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**TECHNICAL MEMORANDUM II  
RESULTS OF THE FIELD PROGRAM  
TUTU SERVICE STATION INVESTIGATION  
ST. THOMAS, U.S. VIRGIN ISLANDS**

February 1993

Prepared for  
  
Tutu Environmental Investigation Committee  
San Juan, Puerto Rico

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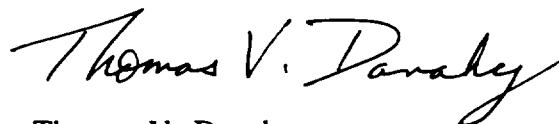
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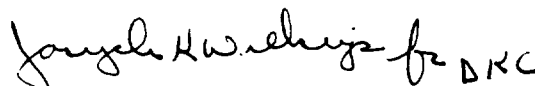
Geraghty & Miller, Inc. is submitting this report to the Tutu Environmental Investigation Committee for work performed at the Tutu Site in St. Thomas, U.S. Virgin Islands. This report was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures to ensure that the report meets industry standards in terms of the methods used and the information presented. If you have any questions or comments concerning this report, please contact one of the individuals listed below.

Respectfully submitted,

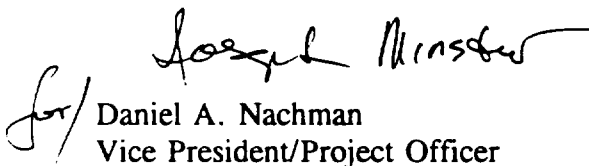
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**TECHNICAL MEMORANDUM II  
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**1.0 INTRODUCTION**

In March 1992, Geraghty & Miller, Inc. submitted the revised Tutu Service Station Investigation Work Plan (Geraghty & Miller, Inc. 1992a) to the United States Environmental Protection Agency (USEPA) on behalf of the Tutu Environmental Investigation Committee (TEIC), which is comprised of Texaco Caribbean Inc. (Texaco), and Esso Virgin Islands, Inc. (Esso). The Work Plan was to be incorporated into an Administrative Order by Consent (No. II-RCRA-7003 and 9003-92-0401) issued to Texaco and Esso by the USEPA Region II, pursuant to Subtitle I of the Resource Conservation and Recovery Act (RCRA). Technical Memorandum I, which was submitted to the USEPA in April 1992 (Geraghty & Miller, Inc. 1992b), provided the results of the preliminary reconnaissance activities performed to select final soil boring and monitoring well locations for the field investigation program. As indicated in the Work Plan, Technical Memorandum II is to be submitted to the USEPA after completion of the first ground-water sampling event of the field investigation program. This Technical Memorandum II includes the data validation report and the hydrogeological data collected during the implementation of the field investigation, including soil sampling and the first ground-water sampling event.

**1.1 PURPOSE**

As specified in the Work Plan (Geraghty & Miller, Inc. 1992a), the purposes of Technical Memorandum II are to evaluate the adequacy of the monitoring well system and to develop recommendations regarding sampling and analytical procedures for the second ground-water sampling event for USEPA review. Accordingly, this technical memorandum includes descriptions of methods, pertinent hydrogeologic data, and data validation results for the first sampling event of the monitoring well system.

The field investigation was designed to delineate the potential sources, and the horizontal and vertical extents and the potential migration pathways for petroleum hydrocarbon products in soil and ground water at the Tutu Service Station Investigation Site, St. Thomas, U.S. Virgin Islands (Tutu Site). The soil and ground-water investigation was also designed to evaluate the presence of tetrachloroethene, commonly known as perchloroethene (PCE), and its breakdown products to address the USEPA's concern regarding these chlorinated compounds. Additional soil sampling locations and deep monitoring wells were included in the scope of work to assist the USEPA. The field investigation was conducted with oversight by the USEPA and its subcontractor, Camp, Dresser & McGee (CDM) Federal Programs Corporation.

The field investigation program at the Tutu Site included the following activities:

- Drilling of soil borings.
- Collection of soil samples for portable gas chromatograph (GC) analysis and laboratory analysis.
- Downhole geophysical surveys in deep borings.
- Installation and development of shallow and deep monitoring wells.
- Surveying of soil boring and monitoring well locations.
- Collection of ground-water samples.
- Performance of two aquifer tests.

## 1.2 SITE LOCATION

The Tutu Site is located in the east-central portion of St. Thomas (see Figure 1-1). The study area and the surrounding topography are shown on Figure 1-2. The Tutu Site is located in the upper Turpentine Run basin. Various commercial establishments line the major roads in the area.



### 1.3 SCOPE OF WORK

The scope of work outlined in the Work Plan (Geraghty & Miller, Inc. 1992a) included ten shallow monitoring wells, seven deep monitoring wells, and 12 soil borings. Prior to completion of the field investigation, this scope of work was enlarged to address the USEPA's concern regarding potential sources of PCE and its breakdown products, including two additional shallow monitoring wells, five additional soil borings, and eight surface soil samples. These additions to the scope of work were discussed by the USEPA and the TEIC and approved by the USEPA prior to implementation. The rationales for the revisions to the original scope of work are discussed below.

The drilling program in the revised scope of work consisted of installing 12 shallow and seven deep monitoring wells, and drilling 17 soil borings. The locations of the soil borings and monitoring wells are shown on Figures 1-3 and 1-4, respectively.

In the revised scope of work, Monitoring Wells MW-9S and MW-14 had been added to the drilling program. Monitoring Well MW-9 was constructed with a screened interval slightly below the water table; therefore Monitoring Well MW-9S was installed next to Monitoring Well MW-9 to intersect the water table. Monitoring Well MW-14 was installed northwest of the Curriculum Center (former Laga Building) to provide additional hydrogeologic and ground-water quality data for this area. Technical Memorandum I (Geraghty & Miller, Inc. 1992b) originally proposed a shallow monitoring well (proposed designation MW-1) at the northwestern corner of the Curriculum Center. However, CDM, the USEPA's subcontractor, performed an independent fracture trace analysis that identified a fracture lineament near the southern end of the Curriculum Center parcel, paralleling the trend of Route 38 (CDM Federal Programs Corporation 1992). During a May 5, 1992 meeting with CDM, USEPA, TEIC, and Geraghty & Miller, the USEPA requested an additional pair of monitoring wells at the southwestern corner of the Curriculum Center (designated MW-1 and MW-1D) to evaluate this fracture lineament. The designation of the shallow monitoring well at the northwestern corner of the Curriculum Center was then changed to MW-14.

During the initial attempt at drilling the boring for Monitoring Well MW-6D in July 1992, the core hole collapsed during reaming and the on-site geologist decided to install shallow Monitoring Well MW-6 in the remaining open hole. However, Monitoring Well MW-6 was abandoned because the collapsed material may not have provided a sufficient separation from the deeper bedrock zone, and Monitoring Well MW-6R was installed as a replacement shallow well. In August 1992, a deep well, Monitoring Well MW-6D, was installed as planned.

Four soil borings (Borings B-13A, B-14, B-15, and B-16) were also added to the original scope during the field investigation. Boring B-13A, located on the western side of O'Henri Dry Cleaners, provided an additional soil sample for the risk assessment database. Borings B-14, B-15, and B-16 were located north of the Curriculum Center where historical information suggested a potential source of PCE (Figure 1-3). In May 1992, the TEIC became aware that the area near a former discharge pipe located at the rear of the Curriculum Center was going to be covered by construction of a concrete foundation during the planned expansion of the building. The TEIC recommended to the USEPA that soil sampling be conducted at Borings B-14, B-15, and B-16 (Geraghty & Miller, Inc. 1992c). These three boring locations at the Curriculum Center were approved by the USEPA.

At the request of the USEPA, eight surface soil samples were added to the scope of work specified in the work plan (Geraghty & Miller, Inc. 1992a). The collection of surface soil samples was intended to provide soil chemistry data for the risk assessment that will be performed by the USEPA. According to USEPA risk assessment guidance documents, contaminants present in soil within 2 feet of an unpaved land surface should be quantified for assessment of risk to human health and the environment (USEPA 1989a; 1991a). The potential exposure routes to humans for contaminants in surficial soils include inhalation of contaminated soil dust or ingestion of contaminated soil, particularly by children. Soil that is covered by pavement or buildings is not accessible for exposure to humans so no risk assessment data are necessary in these areas. Therefore, the selection of surface soil sampling locations was focused in areas of potentially contaminated surficial soils in unpaved areas. Suspected contaminated surface soil areas were determined based on USEPA site evaluation reports (USEPA 1991b) and

a reconnaissance of the Tutu Site. During the site reconnaissance, conducted on July 28, 1992 by Geraghty & Miller and USEPA's oversight subcontractor, CDM Federal Programs, final sampling locations were designated at suspected contaminant source areas. Many of these areas were selected based on visual evidence of contaminated soil (i.e., stained or discolored soil, stressed vegetation, and lack of vegetation).

The eight surface soil samples collected at the Tutu Site as part of the soil investigation were designated as samples SS-1 through SS-8 (Figure 1-3). Samples SS-1, SS-2, and SS-8 were collected to evaluate background metal concentrations in surficial soil. Samples SS-3, SS-4, and SS-5 were collected in potential source areas of constituents of concern. Sample SS-6 (and its field replicate, SS-7) was collected for the risk assessment analysis requested by the USEPA.

## **2.0 METHODOLOGY**

This section describes the activities and procedures performed during the field investigation at the Tutu Site. The methods of investigation for soil quality, geology, ground-water conditions, aquifer characteristics and data validation are described below.

### **2.1 SOIL INVESTIGATION**

The purpose of the soil investigation was to identify source areas of petroleum hydrocarbon products and other constituents of concern at the Tutu Site. Soil samples were collected during the drilling of Borings B-1 through B-13, B-13A, and B-14 through B-16, and of Monitoring Wells MW-1 through MW-10, MW-14, MW-1D, MW-4D, MW-6D, and MW-10D through MW-13D (see Figures 1-3 and 1-4). Soil boring details are included in Table 2-1. Soil samples were collected with a 3-inch diameter, 2-foot long, stainless-steel, split-spoon sampler driven ahead of 3.25-inch inside diameter (I.D.), hollow-stem augers. Soil samples were collected continuously from ground surface to the water table or top of bedrock, whichever was encountered first. At several locations, the drilling was advanced through asphalt or concrete pavement.

The drilling rig, hollow-stem augers, rods, and tools were steam-cleaned before each boring. In addition, split-spoon samplers were decontaminated in accordance with the following procedure: washed in tap water mixed with Micro detergent; rinsed with tap water; rinsed with 10 percent nitric acid; rinsed with deionized water; rinsed with pesticide-grade methanol; rinsed with pesticide-grade hexane; allowed to air dry; and rinsed with deionized water. Each sampler was wrapped in aluminum foil for later use.

Each soil sample was collected by driving the split-spoon sampler through the unconsolidated material with a 140-pound hammer dropping 30 inches. After the sampler was retrieved from the boring, it was placed on a wood table covered by new plastic sheeting and opened. The sample interval, blow counts per 6 inches of advancement, sample recovery, and the soil description were recorded on Geraghty & Miller's sample/core log form. Each soil

sample was screened with a HNu Model PI-101 photoionization detector equipped with a 10.2-electron volt lamp. The HNu readings were recorded on the sample/core logs with the appropriate depth intervals. The HNu was calibrated on a daily basis, as specified in Appendix A of the Work Plan (Geraghty & Miller, Inc. 1992a). Copies of the sample/core logs are included in Appendix A of this report.

A portion of each soil sample was collected with a stainless-steel spatula for field GC analysis. The soil was placed in two 40-milliliter (mL) vials containing deionized water, using a stainless-steel spatula, until half of each vial was filled. Each vial was identified with the boring number, sample number, depth interval, and the date and time of collection. The vials were stored in ice and transported to the field office for GC analysis. Surface soil samples were collected directly from the ground surface with a stainless-steel spatula.

The soil sample with the highest HNu reading from each boring was selected for off-site laboratory analysis. If no elevated HNu readings were measured, the deepest sample (above the water table or above the bedrock) was selected for laboratory analysis. Each soil sample was transferred from the split-spoon sampler to the sample container with a stainless-steel spoon. Soil sample jars were preserved in the field with ice and transported along with the field and trip blanks to the field office for packaging.

One field blank was collected for laboratory analysis during each day soil sampling occurred. The field blank was prepared by pouring deionized water through the precleaned, split-spoon sampler. One trip blank was provided in each cooler of samples. Samples were shipped to Enseco East Laboratories (Enseco) in New Jersey via overnight courier. Soil samples were analyzed for volatile organic compounds (VOCs) from the target compound list (TCL); 1,2-dibromomethane; n-propylbenzene; and methyl tertiary-butyl ether (MTBE); TCL base neutral acid extractable compounds (BNAs); and metals, cyanide, and total petroleum hydrocarbons (TPH) from the target analyte list (TAL) using the March 1990 Contract Laboratory Program (CLP) protocols (USEPA 1990a; 1990b).

## **2.2 GEOLOGICAL INVESTIGATIONS**

During the field investigation at the Tutu Site, exposed outcrops were examined, and site-specific geology was documented from the drilling of the soil borings and the bedrock core holes. Downhole geophysical surveys were also performed. These activities are described in the following sections.

### **2.2.1 Surficial Geology**

To correlate the geologic information obtained during the field investigation with previous geologic data, three rock outcrops located in the Tutu area were examined, and the observed rock units were described. The strike and dip of bedding planes and fractures, and degree of weathering and fracturing, were documented. These data and observations are described in Section 3.1.2 (Site Geology).

### **2.2.2 Bedrock Coring**

The bedrock was cored during the drilling of deep Monitoring Wells MW-1D, MW-4D, MW-6D, MW-10D, MW-11D, MW-12D, and MW-13D and shallow Monitoring Well MW-9 (Figure 1-4). Coring began at the top of bedrock in each borehole. Depth to the top of bedrock varied from 0 to 11.6 feet below land surface (bls). Bedrock samples were obtained using the wireline NQ core barrel rotary method with a 2 3/4-inch outside diameter (O.D.) diamond bit. Cuttings removal and cooling of the diamond bit was accomplished by recirculating water through the drilling system. A temporary, 5-foot long, 4-inch diameter polyvinyl chloride (PVC) casing was installed in each 7-inch diameter boring before coring. The 5-foot long casing was used to avoid borehole collapse and to assist in recirculating the water from a holding tank to the boring. The recirculation system consisted of a holding/settling tank, a pump, and the downhole drilling tools. A sample of the drilling water was collected and analyzed for the constituents of concern prior to field activities. Sample cores were obtained in 5-foot sections

wherever possible. Downhole drilling pressure, rate of penetration per foot, and water circulation were observed and recorded.

The total length of each core sample was measured and recorded, along with the core recovery percentage and rock quality designation (RQD). These measurements were recorded on a Geraghty & Miller bedrock core log form, along with a description of the core sample. The core descriptions include lithology, color, hardness, grain size and shape, sorting, luster, cementation, accessory minerals, inclusions, bedding, weathering, and fracturing. The following information was also recorded on a bedrock coring log: run number, run depth, run penetration, run duration, penetration rate, downhole pressure, run recovery, percent recovery, and RQD. Bedrock core logs are included in Appendix A.

Rock cores were stored in sample core boxes. These boxes were identified with the boring number, core depth, date, project number, and box number written on the outside of the box cover. The box number, project number, date, depth, run number, recovery percentage, and RQD were recorded on the inside of the box cover. The sample core boxes were stored on-site for further lithologic analysis.

Soil and rock cuttings resulting from the drilling operation were placed in 55-gallon, U.S. Department of Transportation (DOT)-approved drums. Three composite samples were collected from these drums to characterize the soil cuttings for disposal purposes. Drilling equipment and tools were decontaminated by steam-cleaning between each core sampling location.

### **2.2.3 Downhole Geophysics**

Caliper and sonic logs were run in all bedrock core holes (Monitoring Wells MW-1D, MW-4D, MW-6D, MW-10D, MW-11D, MW-12D, and MW-13D). For Monitoring Well MW-9, only caliper logging was attempted. The caliper log is a record of borehole diameter versus depth. The sonic log is a record of the time required for a compressional sound wave to transverse 1 horizontal foot into the rock formation.

A caliper probe (Model 3ARM COO4) was used for the core hole caliper logging. The caliper probe was calibrated with 3- and 4.5-inch diameter rings for the 3-inch diameter core holes, and 6- and 12-inch diameter rings for the 10-inch diameter core holes. The starting depth was calculated by measuring the distance between the ground surface or the temporary PVC pipe to the bottom of the caliper arms. The PVC pipe had been installed previously in the core hole to recirculate the water used during coring procedures. The caliper was lowered slowly to the bottom of the core hole. Core hole depth was compared with the depth obtained during diamond coring. At the core hole bottom, the caliper arms were opened to start logging. A printout of the raw data was obtained during logging of the hole and processed later at the field office.

