	1,1,2-TRICHLOROETHANE		U	0.027
127-18-4	TETRACHLOROETHENE		U	0.022
108-88-3	TOLUENE		U	0.040
108-90-7	CHLOROBENZENE		U	0.033
100-41-4	ETHYL BENZENE		U	0.035
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.025
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.042
75-65-0	TERT-BUTYL ALCOHOL		U	0.050
98-82-8	ISOPROPYLBENZENE		U	0.031
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.029
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.027
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.040
75-71-8	DICHLORODIFLUOROMETHANE		U	0.030
106-93-4	1,2-DIBROMOETHANE		U	0.020

000011

CHEMTECH
SUMMA CANNISTER ANALYSIS BY GC/MS VOA

CLIENT: FOSTER WHEELER
 SAMPLE ID: FTAV-04X ✓
 PROJECT: CALVERTON VAOS
 SAMPLE VOL: 0.05L
 DATA FILE: M8949.D
 NJDEP LAB ID: 12531

LAB SAMPLE ID: LS761-94030
 DATE SAMPLED: 11/18/99
 DATE RECEIVED: 11/19/99
 DATE ANALYZED: 11/22/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE			
74-83-3	BROMOMETHANE		U	0.073
75-01-4	VINYL CHLORIDE		U	0.039
75-00-3	CHLOROETHANE		U	0.059
75-09-2	METHYLENE CHLORIDE		U	0.057
75-35-4	1,1-DICHLOROETHENE		U	0.043
75-34-3	1,1-DICHLOROETHANE		U	0.038
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.037
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.038
107-06-2	1,2-DICHLOROETHANE		U	0.031
71-55-6	1,1,1-TRICHLOROETHANE		U	0.037
56-23-5	CARBON TETRACHLORIDE		U	0.027
75-27-4	BROMODICHLOROMETHANE		U	0.024
78-37-5	1,2-DICHLOROPROPANE		U	0.022
79-01-6	TRICHLOROETHENE		U	0.032
75-69-4	TRICHLOROFLUOROMETHANE		U	0.028
71-43-2	BENZENE		U	0.036
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.047
124-48-1	DIBROMOCHLOROMETHANE		U	0.033
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.018
79-00-5	1,1,2-TRICHLOROETHANE		U	0.033
127-18-4	TETRACHLOROETHENE		U	0.027
108-88-3	TOLUENE		U	0.022
108-90-7	CHLOROBENZENE		U	0.040
100-41-4	ETHYL BENZENE		U	0.033
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.035
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.025
75-65-0	TERT-BUTYL ALCOHOL		U	0.042
98-82-8	ISOPROPYLBENZENE		U	0.050
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.031
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.029
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.027
75-71-8	DICHLORODIFLUOROMETHANE		U	0.040
106-93-4	1,2-DIBROMOETHANE		U	0.030
			U	0.020

CHEMTECH

SUMMA CANNISTER ANALYSIS BY GC/MS VOA

CLIENT: FOSTER WHEELER
 SAMPLE ID: FTAV-04A
 PROJECT: CALVERTON
 SAMPLE VOL: 0.05L
 DATA FILE: H8947.D
 NJDEP LAB ID: 12531

LAB SAMPLE ID: L5761-94031
 DATE SAMPLED: 11/18/99
 DATE RECEIVED: 11/19/99
 DATE ANALYZED: 11/22/99
 DIL FACT: 1.5
 ANALYST: MRP