A sonic probe (Model SONIC 1275) was used for the core hole sonic logging. The starting depth for the sonic log was selected by measuring the distance between the ground surface or the temporary PVC stick-up and the middle point between the two receivers of the sonic probe. The sonic log was run without centralizers in 3-inch diameter core holes (Monitoring Wells MW-1D and MW-4D). Centralizers were used on 6- and 10-inch diameter core holes (Monitoring Wells MW-6D, MW-10D, MW-11D, and MW-12D). The sonic probe was lowered to the bottom of the core hole to start logging. A printout of the raw data was obtained in some of the logs. The raw data were processed later at Geraghty & Miller's Puerto Rico office.

Caliper and sonic logs were performed on each core hole twice to check the raw data obtained during logging. A detailed log was obtained by processing the raw data. This log included a three-arm caliper borehole diameter versus depth curve, a tube (i.e., borehole) wave amplitude curve, a transit time curve, a variable density log, and drilling and logging information for each core hole.

The geophysical logging of Monitoring Wells MW-1D and MW-4D was conducted in 3-inch diameter core holes. The rest of the core holes were reamed prior to logging with a 10-inch diameter air-rotary hammer bit from the top of bedrock to the top of the open hole interval to minimize core hole collapse. The 6-inch stainless-steel casing was then installed, and grout was



poured into the annular space between the casing and the core hole. After the grout had hardened, the bottom 20 feet of the core hole was reamed with a 5.5-inch diameter hammer bit. A second run was made with the caliper and the sonic probe in the bottom part of the core hole. This procedure was followed in the core holes of Monitoring Wells MW-6D, MW-10D, MW-11D, and MW-13D. An attempt was made to log the core hole of Monitoring Well MW-9 after it was reamed; however, due to a temporary malfunction, the arms of the caliper probe did not open inside the core hole of Monitoring Well MW-9 despite several attempts during the logging procedures.

The core hole of Monitoring Well MW-12D was reamed completely with the 10-inch diameter hammer bit due to the highly weathered material encountered during coring of the hole. After geophysical logging, Monitoring Well MW-12D was completed as a shallow monitoring well with 4-inch diameter stainless-steel screen and casing.

## **2.3 GROUND-WATER INVESTIGATION**

The ground-water investigation included the installation of shallow and deep monitoring wells, well development, and ground-water sampling and analysis. The purpose of the ground-water investigation was to define ground-water flow conditions and to delineate the horizontal and vertical extent of petroleum hydrocarbon products and other potential constituents of concern in ground water.

### **2.3.1 Monitoring Well Installation**

Twelve shallow monitoring wells were installed at the Tutu Site (Monitoring Wells MW-1 through MW-5, MW-6R, MW-7, MW-8, MW-9, MW-9S, MW-10, and MW-14). The shallow monitoring wells were screened to bridge the water table. Each well was constructed with 4-inch diameter, stainless-steel casing and screen (0.020-inch slot size). The screen and riser pipe utilized for well construction were steam-cleaned before installation. A sand pack, consisting of Texblast Sand, was placed around each well screen. The height of the sand pack above the

top of the screen ranged from 1.06 to 2.8 feet (see Table 2-2). The sand pack was poured from ground surface directly into the annulus between the boring and the well screen; and a seal, consisting of bentonite pellets, was installed above the sand pack. The thickness of the bentonite seal ranged from 0.85 to 2.6 feet depending on field conditions (Table 2-2). The bentonite pellets were hydrated with potable water after placement. A cement-bentonite grout seal was installed on top of the bentonite seal to a depth of approximately 0.2 foot bls. The grout slurry was poured in the annulus between the boring and well casing with a 3/4-inch diameter tremie pipe. Each monitoring well was finished with a metal curb box that extended approximately 0.1 foot above the land or pavement surface. Monitoring well construction logs, including diagrams for each shallow monitoring well, are provided in Appendix B.

Seven deep monitoring wells were installed at the Tutu Site during the field investigation (Monitoring Wells MW-1D, MW-4D, MW-6D, MW-10D, MW-11D, MW-12D, and MW-13D). Deep monitoring wells were completed as open holes in previously drilled bedrock core holes (see Section 2.2.2 [Bedrock Coring]), except for Monitoring Wells MW-6D and MW-12D. The original core hole for Monitoring Well MW-6D was decommissioned due to formation collapse. The same situation was encountered in the original core hole for Monitoring Well MW-12D where drill tools were lost due to formation collapse. The core hole for Monitoring Well MW-12D was, therefore, abandoned and grouted during the field program. New holes were drilled in both locations (Monitoring Wells MW-6D and MW-12D) for completion of the monitoring well. Geophysical logs were run in the new holes after reaming had been completed.

Before installation of Monitoring Well MW-4D, the 3-inch diameter core hole was initially reamed with a 7.5-inch diameter air-rotary hammer bit. A 10-inch diameter hammer bit was used for the other wells. The core holes were reamed to a predetermined depth based on the ground-water levels encountered during drilling. Depths of the deep wells were selected so that there was a 20-foot vertical separation between the bottom of the shallow monitoring wells and the top of the deep wells.

Borings were reamed with the 10-inch diameter hammer bit from ground surface to the top of the open hole interval. A 6-inch diameter, stainless-steel casing was then installed in each boring. The annulus between the casing and the boring was grouted from the bottom to ground surface with a 3/4-inch diameter tremie pipe and the grout was allowed to harden for 12 hours. The borings were then reamed with a 5.5-inch diameter hammer bit through the 6-inch diameter casing. The well depth was measured to verify that the boring remained open after the reaming was completed. Deep monitoring wells were completed with a flush-mounted manhole installed approximately 0.1 foot above ground surface. Monitoring well construction logs and diagrams for the deep wells were prepared after well completion. These well construction diagrams are included in Appendix B.

Shallow and deep monitoring wells were surveyed after completion of all installation operations. Land surface, top of flush-mounted manhole, and top of stainless-steel casing elevations were measured for each well installed during the field investigation. Land surface and measuring point elevations are included in Appendix B.

### **2.3.2 Well Development**

Shallow and deep monitoring wells were developed after completion between August 24 and September 15, 1992. A submersible or centrifugal pump was used for development. The submersible pump was used for Monitoring Wells MW-3, MW-4, MW-4D, MW-6R, and MW-13D. A centrifugal pump was used for Monitoring Wells MW-1D, MW-2, MW-5, MW-6D, MW-7, MW-8, MW-9, MW-9S, MW-10, MW-10D, MW-11D, MW-12D, and MW-14. All of the wells except Monitoring Wells MW-3, MW-4, MW-4D, MW-6R, and MW-6D were flushed with potable water during development. Flushing of the wells consisted of pouring potable water into the well and pumping it out several times. Monitoring Wells MW-3, MW-4, MW-4D, MW-6R, and MW-6D did not require flushing because they sustained higher pumping rates.

The submersible pump was cleaned with a detergent (i.e., Micro) and water solution and rinsed with tap water between each well. The tubing and rope used with the centrifugal pump were changed between each well. Well development was continued until the discharged water was relatively sediment-free. Water produced during well development was stored in a 550-gallon holding tank and transported to the water treatment system installed by the TEIC at the Esso service station at the Tutu Site. The treatment consisted of air stripping and granular activated carbon (GAC) adsorption prior to discharge to the sanitary sewer, as authorized by the U.S. Virgin Islands Department of Public Works (DPW) and the Department of Planning and Natural Resources (DPNR).

A water sample was collected from the pump discharge line during well development for field GC analysis in Monitoring Wells MW-1, MW-1D, MW-2, MW-3, MW-5, MW-6R, MW-6D, MW-7, MW-8, MW-9, MW-10, MW-10D, MW-11D, MW-12D, and MW-14. Another sample was collected for field GC analysis prior to discharging treated water to the sanitary sewer system. A sample from the effluent of the water treatment system was collected on September 15, 1992 for laboratory TCL VOC analysis.

### **2.3.3 Water-Level Measurements**

Depth to ground water was measured using a calibrated electronic water-level probe. The electronic probe relies on the conductivity of the water, generating a low-voltage electric circuit only when the probe touches water. Water levels were measured from the top of the stainless-steel casing of each monitoring well.

Water-level measurements were recorded in September, October, and November 1992 and are provided in Tables 2-3 and 2-4. The water-level measurements were obtained from the shallow and deep wells respectively. Depth-to-water data were converted to water-table elevations relative to mean sea level (msl) by subtracting the depth to water in each well from a surveyed datum (the top of stainless-steel casing of each well) and were used to prepare

ground-water contour maps. These maps were used to determine the direction of ground-water flow.

The water-level elevations for the monitoring well clusters were tabulated (see Table 2-5) for comparison. The vertical gradient of ground-water flow at each well cluster was calculated by dividing the difference of the water-level elevations in the well cluster by the vertical separation of the mid-points of the well screens (or the open intervals). The minimum and maximum vertical gradients for each well cluster are presented in Table 2-6.

#### **2.3.4 Ground-Water Sampling and Analysis**

Ground-water samples were collected between September 29 and October 7, 1992 from the 19 monitoring wells installed at the Tutu Site. The ground-water samples were collected at least 2 weeks after completion of well development. A sample of the potable water (i.e., water supplied by the Water and Power Authority [WAPA]) used for decontamination was collected from a faucet located at the Esso service station during this sampling event. Water sampling logs are included in Appendix C.

The water level and well depth were measured in each monitoring well before purging. These measurements were taken with an electronic water-level indicator (i.e., M-scope) and a steel tape from the top of the stainless-steel casing. The instruments were cleaned between each monitoring well with a Micro and water solution, and rinsed with tap water. The volume of water in each well was calculated using the following formula:

- For a 4-inch diameter well: height of water column x 0.65 gallon/foot.
- For a 6-inch diameter well: height of water column x 1.47 gallon/foot.

Three-to-five well volumes were purged from each well with either a submersible or a centrifugal pump. The submersible pump was decontaminated between wells with a Micro and water solution and rinsed with tap water. Tubing used with the centrifugal pump was discarded

between each well. Monitoring Wells MW-1, MW-1D, MW-8, MW-9S, MW-10, MW-10D, and MW-13D went dry during purging operations. Field measurements of temperature, pH, and specific conductance as well as HNu readings, were collected during purging and sampling of the wells; these data are included in Appendix C.

Ground-water samples were collected with dedicated Teflon bailers. The first bailer of water was discarded. The sample was collected by pouring the water directly into the sample container from the bailer; VOC samples were collected first. Field blanks were also collected during ground-water sampling activities by pouring deionized water through the Teflon bailer. Samples were preserved in the field according to approved laboratory quality assurance/quality control (QA/QC) preservation procedures for each specific analyte (see Appendix C). All ground-water samples, along with the field and trip blanks were preserved on ice and sent to Enseco via overnight courier. Monitoring Wells MW-1 and MW-4D were sampled a second time because problems occurred with the initial shipment of samples. Monitoring Well MW-1 was resampled because sample containers were lost during shipment to the laboratory, and Monitoring Well MW-4D was resampled for VOCs because the laboratory found air bubbles in the VOC vials.

Blind field replicates of ground-water samples were collected from Monitoring Wells MW-5 and MW-7 during October 1992. These blind field replicates were originally designated as MW-104 (collected at MW-5) and MW-105 (collected at MW-7). After the laboratory results were received, the original designations were changed from MW-104 and MW-105 to MW-5FR and MW-7FR, respectively.

Because the laboratory notified Geraghty & Miller that air bubbles were present in the ground-water sample collected at Monitoring Well MW-7, the TCL VOC analysis for this sample was not performed. The VOC analysis for the blind field replicate sample MW-7FR (original designation MW-105) was sufficient to characterize VOC content in ground water samples collected at Monitoring Well MW-7. Because the VOC analysis of sample MW-7FR (MW-105) was substituted for sample MW-7, an additional blind field replicate sample MW-9FR

(originally designated MW-106) was collected at Monitoring Well MW-9 for VOC analysis only. The purpose of blind field replicates is to evaluate the reproducibility of sampling and laboratory procedures.

## **2.4 AQUIFER TESTS**

Two 24-hour, constant-rate aquifer pumping tests were carried out in shallow Monitoring Well MW-6R and deep Monitoring Well MW-6D to estimate the hydraulic characteristics of the uppermost and lower saturated deposits underlying the study area. These two wells were selected because of their relatively high yield. The constant-rate aquifer tests conducted on Monitoring Wells MW-6R and MW-6D were performed on November 2, 1992 and November 5, 1992, respectively. The USEPA had originally requested that a 72-hour pump test be conducted, but later approved the 24-hour tests based upon initial pump test results.

Prior to initiation of the 24-hour constant rate aquifer pumping tests, a step-drawdown test was conducted in each well to select an optimal pumping rate. The pumping rates selected for Monitoring Wells MW-6R and MW-6D were 9.25 gallons per minute (gpm) and 14.2 gpm, respectively. The length of the step-drawdown tests ranged from approximately 2 to 4 hours. Four to five steps, each with increasing pumping rates, were run for approximately 30 to 60 minutes each.

Recovery tests were conducted immediately after pumping was stopped. Recovery water levels were measured until at least 90 percent recovery was observed in each well.

### **2.4.1 Water-Level Measurements**

Pressure transducers were placed in the pumping, observation, and other nearby wells for several days prior to the step-drawdown and constant rate pumping tests, to provide data regarding background water-level fluctuations. Pressure transducers were connected by a cable to computerized data loggers that were programmed to record water-level readings every 30

seconds during testing and every 10 minutes prior to testing. After completion of each test, the data from the loggers were downloaded to a field computer. Pressure transducers were installed in Monitoring Wells MW-4, MW-4D, MW-5, MW-6R, MW-6D, MW-7, MW-8, and MW-12D. Water levels in Monitoring Wells MW-2, MW-3, MW-6R, MW-6D, MW-9, MW-10, MW-10D, MW-11D, and Monitoring Wells CHT-4 and CHT-6D (installed by Caribbean Hydrotech) were recorded manually with an electronic water-level indicator. The electronic water-level indicators, transducer cables, and probes were decontaminated in sequence by washing in a Micro and water solution, followed by a potable water rinse and a distilled water rinse.

#### **2.4.2 Aquifer Test Procedures**

Two submersible pumps, with capacities of 10 gpm and 20 gpm, were used to discharge a constant rate of water from the tested monitoring wells for a period of approximately 24 hours. The 10-gpm pump was placed in Monitoring Well MW-6R, and the 20-gpm pump was placed in Monitoring Well MW-6D. The pumps were suspended in the wells with a 1-inch diameter galvanized pipe connected to the discharge outlets of the pumps. A 3/4-inch diameter-threaded, PVC pipe was installed as a drop line for measuring water levels in the pumping wells. This PVC pipe was placed just above the top of the pump to provide accurate water-level measurements in the event that water cascaded from dewatered portions of the bedrock. The pumps were equipped with an in-line valve to adjust the flow rate, and an in-line flow meter to measure the actual flow rate. Electric power was supplied to the pumps from an electrical box outlet in the Esso service station.

The ground water from each of the wells was discharged to a nearby water treatment system through a 1 1/4-inch diameter PVC pipe. This ground water was stored on-site in holding tanks, prior to treatment with an air stripper and carbon absorption units, and was then discharged to the sanitary sewer lines, as authorized by the DPW and the DPNR.

Prior to each test, the submersible pumps were decontaminated by rinsing the interior and exterior of the pumps with a Micro and water solution, followed by a rinse with potable water.



A minimum of 25 gallons of potable water was run through the pumps. The galvanized pipes and the PVC drop line were decontaminated by steam cleaning before use.

#### **2.4.3 Water Sample Collection**

Water samples for field GC and laboratory analysis were collected every 2 and 12 hours, respectively, from the pumping wells throughout the duration of the tests. Water samples for field GC and laboratory analysis were collected before and after treatment of the discharged water to determine the VOC concentrations in the aquifer and the effectiveness of the water treatment system. The temperature, pH, and specific conductance of the water samples were measured every hour using field instruments. Water samples were analyzed for TCL VOCs following the March 1990 CLP protocols (USEPA 1990a).

### **2.5 DATA VALIDATION**

Data validation was provided to ensure the quality of all the laboratory data under Geraghty & Miller's Analytical Quality Assurance/Laboratory Control Program (AQA/LCP) protocols. In some instances, a result was qualified as estimated (identified as J in the tables) because the corresponding analyte was not detected above the CLP contract required detection limit (CRDL). Reported detection limits are approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in a given sample. A reporting limit is the practical quantitation limit (PQL) for a particular parameter in a given matrix that is attainable using the specified, corresponding methodology, and that can be reliably achieved within specified units of precision and accuracy. The method detection limit (MDL) is the minimum concentration of a parameter that can be measured and reported by a particular analytical system.

### **3.0 HYDROGEOLOGIC CONDITIONS**

The hydrogeologic conditions at the Tutu Site have been described using published regional geologic information and site-specific data obtained during this investigation.

#### **3.1 GEOLOGY**

The regional information provided in this section was obtained from published technical reports, U.S. Geological Survey (USGS) publications, and Geraghty & Miller files from previous projects in St. Thomas. Site-specific information was interpreted from the results of Geraghty & Miller's field investigation program.