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.073
74-83-3	BROMOMETHANE		U	0.039
75-01-4	VINYL CHLORIDE		U	0.059
75-00-3	CHLOROETHANE		U	0.057
75-09-2	METHYLENE CHLORIDE		U	0.043
75-35-4	1,1-DICHLOROETHENE		U	0.038
75-34-3	1,1-DICHLOROETHANE		U	0.037
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.038
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.038
67-66-3	CHLOROFORM		U	0.031
107-06-2	1,2-DICHLOROETHANE		U	0.037
71-55-6	1,1,1-TRICHLOROETHANE		U	0.027
56-23-5	CARBON TETRACHLORIDE		U	0.024
75-27-4	BROMODICHLOROMETHANE		U	0.022
78-87-5	1,2-DICHLOROPROPANE		U	0.032
79-01-6	TRICHLOROETHENE		U	0.028
75-69-4	TRICHLOROFLUOROMETHANE		U	0.036
71-43-2	BENZENE		U	0.047
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.033
124-48-1	DIBROMOCHLOROMETHANE		U	0.018
10061-02-6	T-1,3-DICHLOROPROPENE		U	0.033
79-00-5	1,1,2-TRICHLOROETHANE		U	0.027
127-18-4	TETRACHLOROETHENE		U	0.022
108-88-3	TOLUENE		U	0.040
108-90-7	CHLOROBENZENE		U	0.033
100-41-4	ETHYL BENZENE		U	0.035
95-47-6	O-XYLENE		U	0.035
1330-20-7	M/P-XYLENE		U	0.035
100-42-5	STYRENE		U	0.035
541-73-1	1,2-DICHLOROBENZENE		U	0.025
95-50-1	1,3-DICHLOROBENZENE		U	0.025
106-46-7	1,4-DICHLOROBENZENE		U	0.025
1634-04-4	METHYL TERT-BUTYL ETHER		U	0.042
75-65-0	TERT-BUTYL ALCOHOL		U	0.050
98-82-8	ISOPROPYLBENZENE		U	0.031
95-63-6	1,2,4-TRIMETHYLBENZENE		U	0.031
108-67-8	1,3,5-TRIMETHYLBENZENE		U	0.031
95-49-8	2-CHLOROTOLUENE		U	0.029
106-43-4	4-CHLOROTOLUENE		U	0.029
1045-10-8	N-BUTYLBENZENE		U	0.027
135-98-8	SEC-BUTYLBENZENE		U	0.027
99-87-6	P-ISOPROPYLTOLUENE		U	0.040
75-71-8	DICHLORODIFLUOROMETHANE		U	0.030
106-93-4	1,2-DIBROMOETHANE		U	0.020

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CHEMTECH

4A

SYSTEM BLANK ANALYSIS BY GC/MS VOA

CLIENT: N/A
 SAMPLE ID: LABORATORY BLANK
 PROJECT: N/A
 SAMPLE VOL: 0.2
 SAMPLE VOL. UNITS: L
 DATA FILE: H8934.D
 EXTRACT DATE: N/A

LAB SAMPLE ID: N/A
 DATE SAMPLED: N/A
 DATE RECEIVED: N/A
 DATE ANALYZED: 11/19/99
 DIL FACT: 1
 ANALYST: MRP
 NJDEP LAB ID: 12531

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.0121
74-83-3	BROMOMETHANE		U	0.0064
75-01-4	VINYL CHLORIDE		U	0.0098
75-00-3	CHLOROETHANE		U	0.0095
75-09-2	METHYLENE CHLORIDE		U	0.0072
75-35-4	1,1-DICHLOROETHENE		U	0.0063
75-34-3	1,1-DICHLOROETHANE		U	0.0062
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.0063
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.0063
67-66-3	CHLOROFORM		U	0.0051
107-06-2	1,2-DICHLOROETHANE		U	0.0062
71-55-6	1,1,1-TRICHLOROETHANE		U	0.0046
56-23-5	CARBON TETRACHLORIDE		U	0.0040
75-27-4	BROMODICHLOROMETHANE		U	0.0037
78-87-5	1,2-DICHLOROPROPANE		U	0.0054
79-01-6	TRICHLOROETHENE		U	0.0047
75-69-4	TRICHLOROFLUOROMETHANE		U	0.0061
71-43-2	BENZENE		U	0.0078
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.0055
124-48-1	DIBROMOCHLOROMETHANE		U	0.0029
10061-02-6	TRANS-1,3-DICHLOROPROPENE		U	0.0055
79-00-5	1,1,2-TRICHLOROETHANE		U	0.0046
127-18-4	TETRACHLOROETHENE		U	0.0037
108-88-3	TOLUENE		U	0.0066
108-90-7	CHLOROBENZENE		U	0.0054
100-41-4	ETHYLBENZENE		U	0.0058
95-47-6	O-XYLENE		U	0.0058
1330-20-7	M/P-XYLENES		U	0.0058
541-73-1	1,2-DICHLOROBENZENE		U	0.0042
95-50-1	1,3-DICHLOROBENZENE		U	0.0042
106-46-7	1,4-DICHLOROBENZENE		U	0.0042
1634-04-4	METHYL TERT BUTYL ETHER		U	0.0069
75-65-0	TERT BUTYL ALCOHOL		U	0.0083
98-82-8	ISOPROPYL BENZENE		U	0.0051
95-63-6	1,2,4-TRIMETHYL BENZENE		U	0.0051
108-67-8	1,3,5-TRIMETHYL BENZENE		U	0.0051
95-49-8	2-CHLOROTOLUENE		U	0.0048
106-43-4	4-CHLOROTOLUENE		U	0.0048
100-42-5	STYRENE		U	0.0012
75-71-8	DICHLORODIFLUOROMETHANE		U	0.0051
106-93-4	1,2-DIBROMOMETHANE		U	0.0033