##### **3.1.1 Regional Geology**

St. Thomas is an island with an area of 32 square miles. The island is composed primarily of volcanic rocks of Cretaceous age. The Tutu Site is located within the Turpentine Run surface drainage basin, which covers approximately 3.4 square miles (see Figure 1-1). Turpentine Run is an intermittent stream that flows from northwest to southeast. The Turpentine Run basin is separated into upper and lower basins. The upper basin consists of 2.3 square miles upstream of the historical stream gaging station located near Mt. Zion, and the lower basin consists of 1.1 square miles downstream of this station (Jordan and Cosner 1973).

The bedrock in the Turpentine Run basin is underlain by two volcanic formations, the Water Island Formation and the younger Louisenhoj Formation. The Water Island Formation is composed primarily of basaltic flows and breccias. It is unconformably overlain by the Louisenhoj Formation, which consists of pyroclastic to epiclastic augite andesite (Donnelly 1959; 1966). Locally, the base of the Louisenhoj consists of the Cabes Point Conglomerate, which contains well-rounded and well-sorted pebbles and cobbles of the older Water Island Formation. A light-colored intrusive plug has been mapped near Mt. Zion. This intrusive rock is a quartz-andesine porphyry (Donnelly 1966).

Both the Water Island and Louisenhoj Formations are present in the upper basin. By mapping the offset of formation contacts, Donnelly (1966) identified two major strike-slip faults striking northwest-southeast, with right lateral separation. One of these faults occurs approximately 2,500 feet northeast of the Tutu Site. Geologic logs of wells drilled in the upper basin do not differentiate between the Water Island and the Louisenhoj Formations. In the lower basin, only the Water Island Formation is found, and it is overlain by as much as 40 feet of alluvial deposits (Jordan and Cosner 1973).

### **3.1.2 Site Geology**

The Tutu Site is a moderately developed area crossed by several roads, and a number of commercial and residential buildings have been built along the roads. Geraghty & Miller's drilling program established that most of the shallow sediment under the paved areas consists of fill material and reworked native sediment. Several small catchment areas created along the axis of Turpentine Run basin serve to trap sediment, and organic soil is found under a heavy vegetative cover along the axis of the basin. These sediments are underlain by Quaternary alluvial and colluvial deposits along the valley that appear to thicken southward.

The alluvial and colluvial deposits present in the upper basin are relatively thin, with thicknesses usually varying from zero to 2 feet, with as much as 10 to 20 feet in isolated valley areas. The sediment consists of unconsolidated, unstratified, poorly sorted mixtures of clay, silt, sand, gravel, cobbles, and boulders transported from the upper valley and the foothills by gravity and flash floods. Average grain size increases with proximity to valley slopes.

The alluvium/colluvium is underlain by moderately weathered, fractured volcaniclastic rock in which the original rock components have been partially replaced by clay, chlorite, and oxide minerals. The unit is a gray to greenish-gray volcanic sandstone and breccia with a fine-grained matrix and occasional clasts ranging in diameter from 1 to 5 centimeters (cm). Visible mineral grains in the matrix include plagioclase, pyroxene, quartz, and chlorite. In Monitoring Well MW-6D, a thin (0.5-foot) layer of siltstone was encountered.

Three outcrops were examined: behind the 7th Day School along Route 38, in front of the Virgin Islands Housing Authority (VIHA) Building, and in the newly cleared area where the Tutu Shopping Plaza is being constructed. All outcrops contain the same rock type, a volcanoclastic sandstone that, in some areas, grades to a coarser grained breccia. The breccia is more predominant in the subsurface, as indicated by the geologic logs (Appendix A).

The rock is most fractured in the Tutu Shopping Plaza outcrop, located just west of the Four Winds Plaza. The easternmost extension of this outcrop is hydrothermally altered. Several large fractures trend in a north-south direction, almost perpendicular to the regional strike of the bedding planes of the massive volcanoclastic units found at the site.

At the outcrop behind the 7th Day School, bedding planes dip steeply (between 54 and 67°) to the northeast and strike N-61-W to N-88-W, which agree with the strike and dip measurements reported in the published literature (Donnelly 1966). The predominant rock matrix is volcanic sandstone, alternating with thin to massive beds of volcanoclastic flow breccias. The breccias include visible, angular-to-rounded, volcanic and sedimentary clasts that range in size from pebbles to cobbles. The rock outcrop is less altered or weathered than the outcrop at the Tutu Shopping Plaza.

The outcrop at the VIHA property is the smallest of the three and also the most extensively weathered. Some of the original structure of the volcanic sandstone is visible, and because of its proximity to the 7th Day School outcrop, it is considered to be an extension of the latter. Measurable strikes and dips of the beds are similar to those previously described.

Iron staining and thin calcite veins are common along fracture surfaces. The fractured areas are usually the most weathered. Highly weathered zones were encountered in Monitoring Wells MW-4D and MW-6D. The weathered zones range in thickness from 1 to 5 inches in Monitoring Well MW-4D, and up to 2 feet in Monitoring Well MW-6D. The highly weathered rock has been altered to a friable, light brown to tan, sandy to clayey silt that maintains the

original rock structure (saprolite). The physical properties of this unit are characteristic of very dense fractured rock. Fractured zones in the rock units are shown on Figure 3-1.

Evidence of intrusive rocks was observed in Monitoring Wells MW-11D and MW-4D. These rocks are interpreted to be diorite. Diorite is a coarse-grained intrusive rock composed mainly of sodic plagioclase and hornblende, with variable amounts of quartz, biotite, and/or pyroxene. Samples of this unit from Monitoring Well MW-11D are described as a very dense, dark green to black rock matrix with visible, abundant plagioclase phenocrysts (large, well-shaped crystals). The diorite contained abundant, thin veins of calcitic minerals throughout the rock matrix.

The stratigraphy of the site was interpreted from geologic logs, which are included in Appendix A. Figure 3-1 presents a north-south cross section through the site. The geologic logs (Appendix A) and the geologic cross section (Figure 3-1) are presented in draft form. These items are subject to revision based on final preparation and comparison of borehole geophysical logs with a detailed review of the bedrock cores. Stratigraphic correlation of the lower rock units was not possible due to the steep angles ( $60^{\circ}$  to  $80^{\circ}$ ) at which the rock layers dip and the large distances between borings and monitoring wells. Bed thicknesses range from very thin to massive, and strata are reported to dip north to northeast at angles of  $60^{\circ}$  to  $80^{\circ}$  (Donnelly 1966). The geologic reconnaissance of the area confirmed these trends. The rocks are reportedly faulted approximately 2,500 feet northeast of the site and are locally cut by steeply inclined joints. Most joints are filled with calcite. The weathered, less competent bedrock noted in core logs appears to be correlated with the occurrence of volcanic sandstone. This correlation may be due to the preferential development of joints in the more homogenous lithology and the texture of the volcanic sandstone versus the volcanic breccia.

The matrix of the volcaniclastic rocks shows signs of low-grade metamorphism and hydrothermal alteration. The minerals that compose the rock matrix have been weathered and transformed into clayey sediment in some areas. Chloritic minerals are common throughout the rock matrix. This matrix, when weathered, maintains its original structure. Igneous rocks

(diorites) were observed at depth in Monitoring Well MW-4D and near the southern boundary of the site (Monitoring Well MW-11D). These intrusive bodies are probably the cause of the localized metamorphism.

## **3.2 HYDROGEOLOGY**

Regional hydrogeologic information for the area was obtained from USGS studies and other published reports. The site hydrogeology was evaluated using data collected by Geraghty & Miller during the installation of the monitoring wells at the Tutu Site.

### **3.2.1 Regional Hydrogeology**

Ground water in the Turpentine Run basin occurs in two aquifers (Jordan and Cosner 1973). The primary aquifer is the fractured volcanic rock of the Water Island and Louisenhoj Formation and, locally, the Cables Point Conglomerate. The secondary aquifer consists of the alluvial deposits in the lower basin. Very thin alluvial deposits are also present in the upper basin, with thicknesses varying from less than 2 feet to 20 feet in isolated valley areas. However, the alluvial deposits in the upper basin do not constitute an aquifer capable of supplying useable amounts of water because of their limited extent and thickness, and because they are often unsaturated. The alluvial deposits are considered to be hydraulically connected to the fractured volcanic rock. Ground water in both units generally exists under water-table conditions. Localized low permeability (fine-grained) layers in the alluvial deposits result in confined conditions of limited extent.

In the upper basin, ground-water supply is derived from wells installed in the fractured volcanic rock. Supply well depths in the upper basin range from 73 to 325 feet bls (Stevens et al. 1981). The depths of these wells do not correlate with yield, but rather are an indication of where water-bearing fracture zones were penetrated. Short-term well yields in the upper basin range as high as 100 gpm; sustained yields range between 2 and 21 gpm (Jordan and Cosner 1973).

Recharge to the fractured volcanic rock in the upper basin is from occasional major rainstorms and is dependent on the frequency and volume of rainfall. As a result of surface runoff and a high evapotranspiration rate, rainfall of at least 2 inches within a 24-hour period is necessary for recharge to occur. Annual recharge to the upper basin due to rainfall is estimated to be 130 million gallons (Jordan and Cosner 1973).

Few data are available to evaluate the hydraulic characteristics of the Turpentine Run basin aquifers. Of the six pump tests reported in the basin prior to 1982, only one test indicated a specific capacity greater than 1 gallon per minute per foot (gpm/ft) of drawdown. The specific capacity of that well was between 1 and 2 gpm/ft (Stevens et al. 1981). On May 20, 1982, Geraghty & Miller conducted a pumping test on the VIHA I supply well. After 10 hours of pumping at 48.4 gpm, 5.3 feet of drawdown were observed in the pumping well (VIHA I), which has a total depth of 140 feet. Supply well VIHA II (located 120 feet north of VIHA I) was used as an observation well during the May 1982 pumping test. After 10 hours of pumping, 1.42 feet of drawdown was observed in supply well VIHA II, which is 142 feet deep. Review of the drilling log for VIHA I indicated fracture zones at 78, 87, 105, 125, and 138 feet bls (Geraghty & Miller, Inc. 1983). The later part of the May 1982 pumping test indicated that the drawdown was continuing over time. Projecting the rate of drawdown defined in the later part of the test, Geraghty & Miller predicted approximately 19.2 feet of drawdown would be present after 2 years of continuous pumping at 48 gpm from supply well VIHA I (Geraghty & Miller, Inc. 1983). Accordingly, the predicted specific capacity is 2.5 gpm/ft.

### **3.2.2 Site Hydrogeology**

Water-level data were obtained from 12 shallow monitoring wells and seven deep monitoring wells installed at the Tutu Site. Of these, four locations contained clustered monitoring well pairs (Monitoring Wells MW-1, MW-4, MW-6, and MW-10). The locations of the wells are shown on Figure 1-4. Monitoring well construction details are presented in Table 2-2.

The shallow monitoring wells, which range from 19 to 45 feet deep, and the deeper monitoring wells, which are between 45 and 100 feet deep, generally penetrate low-yielding sections of the bedrock aquifer. With the exception of three locations, none of the monitoring wells can sustain pumpage of even minimal flow rates, and these wells go dry when sampled. The three exceptions are all in an area that includes the Texaco Service Station and the northern end of the Four Winds Plaza parking lot. The wells in this area, Monitoring Wells MW-3, MW-4, MW-4D, MW-6R and MW-6D, are the only ones that could be pumped steadily during development and sampling. This is an area where independent aerial photograph analysis by Geraghty & Miller and CDM Federal Programs Corporation have identified a concentration of intersecting fracture traces (CDM Federal Programs Corporation 1992; Geraghty & Miller, Inc. 1992b).

#### 3.2.2.1 Shallow Wells

Twelve shallow monitoring wells were installed at the Tutu Site. The total depths of the shallow wells ranged from 18.7 to 45.2 bls. All shallow wells, except Monitoring Well MW-9, were installed with screens that bridge the water table. Monitoring Well MW-9S was installed near Monitoring Well MW-9 with the top of the screen above the water table. Depth to ground water from September through November 1992 ranged from 5.5 feet bls (Monitoring Well MW-6R) to about 30 feet bls (Monitoring Well MW-1).

Six rounds of ground-water levels were measured from September through November 1992 (Tables 2-3 and 2-4). During this time, ground-water levels in the shallow wells fluctuated an average of 3.57 feet, with maximum fluctuation in Monitoring Well MW-8 (5.96 feet) and Monitoring Well MW-1 (5.19 feet), and minimum fluctuation in Monitoring Well MW-9 (1.61 feet).

Liquid phase hydrocarbon product was detected in shallow Monitoring Wells MW-5, MW-9, and MW-9S between September and November 1992. Product was observed once in Monitoring Wells MW-5 (0.01 foot) and MW-9 (sheen). In Monitoring Well MW-9S product



was present on four occasions, with thicknesses ranging from a sheen on September 17, October 28, and November 16, 1992 to 0.11 foot on September 28, 1992. Product was not detected in Monitoring Well MW-9S on November 9, 1992. The product in Monitoring Well MW-9S appears to be a light petroleum hydrocarbon that has been weathered to a dark-colored, viscous oily liquid.

A low-flow pumping test was conducted in Monitoring Well MW-9S on November 16, 1992. The purpose of the low-flow pumping test was to determine the recharge rate of product under pumping conditions and to obtain a sample of the product. Monitoring Well MW-9S was pumped at 0.75 gpm for 15 minutes. The static ground-water level in the well was drawn down about 1.65 feet; but an attempt to sample the floating product was unsuccessful due to insufficient product thickness (less than 0.01 foot) and the limited product yield. Only a sheen of product was observed on November 16, 1992 even though the water table was depressed during the low-flow pumping test.

#### **3.2.2.2 Deep Wells**

Seven deep monitoring wells were installed at the Tutu Site. Total depths of the deep wells varied from 45 feet bls (Monitoring Well MW-6D) to 100 feet bls (Monitoring Well MW-13D). All deep monitoring wells, except Monitoring Well MW-12D, were installed with solid casing above an open borehole interval. Monitoring Well MW-12D had to be completed with solid stainless-steel casing and slotted screen to avoid borehole collapse during installation.

Depths to static ground-water level in the deep wells ranged from 5.3 feet bls (Monitoring Well MW-6D) to about 97.3 feet bls (Monitoring Well MW-13D). Ground-water levels in the deep wells fluctuated an average of 7.93 feet from September through November 1992, with a maximum fluctuation of 20.9 feet (Monitoring Well MW-1D) and a minimum fluctuation of 2.72 feet (Monitoring Well MW-6D).

On September 28, 1992, liquid phase petroleum hydrocarbon product was observed and measured in Monitoring Well MW-4D (0.01 foot) and was bailed out of the well. No product has been observed in Monitoring Well MW-4D since this occurrence, and no product was observed in any other deep well.

### **3.2.3 Ground-Water Flow Regime**

Ground-water levels at the Tutu Site have steadily risen since the installation of the monitoring wells. This rise correlates with the frequent periods of rain observed during the field program. Tables 2-3 and 2-4 present a summary of the water levels measured from September through November 1992. Ground-water elevation contour maps for the shallow and deep wells were prepared using the September 28, 1992 and November 16, 1992 water-level data (see Figures 3-2, 3-3, 3-4, and 3-5).

Ground water generally flows perpendicular to lines of equal ground-water elevation in the direction of decreasing elevation. Accordingly, ground-water flow in the shallow zone is consistently toward the south. Figures 3-2 and 3-4 show that ground-water flow converges along Route 38, discharging to what appears to be the old axis of the Turpentine Run basin. One of the principal fractures identified in the aerial photograph analysis is oriented along Route 38 (CDM Federal Programs Corporation 1992); this fracture zone appears to act as a shallow ground-water discharge zone. The valley is presently backfilled, and surface flow is channelized through a pipe or concrete box culvert under the area (see Figure 3-6).

The shallow ground-water flow is characterized by a steep hydraulic gradient (see Figures 3-2 and 3-4). This steep gradient is indicative of the low overall permeability of the zone penetrated by the shallow wells. The gradient is less steep in the area that includes the Texaco Service Station and the north portion of the Four Winds Parking lot, indicating that a higher permeability may be present in the shallow zone in this area. This observation agrees with the information collected during well development; Monitoring Wells MW-3, MW-4, MW-4D, MW-6D, and MW-6R, could sustain pumpage at pumping rates of approximately 2 gpm, while

the other shallow monitoring wells were quickly pumped dry during development and sampling. Pumping tests at Monitoring Wells MW-6R and MW-6D indicate potential sustained yields greater than 9.25 and 14 gpm for these two wells, respectively.

As shown on Figures 3-3 and 3-5, the general gradient of ground-water flow in the deeper zone at the Tutu Site is to the south, with a potential southeasterly component under part of the study area. It is possible that deeper ground-water flow mimics shallow ground-water flow on the east side of Route 38 and, therefore, the axis of Turpentine Run could also serve as a discharge zone for deeper ground-water flow. This flow pattern remained essentially constant from September through November 1992.

Monitoring Well MW-13D appeared to have anomalously low water-level readings in September 1992. These anomalous readings may have been related to the very slow recovery rate noted after well development (the well may still have been recovering). As a result, the water-level datum from Monitoring Well MW-13D was not used to construct the September 28, 1992 ground-water contour map for the deeper zone.

The ground-water contour map for November 16, 1992 for the deeper zone (Figure 3-5) indicates that pumpage in the northeastern portion of the study area at the Ramsay or VIHA supply wells was influencing water levels in deep Monitoring Wells MW-13D and MW-1D. The nearby shallow wells (Monitoring Wells MW-1, MW-14, and MW-3) appear to have been unaffected by that same pumpage (see Figure 3-4).

Differences in water levels in nested well pairs were observed from September through November 1992. The greatest difference in ground-water elevations was measured at Monitoring Well MW-1 where, on two occasions, the water in the shallow well was approximately 20 feet higher in elevation than in the corresponding deep well (see Table 2-5). The smallest difference (0 to 0.15 foot) in deep and shallow ground-water levels was measured at Monitoring Well MW-6. The other two nested pair locations, Monitoring Wells MW-4 and

MW-10, showed several inches to 1 foot of ground-water elevation difference, with higher levels consistently in the shallow wells.

Based on the ground-water level data measured at the nested well locations, there generally appears to be a small downward vertical hydraulic gradient throughout most of the study area (see Table 2-6). A strong downward gradient is present in the northeast area (Monitoring Well MW-1) near the Curriculum Center, and a horizontal or slightly upward gradient is present near the old channel of the Turpentine Run basin (Monitoring Well MW-6). The change in gradient may be attributable to the presence of Monitoring Well MW-1 in a recharge zone and the possibility that the valley axis near Monitoring Well MW-6 behaves as a localized discharge zone. Pumpage of supply wells at the VIHA complex, upgradient of Monitoring Well MW-1, may also increase the downward vertical hydraulic gradient in the northeastern portion of the Tutu Site.

The rate of ground-water flow is controlled by the permeability of the geologic materials; the presence, extent, and orientation of fracture zones; and the hydraulic gradient. Measurement of these aquifer characteristics and the rate of ground-water flow are discussed in the following section.

### **3.3 AQUIFER CHARACTERISTICS**

Monitoring Wells MW-6R and MW-6D were selected for pumping tests because they were two of only five monitoring wells that can sustain continuous pumping rates. The aquifer hydraulic characteristics derived from the two pumping tests are, therefore, only representative of the area that includes the Texaco Service Station and the northern portion of the Four Winds Plaza parking lot. Outside of this area, the upper 100 feet of the aquifer penetrated by the other shallow and deeper monitoring wells have a significantly lower transmissivity based on well recovery rates during development and purging.

As required by the Work Plan (Geraghty & Miller, Inc. 1992a), aquifer tests were conducted on two of the existing monitoring wells (Monitoring Wells MW-6R and MW-6D) to estimate the hydraulic properties of the aquifer in the immediate vicinity of the Tutu Site. Monitoring Well MW-6R was tested to estimate the hydraulic properties of T and S in the shallow aquifer, as described in Section 2.4 (Aquifer Tests); the test was conducted on November 2, 1992 at a constant rate of 9.25 gpm for 24 hours. Monitoring Well MW-6D was tested to estimate the hydraulic properties of transmissivity (T) and storage (S) in the deep aquifer, as described in Section 2.4 (Aquifer Tests); this test was conducted on November 5, 1992 at a rate of 14 gpm for 24 hours. During each of the tests, water-level measurements were recorded manually and electronically in nearby monitoring wells (see Section 2.4.1 [Water-Level Measurements]) to monitor the pumpage effects of each of the wells tested. However, because it rained before the MW-6D aquifer test had been completed, the water levels in wells recovered during the later part of this test and the data generated is not usable.

### 3.3.1 Monitoring Well MW-6R Aquifer Test Analysis

The water-level data collected from Monitoring Well MW-6R during the aquifer test were analyzed using the computer software AQTESOLV. This program was written by Geraghty & Miller for MS-DOS computers and allows the user to analyze the time-drawdown data using industry standard techniques. The drawdown data from Monitoring Well MW-6R were analyzed using the Cooper-Jacob straight-line method; which involves plotting the time-drawdown data on semi-log graph paper (Cooper and Jacob 1946). The Cooper-Jacob method was designed for analysis of confined conditions. To apply this method for analysis of unconfined conditions (such as at the Tutu Site), drawdown values can be corrected to compensate for decreased saturated thickness. Because excessive drawdown was not present during this pumping test, correction of drawdown values was not necessary. The aquifer coefficient of transmissivity is calculated as follows:

$$T = \frac{264Q}{\Delta s}$$

where

|            |   |                                                                                                               |
|------------|---|---------------------------------------------------------------------------------------------------------------|
| T          | = | coefficient of transmissivity, in gallons/day/ft                                                              |
| Q          | = | pumping rate, in gallons/minute                                                                               |
| $\Delta s$ | = | slope of the time-drawdown graph expressed as the change in drawdown between any two times over one log cycle |

The aquifer coefficient of storage is calculated as follows:

$$S = \frac{0.37t_0}{r^2}$$

where

|       |   |                                                                                                         |
|-------|---|---------------------------------------------------------------------------------------------------------|
| S     | = | storage coefficient                                                                                     |
| T     | = | coefficient of transmissivity, in gallons/day/ft                                                        |
| $t_0$ | = | intercept of the straight line at zero drawdown, in days                                                |
| r     | = | distance in feet from the pumped well to the observation well where the drawdown measurements were made |

Figure 3-7 illustrates the semi-log plot for the time-drawdown relationships for Monitoring Well MW-6R and the calculated values of T in units of square feet/minute (ft<sup>2</sup>/min) and S. The value for T, as illustrated on Figure 3-7, is calculated from the late time-drawdown data because the early data appear to represent the initial dewatering of the well casing and may not be representative of the aquifer materials. Table 3-1 presents a summary of the calculated transmissivity and storativity values for the pumping tests. The hydraulic property of S cannot be determined from drawdown data collected at a pumping well.

Based on the analysis of the water-level data for this well, the transmissivity of the shallow aquifer in the immediate vicinity of the Tutu Site was 8.2 ft<sup>2</sup>/min (88,320 gallons per day per foot [gal/day/ft]). Because no confining units were identified during the drilling program, the aquifer is unconfined.

In addition to the development of aquifer hydraulic coefficients, the aquifer test of Monitoring Well MW-6R also illustrated the impacts of the pumpage on the ground-water levels in the vicinity of the Tutu Site. After 24 hours of pumping at 9.25 gpm, the effects of this pumpage were measured at distances as great as 290 feet from the pumping well at Monitoring Well MW-4 (0.11 feet of drawdown).

### **3.3.2 Monitoring Well MW-6D Aquifer Test Analysis**

The water-level data collected from Monitoring Wells CHT-6D and MW-6D during the MW-6D aquifer test were analyzed using the computer software AQTESOLV. The drawdown data from Monitoring Wells CHT-6D and MW-6D were analyzed using the Cooper-Jacob straight-line method, which involves plotting the time-drawdown data on semi-log graph paper (Cooper and Jacob 1946). The aquifer properties of transmissivity and storage were calculated as described in Section 3.3.1 (Monitoring Well MW-6R Aquifer Test Analysis).

Figures 3-7 and 3-8 illustrate the semi-log plots for the time-drawdown relationships for Monitoring Wells CHT-6D and MW-6D and the calculated values of transmissivity (T) and storage (S). Because the hydraulic property of storage cannot be determined from the pumping well drawdown data, the value illustrated for storage (S) for MW-6D is meaningless.

Based on analysis of the water-level data for these wells, the transmissivity of the deeper parts of the aquifer in the immediate vicinity of the Tutu Site ranges from 5.2 to 7.2 ft<sup>2</sup>/min (56,010 to 77,552 gal/day/ft). Although no confining units were identified during the drilling program, the calculated storage coefficient of 0.0007 from the CHT-6D time-drawdown relationship is more representative of a confined aquifer (see Table 3-1).

In addition to the development of aquifer hydraulic coefficients, the aquifer test of Monitoring Well MW-6D also illustrated the impacts of the pumpage on the ground-water levels in the vicinity of the Tutu Site. After 24 hours of pumping at 14 gpm, the effects of this

pumpage were measured at distances as great as 230 feet from the pumping well at Monitoring Well MW-7 (0.09 feet of drawdown).



## **4.0 SOIL QUALITY DATA**

During drilling activities at the Tutu Site, 43 soil samples and four replicate soil samples were collected in June, July, and August 1992 for laboratory analysis. The samples were collected in accordance with the procedures established in the Work Plan (Geraghty & Miller, Inc. 1992a). Continuous soil samples were collected during drilling at soil boring and shallow and deep monitoring well locations. In addition, eight surface soil samples were collected. Validated analytical results are provided in Tables 4-1 through 4-11.

Samples for laboratory analysis were selected using the methods described in Section 2.1 (Soil Investigation). Each soil sample was identified with the name of the boring or monitoring well and the depth interval. Three surface soil sample locations were selected as background locations, and five surface soil sample locations were selected in potential source areas of constituents of concern.

Soil samples collected from soil boring and monitoring well locations were analyzed for TCL VOCs, 1,2-dibromomethane, n-propylbenzene, MTBE, TCL BNAs, TAL metals, total cyanide, and TPH following the March 1990 CLP Protocols, as indicated in the Work Plan (Geraghty & Miller, Inc. 1992a).

### **4.1 ORGANIC COMPOUND RESULTS FOR SOIL BORING SAMPLES**

Soil samples were collected from borings drilled near the Curriculum Center (Borings B-1, B-6, B-14, B-15, and B-16), Antilles Auto Parts (former Gassett Auto Parts) and Ramsay buildings (Borings B-2, B-3, and B-5), Texaco Service Station (Boring B-4), Fire Department (Boring B-7), Tillett area (Boring B-8), Esso Service Station (Boring B-9), and O'Henri (Borings B-10, B-11, B-12, B-13, and B-13A).

Concentrations of organic compounds (TCL VOCs, 1,2-dibromomethane, n-propylbenzene, MTBE, TCL BNAs, and TPH) detected in soil samples from Borings B-1

through B-16 and B-13A are shown on Figure 4-1. Analytical results are listed in Tables 4-1, 4-2, and 4-3.

#### **4.1.1 Petroleum Compounds**

Volatile petroleum compounds were detected in several soil samples collected at the Tutu site. Toluene was detected in Borings B-5, B-8, B-11, B-14, B-15, and B-16, as indicated on Figure 4-1. The highest toluene concentration was detected in Boring B-15 (12 parts per billion [ppb]), located near the Curriculum Center. Ethylbenzene was detected only in Boring B-8 (2 ppb) which is located near the Tillett supply well. MTBE was detected only in Boring B-5 (1.3 ppb), which is located at the Antilles Auto Parts property (former Gassett Auto Parts).

BNA compounds were detected in Borings B-2, B-8, B-9, B-10, B-13, and B-16, as shown on Figure 4-1. Most of the BNA compounds may be related to petroleum; however, a few BNA compounds may be due to laboratory contamination. The boring in which the greatest number of BNA compounds was detected was Boring B-8, which is located at the Tillett area. The BNA compounds with the highest concentrations in that boring were pyrene (300 ppb), fluoranthene (290 ppb), benzo(b)fluoranthene (250 ppb), and chrysene (210 ppb). Benzo(a)anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and phenanthrene were also reported in the soil sample from Boring B-8. A field replicate (B-8FR) of this soil sample had no detectable BNA compounds reported. Benzo(a)pyrene, benzo(g,h,i)perylene, and pyrene were also detected in Boring B-2, which is located at the Ramsay property near a storage area for 55-gallon drums containing waste oil. The compound with the highest concentration in this sample was benzo(g,h,i)perylene (290 ppb).

Butyl benzyl phthalate and di-n-butyl phthalate were detected in Boring B-10 (220 ppb and 160 ppb, respectively), and fluoranthene was detected in Boring B-13 (42 ppb). These samples were collected near the O'Henri Dry Cleaners. Butyl benzyl phthalate was also detected in Boring B-16 (58 ppb), located at the rear of the Curriculum Center.

#### **4.1.2 Total Petroleum Hydrocarbon Results for Soil Boring Samples**

TPH compounds were detected in Borings B-2, B-5, B-6, B-7, B-9 through B-14, and B-16, as shown on Figure 4-1. The highest TPH concentrations in collected soil boring samples were detected in Boring B-14 (250 parts per million [ppm]), Boring B-6 (170 ppm), and Boring B-9 (160 ppm). Boring B-14 is located immediately north of the Curriculum Center, Boring B-6 is located southwest of the Curriculum Center and Boring B-9 is located at the northwest corner of the Esso Service Station.

The reported TPH concentrations in soil may be false-positives (e.g., Boring B-9) for two reasons:

1. VOC and BNA analytical results were non-detectable (in the parts per billion range) in several of the same soil samples.
2. The TPH analytical method (USEPA Method 418.1) is prone to false-positive results (Thomey et al. 1989), especially with fine-grained soil samples such as those collected at the Tutu Site.

#### **4.1.3 Chlorinated Compounds**

Chlorinated compounds were detected in soil samples collected north of the Curriculum Center (Borings B-14, B-15, and B-16), at the Ramsay Auto Parts (Boring B-3), at the Antilles Auto Parts and Repair (formerly Gassett Auto Parts) building (Boring B-5), at the Tillett area (Boring B-8), and south of O'Henri Dry Cleaners (Borings B-11, B-13, and B-13A), as illustrated on Figure 4-1.

PCE was detected in soil samples from Borings B-3, B-8, B-11, B-13, B-13A, B-14, B-15, and B-16. The highest PCE concentrations were detected in Boring B-13 (200 ppb) near the

O'Henri Dry Cleaners, and Borings B-14 (72 ppb) and B-15 (170 ppb) located north of the Curriculum Center. Other detected PCE concentrations ranged from 1 to 29 ppb.

Acetone and 2-butanone were detected in Borings B-5 and B-6. Methylene chloride was also detected in Borings B-2, B-3, B-5, B-11, and B-14 through B-16. The highest methylene chloride concentration (26 ppb) was detected in Boring B-3. Acetone was detected in Borings B-1, B-2, B-3, and B-4. The highest acetone concentration (370 ppb) was detected in Boring B-6, which is located southwest of the Curriculum Center. Methylene chloride and acetone were also detected in field, trip, and laboratory blanks (see Section 4.7.1 [Organic Compound Results for QA/QC Samples]); therefore, their presence in soil samples may be due to laboratory contamination.

## **4.2 ORGANIC COMPOUND RESULTS FOR MONITORING WELL SOIL SAMPLES**

Detected concentrations of organic compounds (TCL VOCs, 1,2-dibromomethane, n-propylbenzene, MTBE, TCL BNAs, and TPH) detected in soil samples from monitoring wells are shown on Figure 4-2. Analytical results are listed in Tables 4-1, 4-2, and 4-3. Soil samples were collected from the borings completed as shallow or deeper monitoring wells (see Figure 4-2).

### **4.2.1 Petroleum Compounds**

Petroleum compounds were detected in soil samples from Monitoring Wells MW-3, MW-4, MW-8, MW-10D, MW-11D, and MW-14, as shown on Figure 4-2. Toluene was detected in soil samples from Monitoring Wells MW-8, MW-10D, MW-11D, and MW-14. The highest toluene concentration was detected in the soil sample from Monitoring Well MW-14 (2 ppb), which is located west of the Curriculum Center (Figure 4-2). Total xylenes were detected only in the soil sample from Monitoring Well MW-14 at a concentration of 1 ppb.

Benzo(a)pyrene was detected in the soil sample from Monitoring Well MW-4 (140 ppb). Di-n-butyl phthalate was detected in the soil sample from Monitoring Well MW-3 (170 ppb), and diethyl phthalate was detected in the soil sample from Monitoring Well MW-14 (40 ppb).

#### **4.2.2 Total Petroleum Hydrocarbons**

Detected TPH concentrations are presented in Table 4-3. TPH compounds were detected in soil samples from Monitoring Wells MW-1, MW-1D, MW-2, MW-4, MW-5, MW-6, MW-6D, MW-7, MW-9, and MW-14. TPH concentrations range from 27 ppm in Monitoring Well MW-7, located south of Mike's Paint, to 590 ppm in Monitoring Well MW-5, south of the Texaco Service Station (see Figure 4-2).

#### **4.2.3 Chlorinated Compounds**

Several chlorinated compounds were detected in soil samples collected from monitoring wells (see Figure 4-2). Trace concentrations of PCE were detected in soil samples from Monitoring Wells MW-3 and MW-4, which are located at the Texaco Service Station; Monitoring Well MW-6 located at the Four Winds Shopping Plaza; and Monitoring Well MW-8 located at the northeast corner of the Esso Service Station. These PCE concentrations ranged between 1 ppb in Monitoring Well MW-4 and 6 ppb in Monitoring Well MW-6. In soil samples from Monitoring Wells MW-4 and MW-10, 2-butanone was detected at concentrations of 48 ppb and 5 ppb, respectively. Methylene chloride was detected in all soil samples collected from monitoring well borings except for samples from Monitoring Wells MW-1D, MW-5, MW-6D, MW-9, MW-12D, MW-13D, and MW-14. Methylene chloride concentrations ranged from 1 ppb (Monitoring Wells MW-3 and MW-4D) to 22 ppb (Monitoring Well MW-6). Acetone was detected in soil samples from Monitoring Wells MW-1D, MW-2, MW-3, MW-4D, MW-6D, and MW-10. Acetone concentrations in soil ranged between 6 ppb (Monitoring Well MW-6D) and 81 ppb (Monitoring Well MW-4D). Methylene chloride and acetone may be laboratory artifacts.