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CHEMTECH

4A

SYSTEM BLANK ANALYSIS BY GC/MS VOA

CLIENT:	N/A	LAB SAMPLE ID:	N/A
SAMPLE ID:	LABORATORY BLANK	DATE SAMPLED:	N/A
PROJECT:	N/A	DATE RECEIVED:	N/A
SAMPLE VOL:	0.2	DATE ANALYZED:	11/22/99
SAMPLE VOL. UNITS:	L	DIL FACT:	1
DATA FILE:	H8945.D	ANALYST:	MRP
EXTRACT DATE:	N/A	NJDEP LAB ID:	12531

CAS #	COMPOUND	PPM/V	Q	MDL
74-87-3	CHLOROMETHANE		U	0.0121
74-83-3	BROMOMETHANE		U	0.0064
75-01-4	VINYL CHLORIDE		U	0.0098
75-00-3	CHLOROETHANE		U	0.0095
75-09-2	METHYLENE CHLORIDE		U	0.0072
75-35-4	1,1-DICHLOROETHENE		U	0.0063
75-34-3	1,1-DICHLOROETHANE		U	0.0062
156-60-5	TRANS-1,2-DICHLOROETHENE		U	0.0063
156-59-2	CIS-1,2-DICHLOROETHENE		U	0.0063
67-66-3	CHLOROFORM		U	0.0051
107-06-2	1,2-DICHLOROETHANE		U	0.0062
71-55-6	1,1,1-TRICHLOROETHANE		U	0.0046
56-23-5	CARBON TETRACHLORIDE		U	0.0040
75-27-4	BROMODICHLOROMETHANE		U	0.0037
78-87-5	1,2-DICHLOROPROPANE		U	0.0054
79-01-6	TRICHLOROETHENE		U	0.0047
75-69-4	TRICHLOROFLUOROMETHANE		U	0.0061
71-43-2	BENZENE		U	0.0078
10061-01-5	CIS-1,3-DICHLOROPROPENE		U	0.0055
124-48-1	DIBROMOCHLOROMETHANE		U	0.0029
10061-02-6	TRANS-1,3-DICHLOROPROPENE		U	0.0055
79-00-5	1,1,2-TRICHLOROETHANE		U	0.0046
127-18-4	TETRACHLOROETHENE		U	0.0037
108-88-3	TOLUENE		U	0.0066
108-90-7	CHLOROENZENE		U	0.0054
100-41-4	ETHYLBENZENE		U	0.0058
95-47-6	O-XYLENE		U	0.0058
1330-20-7	M/P-XYLENES		U	0.0058
541-73-1	1,2-DICHLOROENZENE		U	0.0042
95-50-1	1,3-DICHLOROENZENE		U	0.0042
106-46-7	1,4-DICHLOROENZENE		U	0.0042
1634-04-4	METHYL TERT BUTYL ETHER		U	0.0069
75-65-0	TERT BUTYL ALCOHOL		U	0.0083
98-82-8	ISOPROPYL BENZENE		U	0.0051
95-63-6	1,2,4-TRIMETHYL BENZENE		U	0.0051
108-67-8	1,3,5-TRIMETHYL BENZENE		U	0.0051
95-49-8	2-CHLOROTOLUENE		U	0.0048
106-43-4	4-CHLOROTOLUENE		U	0.0048
100-42-5	STYRENE		U	0.0012
75-71-8	DICHLORODIFLUOROMETHANE		U	0.0051
1045-10-8	N-BUTYLBENZENE		U	0.0046
99-87-6	P-ISOPROPYLTOLUENE	0.0117	U	0.0067
106-93-4	1,2-DIBROMOMETHANE		U	0.0033

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