### **4.3 ORGANIC COMPOUND RESULTS FOR SURFACE SOIL SAMPLES**

Surface soil samples were collected north of the Curriculum Center (Samples SS-1, SS-2, and SS-8), at the Tillett area (Sample SS-5), and south of the O'Henri Dry Cleaners (Sample SS-6). Samples SS-1, SS-2, and SS-8 were selected as background locations to evaluate the natural metal concentrations in soil found at the Tutu Site; these samples were not analyzed for organic compounds. Samples SS-3, SS-4, SS-5, SS-6, and SS-7 were collected in potential source areas of constituents of concern at the Tutu Site. Samples SS-6 and SS-7 were collected for the future risk assessment analysis, as requested by the USEPA.

#### **4.3.1 Petroleum Compounds**

Petroleum compounds were detected in two surface soil samples; the results are presented in Tables 4-1 and 4-2. Toluene, ethylbenzene, and total xylene were detected in Sample SS-3, which was collected northwest of the Curriculum Center (Figure 4-1). The compound with the highest concentration detected in Sample SS-3 was total xylene (19 ppb). Di-n-butyl phthalate was detected in Samples SS-3 and SS-5, which were collected at the Tillett property. The highest concentration was detected in Sample SS-3 (3,500 ppb).

Benzo(b)fluoreanthene, benzo(g,h,i)perylene, butyl benzyl phthalate, chrysene, and di-n-butyl phthalate were detected in Sample SS-5, which was collected at the Tillett property. The compound with the highest concentration detected in Sample SS-5 was butyl benzyl phthalate (190 ppb). This compound was also detected in Sample SS-6, collected south of the O'Henri Dry Cleaners (Figure 4-1).

#### **4.3.2 Chlorinated Compounds**

Results of organic compounds detected in Samples SS-3 through SS-7 are shown on Figure 4-1 and presented in Tables 4-1 and 4-2. Methylene chloride was detected in Samples SS-3 through SS-7. PCE was detected only in Sample SS-6 (1 ppb). 2-Butanone was detected

in Sample SS-3 (35 ppb). Methylene chloride was detected in Samples SS-3 through SS-7 at concentrations ranging between 8 ppb (Sample SS-4) and 22 ppb (Samples SS-3 and SS-6). Samples SS-3 and SS-4 were collected northwest of the Curriculum Center, and Sample SS-6 was collected near the O'Henri Dry Cleaners. Methylene chloride may be a laboratory artifact.

#### **4.4 INORGANIC COMPOUND RESULTS FOR SOIL BORING SAMPLES**

Analytical results of TAL metals and cyanide are presented in Tables 4-4 and 4-5 and shown on Figure 4-3. Three background samples were collected and analyzed for TAL metals and total cyanide. Samples SS-1, SS-2, and SS-8 were collected in an area north of the Curriculum Center building and the VIHA building to provide background inorganic soil quality data. Beryllium, cadmium, mercury, selenium, and thallium were not detected in Samples SS-1, SS-2 and SS-8; and, therefore, background levels for these analytes could not be determined.

Metal concentrations above background levels were detected in soil samples from Borings B-1 through B-16, as indicated on Figure 4-3. Calcium was not detected above background levels. Antimony, beryllium, cadmium, selenium, and thallium were not detected above the CRDL in soil samples from the soil borings (see Tables 4-4 and 4-5).

#### **4.5 INORGANIC COMPOUND RESULTS FOR MONITORING WELL SOIL SAMPLES**

Analytical results of TAL metals and total cyanide are presented in Tables 4-4 and 4-5 and shown on Figure 4-4. Thallium was not detected in soil samples collected from monitoring well locations. Total cyanide was not detected above background levels in soil samples collected from monitoring well locations. Other analytes were detected above background levels in soil samples collected from monitoring well locations, as indicated on Figure 4-4.

#### **4.6 INORGANIC COMPOUND RESULTS FOR SURFACE SOIL SAMPLES**

Analytical results for TAL metals and cyanide in surface soil samples are presented in Tables 4-4 and 4-5 and shown on Figure 4-3. Aluminum, calcium, cobalt, magnesium, manganese, vanadium, and total cyanide were not detected above background levels in Samples SS-3 through SS-6. Beryllium, cadmium, selenium, and thallium were not detected in these samples. Antimony and sodium were not detected above the CRDL. Other analytes were detected above background concentrations in surface soil samples, as indicated on Figure 4-3.

#### **4.7 QA/QC SAMPLES**

As part of the QA/QC requirements described in the Work Plan (Geraghty & Miller, Inc. 1992a), five soil replicate samples were collected during soil sampling. Field Replicates MW-7FR, MW-8FR, MW-2FR, MW-14FR, and SS-7 were obtained from soil samples from Monitoring Well MW-7, Boring B-8, Monitoring Well MW-2, Boring B-14, and Sample SS-6, respectively. Analytical results for soil replicates are presented in Tables 4-1 through 4-5.

A sample of the decontamination water used during sampling activities was collected and analyzed for TCL VOCs, as required in the Work Plan (Geraghty & Miller, Inc. 1992a). This sample was identified as WAPA, and was collected from the potable water supply located at the VIHA building.

A field blank was collected during each sampling activity. Field blanks were obtained from the sampling equipment (stainless-steel split-spoon and spatulas) utilized during sampling activities. Field blanks were analyzed for all parameters required for the soil samples. Also, a trip blank was included with every shipment of samples to the laboratory. Trip blanks were only analyzed for TCL VOCs, as required in the Work Plan (Geraghty & Miller, Inc. 1992a). Analytical results for the drilling water sample (WAPA), field blanks, and trip blanks are included in Tables 4-6 through 4-11.



#### **4.7.1 Organic Compound Results for QA/QC Samples**

Most analytical results for soil samples and their corresponding replicates correlate closely, which indicates that proper QA/QC procedures were followed during laboratory analysis. One exception is 2-butanone, which was reported at 25 ppb in the field replicate (MW-2FR) of the soil sample collected from the boring for Monitoring Well MW-2, but was not detected in soil sample MW-2 (see Table 4-1).

Analytical results for WAPA (the water supply sample), which was analyzed for TCL VOCs only, indicate trace concentrations of chloroform (2 ppb), bromodichloromethane (3 ppb), dibromochloromethane (3 ppb), and bromoform (2 ppb). None of these compounds was detected in the soil samples.

Methylene chloride, acetone, carbon disulfide, and TPH were reported in several field blanks. Methylene chloride, acetone, chloromethane, and carbon disulfide were also detected in several trip blanks. In addition, methylene chloride and acetone were detected in laboratory blanks. Some reported detections of these compounds in soil samples are not included on the figures because of the data validation results.

#### **4.7.2 Inorganic Compound Results for QA/QC Samples**

Analytical results for soil samples and their corresponding replicates correlate closely except for lead and mercury for Replicate Sample MW-8FR. The lead value for Boring B-8 was rejected, and lead was reported in Replicate Sample MW-8FR as an estimated concentration. Mercury was detected in Boring B-8, but was not detected in Replicate Sample B-8FR.

Iron and zinc were the only analytes detected above the CRDL in field blanks collected during soil sampling. Arsenic, beryllium, cadmium, cobalt, mercury, nickel, selenium, silver, thallium, and vanadium were not detected in the field blanks. Other analytes were reported between the CRDL and the instrument detection limit (IDL).

## **5.0 GROUND-WATER QUALITY**

Ground-water samples from the shallow and deeper monitoring wells were collected between September 29 and October 7, 1992. Ground-water sampling was performed in accordance with the procedures established in the Work Plan (Geraghty & Miller, Inc. 1992a), and described in Section 2.3.4 (Ground-Water Sampling and Analysis) of this Technical Memorandum No. II.

Ground-water samples were analyzed for TCL VOCs, 1,2-dibromomethane, n-propylbenzene, MTBE, TCL BNAs, TAL total metals, TAL dissolved metals, total cyanide, and TPH following the March 1990 CLP Protocols, as indicated in the Work Plan (Geraghty & Miller, Inc. 1992a). Validated analytical results are listed in Tables 5-1 through 5-7.

### **5.1 ORGANIC COMPOUND RESULTS FOR GROUND-WATER SAMPLES**

Ground-water samples were collected from all shallow and deeper monitoring wells installed at the Tutu Site during the current investigation. The organic compounds (TCL VOCs, 1,2-dibromomethane, n-propylbenzene MTBE, TCL BNAs, and TPH) detected in ground-water samples are shown on Figure 5-1. Validated analytical results are listed in Tables 5-1, 5-2, and 5-3.

#### **5.1.1 Petroleum Compounds**

Petroleum constituents were detected in ground-water samples from Monitoring Wells MW-3, MW-4, MW-4D, MW-5, MW-6R, MW-7FR, MW-8, MW-9, MW-9S, MW-10, MW-10D, MW-12D, MW-13D, and MW-14. Petroleum compounds were not detected in Monitoring Wells MW-1, MW-1D, MW-2, MW-6D, and MW-11D, as shown on Figure 5-1.

One or more of the compounds benzene, toluene, ethylbenzene, total xylenes, n-propylbenzene, and 2-methyl naphthalene were detected in Monitoring Wells MW-5, MW-9, and MW-9S. The highest concentrations of benzene (1,000 ppb), toluene (180 ppb), ethylbenzene

(930 ppb), total xylenes (1,600 ppb), n-propylbenzene (180 ppb), and 2-methyl naphthalene (130 ppb) were detected in Monitoring Well MW-5, located south of the Texaco Service Station.

Toluene was also detected in Monitoring Wells MW-12D and MW-13D at a concentration of 1 ppb. MTBE was detected in Monitoring Wells MW-3, MW-4, MW-5, MW-7FR, MW-8, MW-9, MW-10, MW-10D, and MW-12D. MTBE is reported as tertiary butyl methyl ether in the laboratory reports and on the figures. The highest MTBE concentration was detected in Monitoring Well MW-5 (6,200 ppb). MTBE is a common gasoline additive, and is one to two orders of magnitude more soluble than gasoline constituents such as benzene, toluene, and xylene. MTBE also increases the solubility and mobility of benzene, toluene, xylene, and other gasoline constituents (Garrett et al. 1986). Naphthalene (310 ppb), 2,4-dimethylphenol (7 ppb), and 4-methylphenol (3 ppb) were also detected in Monitoring Well MW-5.

Dibenzofuran was detected in Monitoring Well MW-14 (2 ppb), and 1,2-dichlorobenzene was detected in Monitoring Well MW-3 (2 ppb). Dimethyl phthalate was detected in Monitoring Well MW-4D (8 ppb); di-n-octyl phthalate was detected in Monitoring Well MW-6R (1 ppb); and fluorene (5 ppb), 2-methylnaphthalene (1 ppb), and phenol (3 ppb) were detected in Monitoring Well MW-9. Fluorene was also detected in Monitoring Well MW-9S (9 ppb). Phenanthrene was detected in Monitoring Wells MW-9S (2 ppb) and MW-14 (2 ppb).

#### **5.1.2 Total Petroleum Hydrocarbons**

Total TPH concentrations detected in ground-water samples from Monitoring Wells MW-5, MW-6R, MW-9, and MW-9S were 4.2 ppm, 0.7 ppm, 1.7 ppm, and 21 ppm respectively. Monitoring Well MW-5 is located at the north end of the Tillett property, and Monitoring Wells MW-6R and MW-9 are located at the Four Winds Shopping Plaza, and west of the Esso Service Station, respectively. None of the other wells showed TPH concentrations above the detection limit.

### 5.1.3 Chlorinated Compounds

Chlorinated compounds were detected in all ground-water samples except for the sample from Monitoring Well MW-5, located at the Tillett property; this sample contained elevated concentrations of petroleum constituents, resulting in elevated reporting limits due to decreased analytical sensitivity. Because Samples MW-5 and MW-5FR contained relatively high concentrations of several compounds, the samples were diluted prior to analysis, and concentrations of chlorinated VOCs below the reporting limit of 500 ppb were not identified.

Trichloroethene (TCE) and PCE were detected in Monitoring Wells MW-1, MW-1D, MW-2, MW-3, MW-4, MW-4D, MW-6R, MW-7FR, MW-8, MW-10, and MW-10D, as indicated on Figure 5-1. PCE was also detected in Monitoring Wells MW-13D and MW-14. The highest TCE concentration (190 ppb) and the highest PCE concentration (590 ppb) were detected in Monitoring Well MW-1, which is located west of the Curriculum Center. 1,2-Dichloroethene (1,2-DCE) (cis/trans) was detected in all ground-water samples except Monitoring Wells MW-5, MW-6D, MW-9, MW-11D, and MW-13D. The highest DCE concentration (1,000 ppb) was detected in Monitoring Well MW-1. Vinyl chloride was detected in Monitoring Wells MW-1D, MW-3, and MW-14, which are located west of the Curriculum Center; the highest vinyl chloride concentration (140 ppb) was detected in Monitoring Well MW-3.

Bromodichloromethane, dibromochloromethane, and bromoform were detected in Monitoring Wells MW-1D, MW-6D, MW-11D, and MW-12D. The highest concentrations of bromodichloromethane (30 ppb), dibromochloromethane (55 ppb), and bromoform (44 ppb) were detected in Monitoring Well MW-12D, which is located at the God of Holiness Church property. Chloroform was detected in Monitoring Wells MW-1, MW-1D, MW-2, MW-4D, MW-6D, MW-7FR, MW-8, MW-11D, and MW-12D. These four compounds (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) are referred to collectively as trihalomethanes and are often a by-product of the chlorination of drinking water. The highest

concentration of chloroform was detected in Monitoring Well MW-8 (18 ppb). 2-Butanone was detected in Monitoring Wells MW-9S and MW-13D at 2 ppb and 12 ppb, respectively.

Acetone was detected in Monitoring Wells MW-9, MW-10, and MW-13D. The highest acetone concentration (56 ppb) was detected in Monitoring Well MW-13D. Carbon disulfide was only detected in Monitoring Well MW-14 (3 ppb). Acetone and carbon disulfide may be artifacts of laboratory contamination.

## **5.2 INORGANIC COMPOUND RESULTS FOR GROUND-WATER SAMPLES**

The ground-water samples collected from the 19 monitoring wells at the Tutu Site were analyzed for TAL total metals, TAL dissolved metals, and total cyanide. The results are presented in Tables 5-4, 5-5, and 5-6, respectively.

### **5.2.1 Total Metals**

The total metal concentrations detected in ground-water samples from the Tutu Site are shown on Figure 5-2. Total antimony, beryllium, cadmium, mercury, silver, and thallium were not detected in the ground-water samples from the Tutu wells. Trace concentrations of total arsenic, calcium, copper, nickel, selenium, and zinc were detected in most of the wells.

In all samples except Monitoring Wells MW-6D and MW-13D, concentrations of total aluminum, barium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, potassium, sodium, and vanadium were detected above IDLs, but below the Federal Primary Drinking Water Standard. The Federal Primary Drinking Water Standard for chromium is 100 ppb. The concentration of total chromium in sample MW-6D was 208 ppb. The concentration of total lead in sample MW-13D was 124 ppb. The metals in ground water probably occur naturally, due to the presence of these same metals in the crystal structure of the minerals in the volcanic rocks through which the ground water flows.

### **5.2.2 Dissolved Metals**

In general, concentrations of dissolved metals in the ground-water samples (see Figure 5-3) were lower than the concentrations of total metals. The concentration of dissolved chromium was 195 ppb in Monitoring Well MW-6D, and the concentration of dissolved lead in Monitoring Well MW-13D was 81.5 ppb. Dissolved metal concentrations in all other samples were below detection limits or MCLs.

### **5.2.3 Total Cyanide**

Total cyanide concentrations in ground-water samples from the wells at the Tutu Site were below detection limits, except for Monitoring Wells MW-6R, MW-8, and MW-11D. The analyses for these three wells were rejected during validation of the laboratory data (see Appendix D). Analytical results for all field blanks were below detection limits.

## **5.3 QA/QC SAMPLES**

A sample of the decontamination water used during ground-water sampling activities was analyzed for TCL VOCs, 1,2-dibromomethane, n-propylbenzene, MTBE, TCL BNAs, TPH, total and dissolved metals, and total cyanide, as required in the Work Plan (Geraghty & Miller, Inc. 1992a). This sample was identified as ESSO-TAP, and was collected from a faucet located at the Esso Service Station.

As part of the QA/QC requirements described in the Work Plan (Geraghty & Miller, Inc. 1992a), three field replicates were collected during ground-water sampling activities. Field replicates MW-5FR, MW-7FR and MW-9FR were obtained from Monitoring Wells MW-5, MW-7, and MW-9, respectively. As explained in Section 2.3.4 (Ground-Water Sampling and Analysis), MW-9FR was analyzed for TCL VOCs only. Validated analytical results from ESSO-TAP and field replicate samples are presented in Tables 5-1 through 5-6.

A field blank was collected during each sampling activity. Field blanks were obtained from the sampling equipment (Teflon bailer) used during sampling activities. Field blanks were analyzed for the same parameters required for the water samples. Also, a trip blank was included with every shipment of samples to the laboratory; trip blanks were only analyzed for TCL VOCs. Validated analytical results for field blanks and trip blanks are provided in Tables 5-1 through 5-6.

### **5.3.1 Organic Compound Results for QA/QC Samples**

Analytical results of VOCs for the potable water sample (ESSO-TAP) were rejected, as indicated in Table 5-1. BNAs and TPH compounds were not detected in this sample.

Analytical results for ground-water samples and their corresponding replicates correlate closely. The ground-water sample collected from Monitoring Well MW-7 was not analyzed for VOCs because air bubbles were found in the sampling vials. The blind field replicate sample MW-7FR was substituted for the TCL VOC analysis of the MW-7 sample. A field replicate (Replicate Sample MW-9FR) was collected from Monitoring Well MW-9 and was analyzed for VOCs only.

Methylene chloride, acetone, and carbon disulfide were reported in several field blanks and trip blanks. Methylene chloride and acetone were detected in laboratory blanks. Some of the reported detections of these compounds in the ground-water samples are not included on the figures because of the data validation results.

### **5.3.2 Inorganic Compound Results for QA/QC Samples**

Analytical results for QA/QC samples are provided in Tables 5-4, 5-5, and 5-6.

#### **5.3.2.1 Total Metals Results for QA/QC Samples**

Calcium and zinc were the only analytes detected above the CRDL in the potable water sample (ESSO-TAP). Other analytes detected in this sample were non-detected or reported between the CRDL and the IDL.

Analytical results for ground-water samples and their corresponding replicates (Replicate Samples MW-5FR and MW-7FR) correlate closely. This correlation indicates that proper QA/QC procedures were followed during laboratory analysis.

No analytes were detected above the CRDL in the field blanks. Some analytes were detected in field blanks reported between the CRDL and the IDL.

#### **5.3.2.2 Dissolved Metals Results for QA/QC Samples**

Calcium and sodium were the dissolved metals detected in the potable water sample (ESSO-TAP). Other analytes were not detected or reported between the CRDL and the IDL.

Analytical results for ground-water samples and their corresponding replicates (Replicate Samples MW-5FR and MW-7FR) correlate closely except for antimony in Replicate Samples MW-5FR and MW-7FR, cobalt and nickel in Replicate Samples MW-5FR, and iron and selenium in Replicate Sample MW-7FR.

Calcium, iron, magnesium, sodium, and zinc were detected in field blanks, but the values reported by the laboratory were between the CRDL and the IDL.

### **5.4 SUMMARY OF GROUND-WATER QUALITY RESULTS**

The ground-water quality data for the monitoring well network and for the supply wells in the area of the Tutu Site are summarized below. The analytical results for the water supply



well samples collected from September 14 through 17, 1992 (Geraghty & Miller, Inc. 1992c) are presented on Figure 5-4.

The distribution of petroleum compounds in the monitoring and water supply wells in the Tutu study area indicates a localized presence of these compounds in the shallow ground water in the immediate vicinity of the Texaco and Esso service stations. These compounds are present near the Texaco Service Station and southward to Monitoring Well MW-5, the Tillett Supply Well, and Monitoring Well MW-7. BTEX compounds detected in ground-water samples collected from Monitoring Well MW-5 included benzene (1,000 ppb), toluene (180 ppb), ethylbenzene (930 ppb), and xylenes (1,600 ppb). The Tillett Supply Well sample, collected in September 1992, contained 7 ppb of benzene (Geraghty & Miller, Inc. 1992c).

The petroleum compounds in ground water near the Esso Service Station (at Monitoring Wells MW-9 and MW-9S) are present from west of the Esso property southward to Monitoring Wells MW-10D and MW-12D. No benzene, toluene, ethylbenzene, and xylene (BTEX) compounds were detected in Monitoring Wells MW-10 and MW-10D which are located immediately downgradient of the Esso Service Station. The BTEX compounds located near the Esso Service Station appear to be contained west of the station (near Monitoring Wells MW-9 and 9S).

Concentrations of benzene above the USEPA maximum contaminant levels (MCLs) were observed in Monitoring Well MW-5, which is south of the Texaco Service Station (1,000 ppb), and in Monitoring Wells MW-9 (26 ppb) and MW-9S (16 ppb), which are located west of the Esso Service Station. The MCL for benzene in drinking water is 5 ppb. Concentrations of toluene, ethylbenzene, and xylenes, including all estimated values, were found at non-detectable levels or below MCLs in all ground-water samples collected during this investigation, except in Monitoring Well MW-5 where ethylbenzene was reported at 930 ppb, above the MCL of 700 ppb. Little or no petroleum compounds have been detected in any monitoring or supply wells south of the Monitoring Wells MW-10 and MW-12D.

MTBE was detected in ground-water samples collected from Monitoring Wells MW-3 (24 ppb), MW-4 (1.2 ppb), MW-5 (6,200 ppb), MW-7FR (5.8 ppb), MW-8 (51 ppb), MW-9S (2,200 ppb), MW-9 (2,700 ppb), MW-10 (660 ppb), MW-10D (780 ppb), and MW-12D (11 ppb).

The distribution of chlorinated compounds in groundwater at the Tutu Site indicates that PCE and its breakdown products (TCE, 1,2-DCE, and vinyl chloride) are present throughout the site. PCE and its breakdown products occur in total concentrations in excess of 100 ppb under most of the study area, with the highest concentrations in the vicinity of the Curriculum Center (Former Laga Building) and the O'Henri Dry Cleaning property. The absence (or trace levels) of these compounds in Monitoring Wells MW-11D and MW-12D indicates that there are two separate sources. Monitoring well concentrations are highest in the vicinity of the Curriculum Center building, and the high concentrations extend down the valley in a zone that includes Monitoring Wells MW-1, MW-1D, MW-3, MW-4, MW-4D, MW-7, MW-8, MW-10, and MW-10D. Supply wells in this zone also showed total concentrations of PCE, TCE, and 1,2-DCE in excess of 100 ppb. Moderate total concentrations of these compounds (between 10 and 100 ppb) have been detected in a fringe that borders the high concentration zone to the north and west, in Monitoring Wells MW-2, MW-6R, and MW-14, and the Ramsay Supply Well. The VIHA Supply Wells were not sampled during the September 1992 sampling event, but previous sampling events have indicated the presence of PCE, TCE, and 1,2-DCE. All of these wells show the presence of PCE and its breakdown products. PCE was detected in soil collected at Boring B-13, located near the O'Henri Dry Cleaners, at a concentration of 200 ppb.

With the exception of one detection each of lead (Monitoring Well MW-13D) and chromium (Monitoring Well MW-6D) above Federal Primary Drinking Water Standards, all metal concentrations were below MCLs. The total and dissolved metals detected in ground-water samples are probably indicative of naturally occurring constituents derived from the bedrock in the area. No cyanide was detected in any of the wells sampled.

## **6.0 SUMMARY AND CONCLUSIONS**

The following summary and conclusions are based on data obtained during this field investigation, which was designed to delineate the potential sources, the horizontal and vertical extent, and the potential migration pathways of petroleum hydrocarbon products and PCE and its by-products in soil and ground water at the Tutu Site. An evaluation of the ground-water monitoring well network is also provided in this section.

### **6.1 HYDROGEOLOGIC CONDITIONS**

The geology of the Tutu Site consists of a southward thickening mantle, 0 to 15 feet thick, of well-sorted alluvial soils overlying fractured volcanic and volcanoclastic rocks of Cretaceous age. These volcanoclastic rocks consist of sandstones, siltstones, and breccias. The rocks contain numerous fine, closely spaced calcite veins, and weathered and fractured zones that are filled with clay-oxide residual minerals. Low-grade metamorphism of these rocks was caused by intrusive bodies found at depth beneath the Tutu Site.

Ground water under the Tutu Site is stored and transmitted in fractures that transect the bedrock. Ground-water flow in the shallow zone is to the south; in the deeper zone, the general ground-water gradient is also southward, with the possibility of a southeastern component under part of the Tutu Site. Water levels measured in the clustered well pairs indicate a slight downward component to ground-water flow.

Based on well development data, the upper 100 feet of the aquifer penetrated by the shallow and deeper monitoring wells has a low hydraulic conductivity. In the area that underlies the Texaco Service Station and the northern part of the Four Winds Plaza parking lot, Monitoring Wells MW-3, MW-4, MW-4D, and MW-6R had relatively higher yields.

Pumpage of the Ramsay or VIHA supply wells in the northeastern portion of the area of investigation appears to have a significant effect on water levels (resulting in the lowering of water-level elevations in MW-1D by over 20 feet) in the deeper monitoring wells located within

600 feet downgradient (i.e., Monitoring Wells MW-1D and MW-13D), but no effect was observed on water levels in nearby shallow wells (i.e., Monitoring Wells MW-1 and MW-3).

## 6.2 SOIL QUALITY

Results of analyses of soil samples collected during the field program showed trace concentrations of petroleum compounds (mainly toluene, ethylbenzene, and xylenes) in borings located at the Curriculum Center. Benzene was not detected in any of the soil samples collected at the Tutu Site. Other petroleum-related compounds were reported in borings and surface soil samples from the Tillett Area (Boring B-8 and Surface Soil Sample SS-5), on or near the O'Henri Dry Cleaners (Borings B-10 and B-13, and Surface Soil Samples SS-6 and SS-7), and on the Ramsay Auto Parts property (Boring B-2).

Concentrations of TPH in soil samples ranged from non-detectable to 590 ppm, with the highest concentrations detected at and south of the Texaco Service Station in Monitoring Wells MW-4 (130 ppb), and MW-5 (590 ppb), west of the Esso Service Station in Monitoring Well MW-9 (230 ppb), and at the Curriculum Center in Monitoring Wells MW-1 (140 ppb) and MW-14 (220 ppb) and in Borings B-6 (170 ppb) and B-14 (250 ppb). Other samples with TPH concentrations of over 100 ppm in shallow soils were from the Esso Service Station Boring B-9 (160 ppm), the Four Winds Plaza parking lot Monitoring Well MW-6 (120 ppm), and the Ramsay Auto Parts area in Boring B-2 (110 ppm). The TPH values may be false-positives.

BNAs reported in boring soil samples collected may be associated with laboratory artifacts (especially phthalate compounds). The di-n-butyl phthalate concentrations reported in soil samples from Monitoring Wells MW-8 (at the northeast corner of the Esso Service Station), MW-10 and MW-10D (at the Splash and Dash car wash), MW-6D (at Four Winds Shopping Center), and MW-4 (at the Texaco Service Station) were qualified in accordance with USEPA CLP and data validation protocols, indicating that these results are most probably due to laboratory artifacts. Di-n-butylphthalate was the only BNA compound detected in soil collected from Monitoring Well MW-3 (at the northeast corner of the Texaco Service Station). Because

of the laboratory contamination documented in other samples, this analytical result for the soil sample from Monitoring Well MW-3 is also most likely a laboratory artifact. Other BNAs were detected in soil samples collected at the Curriculum Center (Boring B-16, Surface Soil Sample SS-3, and Monitoring Well MW-14), the Ramsay Auto Parts (Boring B-2), the Texaco Service Station (Monitoring Well MW-4), the Tillett property (Boring B-8 and Surface Soil Sample SS-5), and the O'Henri Dry Cleaning property (Borings B-10 and B-13 and Surface Soil Sample SS-6/SS-7).

Total chlorinated organic compound concentrations (mainly PCE, TCE, and 1,2-DCE) in excess of 100 ppb were detected in soil samples from the Curriculum Center (Boring B-15), and concentrations between 10 and 100 ppb were detected in Borings B-14 and B-16. Total chlorinated organic compound concentrations in excess of 100 ppb were detected in the O'Henri Dry Cleaners (Boring B-13), and concentrations between 10 and 100 ppb were detected in Borings B-11 and B-13A. Trace concentrations (less than 10 ppb) of these compounds were detected in soil samples from the Texaco Service Station (Monitoring Wells MW-3 and MW-4), the Four Winds Plaza Shopping Center parking lot (Monitoring Well MW-6), and the Esso Service Station (Monitoring Well MW-8).

Metal concentrations detected in soil samples were consistent with concentrations detected in the background samples (Surface Soil Samples SS-1, SS-2, and SS-8) and are representative of the natural constituents of the soil at the Tutu Site.

### **6.3 GROUND-WATER QUALITY**

A thin layer of floating product was detected once in two wells on or near the Texaco Service Station, but this product did not return after bailing. The minimum measurable thickness of product (0.01 foot) was detected once on October 28, 1992 in Monitoring Wells MW-4D and MW-5 which are located at and south of the Texaco Service Station, respectively. Product was present on four occasions in Monitoring Well MW-9S west of the Esso Service Station, with thicknesses ranging from a sheen on September 17, October 28, and November 16, 1992 to 0.11

foot on September 28, 1992. Product was not detected in Monitoring Well MW-9S on November 9, 1992. A sheen of product was detected once (September 17, 1992) in Monitoring Well MW-9.

BTEX compounds have only been detected at two locations, in Monitoring Well MW-5 (a total of approximately 3,700 ppb) and in Monitoring Wells MW-9 and MW-9S (47 ppb and 23 ppb, respectively. The only supply well in the area which BTEX compounds have been detected (7 ppb of benzene in September 1992) is the Tillett Supply Well, which is south of Monitoring Well MW-5.

MTBE is a more soluble gasoline constituent that has also been detected at the three locations where BTEX was found: Monitoring Wells MW-5 (6,200 ppb), MW-9 (2,700 ppb), and MW-9S (2,200 ppb). At the Texaco Service Station, MTBE was detected at a concentration of 24 ppb in Monitoring Well MW-3. In Monitoring Wells MW-10 and MW-10D, located south of the Esso Service Station, MTBE concentrations of 660 and 780 ppb, respectively, were detected. Monitoring Well MW-8, which is located on the northeast corner of the Esso Service Station, had an MTBE concentration of 51 ppb. No other monitoring wells showed an MTBE concentration in excess of 20 ppb. There is no Federal Drinking Water Standard for MTBE.

In summary, the downgradient extent of petroleum constituents in ground water has apparently been adequately delineated by the recently installed monitoring well network. The presence of BTEX compounds is apparently limited to the immediate vicinity of Monitoring Well MW-5, and the Tillett Supply Well and Monitoring Wells MW-9 and 9S. This is evidenced by the absence of BTEX compounds in Monitoring Wells MW-6R, MW-6D, MW-10, MW-10D, MW-11D, and MW-12D, and low concentrations of MTBE in Monitoring Well MW-7 and MW12D, and to the absence of MTBE in Monitoring Well MW11D.

PCE and its breakdown products (TCE, 1,2-DCE, and vinyl chloride) occur in ground water in total concentrations exceeding 100 ppb under most of the study area. The absence of these compounds in Monitoring Wells MW-11D and MW-12D indicates that there are two

separate sources. VOC concentrations from monitoring well samples are highest in the vicinity of the Curriculum Center building, and the high concentrations extend down the valley in a zone that includes Monitoring Wells MW-1, MW-1D, MW-3, MW-4, MW-4D, MW-7, MW-8, MW-10 and MW-10D. Supply wells in this zone also showed total concentrations of PCE, TCE, and 1,2-DCE in excess of 100 ppb. Moderate concentrations have been detected north and west of the high concentration zone in Monitoring Wells MW-2, MW-6R, and MW-14, and the Ramsay Supply Well. The VIHA supply wells were not sampled during the September 1992 sampling event, but the results of previous sampling events have indicated the presence of PCE, TCE, and 1,2-DCE. The presence of PCE and its breakdown products in ground-water samples from all of these wells indicates that the source could be the Curriculum Center Building where PCE was detected in soil samples. The concentrations detected in the Harvey Supply Well and in the Eglin Supply Wells in September 1992 (Geraghty & Miller, Inc. 1992c) appear to be emanating from a separate source near the O'Henri Dry Cleaners, where PCE was also detected in soil samples.

#### **6.4 MONITORING WELL NETWORK EVALUATION**

Geraghty & Miller has implemented the scope of work described in the approved revised Tutu Service Station Investigation Work Plan (Geraghty & Miller, Inc. 1992a). This scope of work included a soil and ground-water sampling and analysis program, the installation of 19 ground-water monitoring wells, and the evaluation of aquifer characteristics. Based on the data collected during this investigation, shallow ground water beneath the site flows in a southerly direction, and the flow from east and west converges in the center of the valley. The monitoring well network will be used during the next ground-water sampling round to monitor ground-water quality.

Based on the hydrogeologic data collected during this investigation, Geraghty & Miller believes that the existing monitoring well network has sufficiently delineated the downgradient extent of petroleum constituents at the Tutu Site. Upgradient delineation of the petroleum constituents could not be adequately performed with the existing network of monitoring wells.

## **7.0 RECOMMENDATIONS**

Based on the findings and conclusions of this investigation, the following activities are recommended:

1. Three additional monitoring wells should be installed and included in future sampling events. One monitoring well should be located north of the Texaco Service Station near Boring B-2 to evaluate potential impacts to ground-water quality from the Ramsay Auto property. Two monitoring wells should be located in the area northwest of the Esso Service Station, in the Four Winds Shopping Center parking lot to evaluate potential impacts to the former Western Auto underground storage tanks. One of these wells should be located approximately 75 feet northwest of existing Monitoring Well MW-9S; the other well should be located approximately 300 feet northwest of Monitoring Well MW-9S immediately downgradient of the former Western Auto underground storage tanks. Soil samples should be collected and analyzed for TCL VOCs, TCL BNAs, and MTBE from the boring for the monitoring well near the Western Auto underground storage tanks.
2. The monitoring wells should only be sampled for TCL VOCs, MTBE, and dissolved metals.
3. The laboratory should try to detect PCE, TCE, and 1,2-DCE in the sample from Monitoring Well MW-5 during future analyses. Due to the presence of high concentrations of other VOCs, high detection limits (500 ppb) for most VOCs were indicated during the first sampling event. Therefore, PCE and its breakdown products may be present at concentrations below 500 ppb.
4. The chlorinated compounds detected in ground-water samples taken south and southeast of the O'Henri Dry Cleaning property should not be investigated further by the TEIC because the source is clearly not associated with the Esso or Texaco



service stations. Additionally, the distribution of chlorinated compounds in soil and ground water at the Tutu Site indicates that the Esso and Texaco service stations may not be sources of chlorinated VOCs. Further evaluation of the distribution of chlorinated and petroleum compounds in ground water should be conducted after the second sampling results for the Tutu Site Monitoring Well System are validated.

## **8.0 BIBLIOGRAPHY**

- Camp, Dresser & McGee (CDM) Federal Programs Corporation 1992. Letter to C. Kwan, U.S. Environmental Protection Agency. Re: Technical Memorandum I, April 24.
- Cooper, H.H., Jr. and C.E. Jacob. 1946. A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well Field History. Transactions, American Geophysical Union, Vol. 27, No. 4.
- Donnelly, T.W. 1959. Geology of St. Thomas and St. John, Virgin Island. Unpublished Ph.D dissertation, Princeton University, 179pp.
- Donnelly, T.W. 1966. Geology of St. Thomas and St. John, Virgin Islands. Caribbean Geologic Investigations. H.H. Hess, ed. Geologic Society of America Memoir 98, pp 15-121.
- Garrett, P., M. Moreau, and J.R. Lowry. 1986. Methyl Tertiary Butyl Ether as a Groundwater Contaminant. Proceedings of the 1986 Conference on Petroleum and Organic Chemicals in Ground Water, National Water Well Association and American Petroleum Institute, Houston, Texas, pp. 227-238.
- Geraghty & Miller, Inc. 1983. Report on Current Ground Water Conditions in the U.S. Virgin Islands. Prepared for the U.S. Virgin Islands Department of Conservation and Cultural Affairs. April 1983, 80 pp.
- Geraghty & Miller, Inc. 1992a. Tutu Service Station Investigation Work Plan, St. Thomas, U.S. Virgin Islands, March 1992.
- Geraghty & Miller, Inc. 1992b. Technical Memorandum I, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands, April 1992.
- Geraghty & Miller, Inc. 1992c. Seventh Sampling Report, September 1992, Tutu Wells Site, St. Thomas, U.S. Virgin Islands, December 1992.
- Graves, R.P., and R. González. 1988. Potentiometric Surface of the Turpentine Run Aquifer in the Tutu Area, Eastern St. Thomas, U.S. Virgin Islands, September 11, 1987. U.S. Geological Survey, Water Resources Investigation Report 88-4131.
- Jordan, D.G., and O.J. Cosner. 1973. A Survey of the Water Resources of St. Thomas, Virgin Islands, U.S. Geological Survey Open-File Report, 55 pp.
- Kruseman, G.P., and N.A. De Ridder. 1979. Analysis and Evaluation of Pumping Test Data, Bulletin II, International Institute for Land Reclamation and Improvements, Wageningen, Netherlands, 200 pp.

- Lopez De Azua & Associates. 1992. Topographic and Planimetric Survey of Approximately 100 Acres Located at the New Tutu Section, St. Thomas, U.S. Virgin Islands, November 2, 1992.
- Neuman, S.P. 1975. Analysis of pumping test data from anisotropic unconfined aquifers considering delayed yield, *Water Resources Research*, vol. 11, no. 2, pp. 329-342.
- Theis, C.V. 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, *Transactions, American Geophysical Union*, vol. 16, p. 519-524.
- Stevens, K.E., F. Gómez-Gómez, and J. Alicia. 1981. Water Wells in the U.S. Virgin Islands, Pt. 1, St. Thomas,. U.S. Geological Survey Open-File Report 82-82.
- Thomey, N., D. Bratberg, and C. Kalisz. 1989. A Comparison of Methods for Measuring Total Petroleum Hydrocarbons in Soil. *Proceedings of the Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater; Prevention, Detection, and Restoration*, Houston, Texas. National Water Well Association.
- U.S. Department of the Interior, Bureau of Reclamation. 1985. *Groundwater Manual*, 480 pp.
- U.S. Environmental Protection Agency (USEPA). 1989a. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 1989b. Method 524.2, Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry, Revision 3.0, Environmental Monitoring Systems Laboratory, United States Environmental Protection Agency, Cincinnati, Ohio, 1989.
- U.S. Environmental Protection Agency (USEPA). 1990a. USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Document Number OLM 01.0, Revised December 1990 and February 1991. USEPA Contract Laboratory Program, Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 1990b. Statement of Work for Inorganics Analysis (Multi-media, Multi-concentration), Document Number ILMO1.1, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1991a. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors" Interim Final. Office of Emergency and Remedial Response, OSWER Directive 9285.6-03, March 25, 1991.

- U.S. Environmental Protection Agency (USEPA). 1991b. Hazardous Ranking System (HRS) Documentation Record, Tutu Wellfield, April 1991.
- U.S. Environmental Protection Agency (USEPA). 1992. Personal Communication from C. Kwan, USEPA Project Manager, with the Tutu Environmental Investigation Committee and Geraghty & Miller, Inc., May 5, 1992
- U.S. Environmental Protection Agency (USEPA). 1992. Hazardous Ranking System, 40 CFR, Part 300, Appendix A.

PR01301-WP3\TECHMEMP.93

Table 2-1. Soil Boring Details, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Boring Identification | Date    | Total Depth<br>(ft bls) | Top of<br>Bedrock<br>(ft bls) | Remarks                       |
|-----------------------|---------|-------------------------|-------------------------------|-------------------------------|
| B-1                   | 7/30/92 | 10.3                    | 10.3                          | Split-spoon refusal           |
| B-2                   | 8/3/92  | 3.5                     | 3.5                           | Split-spoon refusal           |
| B-3                   | 8/3/92  | 3.3                     | 3.3                           | Split-spoon refusal           |
| B-4                   | 6/9/92  | 10.8                    | 10.8                          | Split-spoon refusal           |
| B-5                   | 8/13/92 | 2.8                     | 2.8                           | Split-spoon refusal           |
| B-6                   | 7/30/92 | 7.3                     | 7.3                           | Split-spoon refusal           |
| B-7                   | 7/31/92 | 4.0                     | 3.0                           | Auger refusal                 |
| B-8                   | 8/12/92 | 3.6                     | 3.6                           | Split-spoon and auger refusal |
| B-9                   | 7/29/92 | 5.1                     | 5.1                           | Split-spoon refusal           |
| B-10                  | 8/10/92 | 8.0                     | Not encountered               | Water encountered at 7.9 feet |
| B-11                  | 8/10/92 | 3.5                     | 3.5                           | Split-spoon and auger refusal |
| B-12                  | 8/11/92 | 8.4                     | 8.4                           | Split-spoon and auger refusal |
| B-13                  | 8/10/92 | 6.4                     | 6.4                           | Split-spoon refusal           |
| B-13A                 | 8/12/92 | 2.0                     | Not encountered               | Sample for risk assessment    |
| B-14                  | 8/14/92 | 3.2                     | 3.2                           | Split-spoon refusal           |
| B-15                  | 8/14/92 | 2.2                     | 2.2                           | Split-spoon refusal           |
| B-16                  | 8/14/92 | 3.7                     | 3.7                           | Split-spoon refusal           |

ft bls                      Feet below land surface.

110592-003

Table 2-2. Monitoring Well Construction Details, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Well Identification | Date Installed | Top of Casing Elevation (ft above msl) | Total Borehole Depth (ft bls) | Well Casing Depth (ft bls) | Screened Interval/<br>Open borehole (ft bls) | Top of Sand (ft bls) | Top of Bentonite (ft bls) | Depth to Top of Bedrock (ft bls) |
|---------------------|----------------|----------------------------------------|-------------------------------|----------------------------|----------------------------------------------|----------------------|---------------------------|----------------------------------|
| <u>Shallow</u>      |                |                                        |                               |                            |                                              |                      |                           |                                  |
| MW-1                | 6/30/92        | 195.08                                 | 46.0                          | 43.6                       | 23.6-43.6                                    | 21.1                 | 19.1                      | 1.8                              |
| MW-2                | 8/25/92        | 178.15                                 | 28.0                          | 27.0                       | 7.0-27.0                                     | 5.0                  | 3.0                       | 3.1                              |
| MW-3                | 6/11/92        | 181.84                                 | 34.0                          | 30.4                       | 10.4-30.4                                    | 8.4                  | 6.4                       | 2.4                              |
| MW-4                | 6/17/92        | 175.66                                 | 28.0                          | 27.0                       | 7.0-27.0                                     | 5.0                  | 3.0                       | 8.7                              |
| MW-5                | 8/25/92        | 187.09                                 | 40.8                          | 39.0                       | 19.0-39.0                                    | 17.0                 | 15.0                      | 4.8                              |
| MW-6R               | 9/2/92         | 171.17                                 | 23.7                          | 22.7                       | 2.7-22.7                                     | 1.6                  | 0.8                       | see MW-6D                        |
| MW-7                | 7/29/92        | 180.13                                 | 39.6                          | 35.4                       | 15.4-35.4                                    | 12.8                 | 11.0                      | 15.0                             |
| MW-8                | 7/23/92        | 167.54                                 | 26.0                          | 25.5                       | 5.5-25.5                                     | 3.0                  | 1.5                       | 8.3                              |
| MW-9                | 7/30/92        | 162.26                                 | 34.3                          | 34.1                       | 14.1-34.1                                    | 11.8                 | 10.0                      | 5.0                              |
| MW-9S               | 9/14/92        | 162.37                                 | 21.0                          | 18.7                       | 8.7-18.7                                     | 6.7                  | 5.7                       | see MW-9                         |
| MW-10               | 8/20/92        | 161.50                                 | 36.7                          | 35.6                       | 15.6-35.6                                    | 13.0                 | 11.0                      | 2.9                              |
| MW-14               | 7/2/92         | 196.12                                 | 48.0                          | 45.2                       | 25.2-45.2                                    | 22.4                 | 19.8                      | 3.0                              |
| <u>Deep</u>         |                |                                        |                               |                            |                                              |                      |                           |                                  |
| MW-1D               | 7/8/92         | 195.14                                 | 90.0                          | 70.0                       | 70.0-90.0                                    | NA                   | NA                        | 2.8                              |
| MW-4D               | 6/17/92        | 176.02                                 | 71.0                          | 47.7                       | 47.7-71.0                                    | NA                   | NA                        | 10.7                             |
| MW-6D               | 8/10/92        | 171.01                                 | 65.0                          | 45.0                       | 45.0-65.0                                    | NA                   | NA                        | 4.92                             |
| MW-10D              | 8/19/92        | 161.38                                 | 75.1                          | 55.1                       | 55.1-75.1                                    | NA                   | NA                        | 1.7                              |
| MW-11D              | 7/20/92        | 153.22                                 | 74.3                          | 53.0                       | 53.0-74.3                                    | NA                   | NA                        | 10.2                             |
| MW-12D              | 7/23/92        | 161.81                                 | 88.0                          | 80.5                       | 60.5-80.5                                    | 56.4                 | 54.0                      | 5.9                              |
| MW-13D              | 7/15/92        | 236.60                                 | 120.0                         | 100.0                      | 100.0-120.0                                  | NA                   | NA                        | 5.0                              |

NA Not applicable.  
ft above msl Feet above mean sea level.  
ft bls Feet below land surface.  
MW-6R Replacement well for MW-6.  
MW-9S Additional shallow well at MW-9 location.

All shallow monitoring wells are constructed of 4-inch diameter, stainless-steel casing and screen (0.020-inch slot).  
All deep wells are constructed with 6-inch diameter, stainless-steel casing above the open borehole interval, except MW-12D.  
MW-12D was completed as a shallow monitoring well, with screened casing, to prevent cave-in of weathered material encountered during drilling.

Table 2-3. Water-Level Measurements in Shallow Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Date     | MW-1                                           |             |                                            | MW-2                                           |             |                                            | MW-3                                           |             |                                            |
|----------|------------------------------------------------|-------------|--------------------------------------------|------------------------------------------------|-------------|--------------------------------------------|------------------------------------------------|-------------|--------------------------------------------|
|          | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) |
| 9/10/92  | 195.08                                         | 30.08       | 165.00                                     | 178.15                                         | 13.60       | 164.55                                     | 181.84                                         | 17.40       | 164.44                                     |
| 9/17/92  | 195.08                                         | 29.88       | 165.20                                     | 178.15                                         | 13.50*      | 164.65                                     | 181.84                                         | 17.44       | 164.40                                     |
| 9/28/92  | 195.08                                         | 27.60       | 167.48                                     | 178.15                                         | 12.74       | 165.41                                     | 181.84                                         | 16.51       | 165.33                                     |
| 10/28/92 | 195.08                                         | 26.10       | 168.98                                     | 178.15                                         | 10.82       | 167.33                                     | 181.84                                         | 14.38       | 167.48                                     |
| 11/09/92 | 195.08                                         | 25.11       | 169.97                                     | 178.15                                         | 10.32       | 167.83                                     | 181.84                                         | 13.79       | 168.05                                     |
| 11/18/92 | 195.08                                         | 24.89       | 170.19                                     | 178.15                                         | 10.18       | 167.97                                     | 181.84                                         | 13.49       | 168.35                                     |

ft above msl Feet above mean sea level.  
 DTW Depth to water.  
 ft Feet.  
 \* Water level measured on 9/18/92.  
 \*\* Water level measured on 10/29/92.  
 ND Not detected.  
 NM Not measured.  
 NI Not installed.  
 NA Not available.

The measuring point for shallow monitoring wells is the top of the casing.

TUT 005 1877

Table 2-3 Water-Level Measurements in Shallow Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands

| Date     | MW-4                                           |             |                                            | MW-5                                           |             |                                            |                              | MW-6R                                          |             |                                            |
|----------|------------------------------------------------|-------------|--------------------------------------------|------------------------------------------------|-------------|--------------------------------------------|------------------------------|------------------------------------------------|-------------|--------------------------------------------|
|          | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Product<br>Thickness<br>(ft) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) |
| 9/10/92  | 175.66                                         | 11.64       | 164.02                                     | 187.09                                         | NM          | NM                                         | NM                           | 171.17                                         | 8.22        | 162.95                                     |
| 9/17/92  | 175.66                                         | 11.62       | 164.04                                     | 187.09                                         | 23.68       | 163.41                                     | ND                           | 171.17                                         | 8.20        | 162.97                                     |
| 9/28/92  | 175.66                                         | 10.84       | 164.82                                     | 187.09                                         | 22.83       | 164.26                                     | 0.01                         | 171.17                                         | 7.52        | 163.65                                     |
| 10/28/92 | 175.66                                         | 8.80        | 166.86                                     | 187.09                                         | 20.76**     | 166.33                                     | ND                           | 171.17                                         | 5.98        | 165.19                                     |
| 11/09/92 | 175.66                                         | 8.36        | 167.30                                     | 187.09                                         | 20.29       | 166.80                                     | ND                           | 171.17                                         | 5.68        | 165.49                                     |
| 11/16/92 | 175.66                                         | 8.09        | 167.57                                     | 187.09                                         | 19.93       | 167.16                                     | ND                           | 171.17                                         | 5.51        | 165.66                                     |

ft above msl Feet above mean sea level.  
 DTW Depth to water.  
 ft Feet.  
 \* Water level measured on 9/18/92.  
 \*\* Water level measured on 10/29/92.  
 ND Not detected.  
 NM Not measured.  
 NI Not installed.  
 NA Not available.

The measuring point for shallow monitoring wells is the top of the casing.

TUT 005 1873



Table 2-3. Water-Level Measurements in Shallow Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands

| Date     | MW-7                                     |          |                                      | MW-8                                     |          |                                      | MW-9                                     |          |                                      |                        |
|----------|------------------------------------------|----------|--------------------------------------|------------------------------------------|----------|--------------------------------------|------------------------------------------|----------|--------------------------------------|------------------------|
|          | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) | Product Thickness (ft) |
| 9/10/92  | 180.13                                   | 17.58    | 162.55                               | 167.54                                   | 17.96    | 149.58                               | 162.26                                   | NM       | NM                                   | NM                     |
| 9/17/92  | 180.13                                   | 17.60    | 162.53                               | 167.54                                   | NM       | NM                                   | 162.26                                   | 12.56    | 149.70                               | Sheen                  |
| 9/28/92  | 180.13                                   | 17.00    | 163.13                               | 167.54                                   | 17.03    | 150.51                               | 162.26                                   | 12.49    | 149.77                               | NM                     |
| 10/28/92 | 180.13                                   | 15.80    | 164.33                               | 167.54                                   | 12.00    | 155.54                               | 162.26                                   | 11.33    | 150.93                               | ND                     |
| 11/09/92 | 180.13                                   | 15.56    | 164.57                               | 167.54                                   | 12.57    | 154.97                               | 162.26                                   | NM       | NM                                   | NM                     |
| 11/16/92 | 180.13                                   | 15.46    | 164.67                               | 167.54                                   | 12.20    | 155.34                               | 162.26                                   | 10.95    | 151.31                               | ND                     |

ft above msl Feet above mean sea level.  
 DTW Depth to water.  
 ft Feet.  
 \* Water level measured on 9/18/92.  
 \*\* Water level measured on 10/29/92.  
 ND Not detected.  
 NM Not measured.  
 NI Not installed.  
 NA Not available.

The measuring point for shallow monitoring wells is the top of the casing.

TUT 005 1879

Table 2-3 Water-Level Measurements in Shallow Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands

| Date     | MW-08                                    |          |                                      | Product Thickness (ft) | MW-10                                    |          |                                      |  | MW-14                                    |          |                                      |
|----------|------------------------------------------|----------|--------------------------------------|------------------------|------------------------------------------|----------|--------------------------------------|--|------------------------------------------|----------|--------------------------------------|
|          | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) |                        | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) |  | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) |
| 9/10/92  | 162.37                                   | NI       | NA                                   | NI                     | 161.50                                   | 20.66    | 140.84                               |  | 196.12                                   | 28.08    | 168.04                               |
| 9/17/92  | 162.37                                   | 13.22    | 149.15                               | Sheen                  | 161.50                                   | 20.70    | 140.80                               |  | 196.12                                   | 27.98    | 168.14                               |
| 9/28/92  | 162.37                                   | 13.11    | 149.26                               | 0.11                   | 161.50                                   | 20.52    | 140.98                               |  | 196.12                                   | 26.96    | 169.16                               |
| 10/28/92 | 162.37                                   | 10.92    | 151.45                               | Sheen                  | 161.50                                   | 17.66    | 143.84                               |  | 196.12                                   | 25.00    | 171.12                               |
| 11/09/92 | 162.37                                   | 10.94    | 151.43                               | NA                     | 161.50                                   | 17.42    | 144.08                               |  | 196.12                                   | 24.29    | 171.83                               |
| 11/16/92 | 162.37                                   | 10.47    | 151.90                               | Sheen                  | 161.50                                   | 16.72    | 144.78                               |  | 196.12                                   | 24.24    | 171.88                               |

ft above msl Feet above mean sea level.

DTW Depth to water.

ft Feet.

\* Water level measured on 9/18/92.

\*\* Water level measured on 10/29/92.

ND Not detected.

NM Not measured.

NI Not installed.

NA Not available.

The measuring point for shallow monitoring wells is the top of the casing.

WDT.m3.killer.m3.1

TUT 005 1890

Table 2-4. Water-Level Measurements in Deep Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Date     | MW-1D                                    |          |                                      | MW-4D                                    |          |                                      | Product Thickness (ft) | MW-6D                                    |          |                                      |
|----------|------------------------------------------|----------|--------------------------------------|------------------------------------------|----------|--------------------------------------|------------------------|------------------------------------------|----------|--------------------------------------|
|          | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) |                        | Measuring Point Elevation (ft above msl) | DTW (ft) | Water-Level Elevation (ft above msl) |
| 9/10/92  | 195.14                                   | 31.48    | 163.66                               | 176.02                                   | 12.32    | 163.70                               | ND                     | 171.01                                   | 8.02     | 162.99                               |
| 9/17/92  | 195.14                                   | 31.00    | 164.14                               | 176.02                                   | 12.32    | 163.70                               | ND                     | 171.01                                   | 8.04     | 162.97                               |
| 9/28/92  | 195.14                                   | 29.98    | 165.16                               | 176.02                                   | 11.44    | 164.58                               | 0.01                   | 171.01                                   | 7.34     | 163.67                               |
| 10/28/92 | 195.14                                   | 50.90    | 144.24                               | 176.02                                   | 9.50     | 166.52                               | ND                     | 171.01                                   | 5.78     | 165.23                               |
| 11/09/92 | 195.14                                   | NM       | NM                                   | 176.02                                   | 9.50     | 166.52                               | ND                     | 171.01                                   | 5.52     | 165.49                               |
| 11/16/92 | 195.14                                   | 44.75    | 150.39                               | 176.02                                   | 8.78     | 167.24                               | ND                     | 171.01                                   | 5.32     | 165.69                               |

ft above msl Feet above mean sea level.  
 DTW Depth to water.  
 ND Not detected.  
 NM Not measured.  
 ND Not detected.  
 ft Feet.

The measuring point for deep monitoring wells is the top of the casing.

TUT 005 1881

Table 2-4. Water-Level Measurements in Deep Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Date     | MW-10D                                         |             |                                            | MW-11D                                         |             |                                            | MW-12D                                         |             |                                            |
|----------|------------------------------------------------|-------------|--------------------------------------------|------------------------------------------------|-------------|--------------------------------------------|------------------------------------------------|-------------|--------------------------------------------|
|          | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) |
| 9/10/92  | 161.38                                         | 20.96       | 140.42                                     | 153.22                                         | 20.40       | 132.82                                     | 161.81                                         | 28.94       | 132.87                                     |
| 9/17/92  | 161.38                                         | 21.06       | 140.32                                     | 153.22                                         | 17.94       | 135.28                                     | 161.81                                         | 26.88       | 134.93                                     |
| 9/28/92  | 161.38                                         | 20.98       | 140.40                                     | 153.22                                         | 18.94       | 134.28                                     | 161.81                                         | 27.72       | 134.09                                     |
| 10/28/92 | 161.38                                         | 17.84       | 143.54                                     | 153.22                                         | 16.66       | 136.56                                     | 161.81                                         | 24.94       | 136.87                                     |
| 11/09/92 | 161.38                                         | 17.88       | 143.50                                     | 153.22                                         | 16.51       | 136.71                                     | 161.81                                         | 24.29       | 137.52                                     |
| 11/16/92 | 161.38                                         | 17.26       | 144.12                                     | 153.22                                         | 15.43       | 137.79                                     | 161.81                                         | 23.69       | 138.12                                     |

DTW      Depth to water.  
 ND      Not detected.  
 NM      Not measured.  
 ND      Not detected.  
 ft      Feet.

The measuring point for deep monitoring wells is the top of the casing.

TUT 005 1882

Table 2-4. Water-Level Measurements in Deep Wells, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| MW-13D   |                                                |             |                                            |
|----------|------------------------------------------------|-------------|--------------------------------------------|
| Date     | Measuring<br>Point Elevation<br>(ft above msl) | DTW<br>(ft) | Water-Level<br>Elevation<br>(ft above msl) |
| 9/10/92  | 236.60                                         | 97.32       | 139.28                                     |
| 9/17/92  | 236.60                                         | 86.76       | 149.84                                     |
| 9/28/92  | 236.60                                         | 83.08       | 153.52                                     |
| 10/28/92 | 236.60                                         | 95.34       | 141.26                                     |
| 11/09/92 | 236.60                                         | 92.40       | 144.20                                     |
| 11/16/92 | 236.60                                         | 90.86       | 145.74                                     |

ft above msl Feet above mean sea level.  
 DTW Depth to water.  
 ND Not detected.  
 NM Not measured.  
 ND Not detected.  
 ft Feet.

The measuring point for deep monitoring wells is the top of the casing.

WDTutu(Deep.m3)

TUT 005 1883

Table 2-5. Ground-Water Elevation Comparison for Monitoring Well Clusters, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Well Identification | Date of Development | Ground - Water Elevations<br>(feet above mean sea level) |         |         |          |         |          |
|---------------------|---------------------|----------------------------------------------------------|---------|---------|----------|---------|----------|
|                     |                     | 9/10/92                                                  | 9/17/92 | 9/28/92 | 10/28/92 | 11/9/92 | 11/16/92 |
| MW-1                | 8/29/92             | 165.00                                                   | 165.20  | 167.48  | 168.98   | 169.97  | 170.19   |
| MW-1D               | 8/28/92             | 163.66                                                   | 164.14  | 165.16  | 144.24   | NM      | 150.39   |
| MW-4                | 8/24/92             | 164.02                                                   | 164.04  | 164.82  | 166.86   | 167.30  | 167.57   |
| MW-4D               | 8/24/92             | 163.70                                                   | 163.70  | 164.58  | 166.52   | 166.52  | 167.24   |
| MW-6R               | 9/9/92              | 162.95                                                   | 162.97  | 163.65  | 165.19   | 165.49  | 165.66   |
| MW-6D               | 9/2/92              | 162.99                                                   | 162.97  | 163.67  | 165.23   | 165.49  | 165.69   |
| MW-10               | 9/2/92              | 140.84                                                   | 140.80  | 140.98  | 143.84   | 144.08  | 144.78   |
| MW-10D              | 9/2/92              | 140.42                                                   | 140.32  | 140.40  | 143.54   | 143.50  | 144.12   |

NM Not measured.

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Table 2–6. Vertical Gradients of Ground–Water Flow, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Well Cluster    | Vertical Distance Between Center Point of Screen/Open Interval (feet) | Minimum Ground–Water Elevation Difference (feet) | Maximum Ground–Water Elevation Difference (feet) | Vertical Gradient (feet / feet) |         | Vertical Gradient Direction   |
|-----------------|-----------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------|---------------------------------|---------|-------------------------------|
|                 |                                                                       |                                                  |                                                  | Minimum                         | Maximum |                               |
| MW–1<br>MW–1D   | 46.31                                                                 | 1.06                                             | 24.74                                            | 0.023                           | 0.534   | Strongly downward             |
| MW–4<br>MW–4D   | 42.05                                                                 | 0.24                                             | 0.78                                             | 0.0057                          | 0.019   | Slightly downward             |
| MW–6R<br>MW–6D  | 42.48                                                                 | 0.02                                             | 0.04                                             | 0.00047                         | 0.00094 | Horizontal to slightly upward |
| MW–10<br>MW–10D | 39.34                                                                 | 0.30                                             | 0.58                                             | 0.008                           | 0.015   | Slightly downward             |

PRO1301.T1/020893a.wk3/lcb

TUT 005 1885

Table 3-1. Summary of Transmissivity and Storativity Values from Aquifer Tests, Tutu Service Station Investigation for the TEIC, St. Thomas, U.S. Virgin Islands.

| Monitoring Well | Pumping Well | Method       | Storativity<br>Transmissivity<br>Values<br>(ft <sup>2</sup> /min) | Values<br>(dimensionless) |
|-----------------|--------------|--------------|-------------------------------------------------------------------|---------------------------|
| CHT-6D          | MW-6D        | Cooper-Jacob | 8.14                                                              | 0.0007                    |
| MW-6D           | MW-6D        | Cooper-Jacob | 5.225                                                             | NA                        |
| MW-6R           | MW-6R        | Cooper-Jacob | 8.39                                                              | NA                        |

ft<sup>2</sup>/min      Feet squared per minute.

NA      Not applicable.

#PR01301-WP3/TechMcII.tbl



Table 4-1. Concentrations of Volatile Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: B-1<br>(4.0-8.0') | B-2<br>(0-2.0') | B-3<br>(2.0-4.0') | B-4<br>(8.0-10.0') | B-5<br>(0-2.0') | B-6<br>(4.0-8.0') | B-7<br>(2.0-4.0') | B-8<br>(0-2.0') | B-8 FR<br>(0-2.0') | B-9<br>(2.0-6.0') | B-10<br>(6.0-8.0') | B-11<br>(0-2.0') | B-12<br>(6.0-8.0') |
|--------------------------------|------------------------------|-----------------|-------------------|--------------------|-----------------|-------------------|-------------------|-----------------|--------------------|-------------------|--------------------|------------------|--------------------|
| Date:                          | 30-Jul-92                    | 3-Aug-92        | 3-Aug-92          | 9-Jun-92           | 13-Aug-92       | 30-Jul-92         | 31-Jul-92         | 12-Aug-92       | 12-Aug-92          | 29-Jul-92         | 10-Aug-92          | 10-Aug-92        | 11-Aug-92          |
| Chloromethane                  | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Bromomethane                   | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Vinyl chloride                 | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Chloroethane                   | 38 UJ                        | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 UJ             | 11 U            | 11 U               | 11 UJ             | 12 U               | 12 U             | 11 U               |
| Methylene chloride             | 38 U                         | 17 J            | 26 J              | 12 U               | 9 J             | 29 U              | 10 U              | 11 UJ           | 11 UJ              | 11 U              | 12 UJ              | 3 J              | 11 UJ              |
| Acetone                        | 16 J                         | 14              | 6 J               | 55 J               | 92 J            | 370               | 10 U              | 11 UJ           | 11 UJ              | 11 U              | 12 UJ              | 26 UJ            | 13 UJ              |
| Carbon disulfide               | 38 U                         | 11 U            | 11 U              | 12 UJ              | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,1-Dichloroethene             | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,1-Dichloroethane             | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,2-Dichloroethene (cis/trans) | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Chloroform                     | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,2-Dichloroethane             | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 2-Butanone                     | 38 U                         | 11 U            | 11 U              | 12 U               | 18              | 59                | 10 U              | 11 UJ           | 11 UJ              | 11 U              | 12 UJ              | 12 UJ            | 11 UJ              |
| 1,1,1-Trichloroethane          | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Carbon tetrachloride           | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Bromodichloromethane           | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,2-Dichloropropane            | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| cis-1,3-Dichloropropene        | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Trichloroethene                | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Dibromochloromethane           | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,1,2-Trichloroethane          | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Benzene                        | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| trans-1,3-Dichloropropene      | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Bromoform                      | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 4-Methyl-2-pentanone           | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 UJ           | 11 UJ              | 11 U              | 12 UJ              | 12 UJ            | 11 UJ              |
| 2-Hexanone                     | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 UJ           | 11 UJ              | 11 U              | 12 UJ              | 12 UJ            | 11 UJ              |
| 1,1,2,2-Tetrachloroethane      | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Tetrachloroethene              | 38 U                         | 11 U            | 6 J               | 12 U               | 11 U            | 29 U              | 10 U              | 2 J             | 5 J                | 11 U              | 12 U               | 29               | 11 U               |
| Toluene                        | 38 U                         | 11 U            | 11 U              | 12 U               | 2 J             | 29 U              | 10 U              | 4 J             | 4 J                | 11 U              | 12 U               | 3 J              | 11 U               |
| Chlorobenzene                  | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Ethylbenzene                   | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 2 J             | 3 J                | 11 U              | 12 U               | 12 U             | 11 U               |
| Styrene                        | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| Xylenes (total)                | 38 U                         | 11 U            | 11 U              | 12 U               | 11 U            | 29 U              | 10 U              | 11 U            | 11 U               | 11 U              | 12 U               | 12 U             | 11 U               |
| 1,2-Dibromoethane (EDB)        | 19 U                         | 5 U             | 5 U               | 6 U                | 5.7 U           | 15 U              | 5.2 U             | 5.8 U           | 5.5 U              | 5.3 U             | 5.9 U              | 6.1 U            | 5.7 U              |
| tert-Butyl methyl ether        | 38 UJ                        | 10 UJ           | 10 UJ             | 12 UJ              | 1.3 J           | 30 UJ             | 10 UJ             | 12 UJ           | 11 UJ              | 11 UJ             | 12 UJ              | 12 UJ            | 11 UJ              |
| n-Propylbenzene                | 19 UJ                        | 5 UJ            | 5 UJ              | 6 UJ               | 5.7 UJ          | 15 UJ             | 5.2 UJ            | 5.8 UJ          | 5.5 UJ             | 5.3 UJ            | 5.9 UJ             | 6.1 UJ           | 5.7 UJ             |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Ensco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-1. Concentrations of Volatile Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: B-13<br>(4.0-6.0') | B-13A<br>(0-2.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') |
|--------------------------------|-------------------------------|-------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|
| Date:                          | 10-Aug-92                     | 12-Aug-92         | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             |
| Chloromethane                  | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 UJ            | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Bromomethane                   | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Vinyl chloride                 | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Chloroethane                   | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Methylene chloride             | 11 UJ                         | 11 UJ             | 11 U             | 11 U                | 12 U             | 11 U             | 2 J              | 11 U                | 10 J             | 10 J                | 1 J                | 2 J                | 1 J                  |
| Acetone                        | 11 UJ                         | 11 UJ             | 11 UJ            | 11 UJ               | 12 UJ            | 11 UJ            | 11 U             | 49 J                | 58 J             | 130 J               | 11 J               | 190 B              | 81 J                 |
| Carbon disulfide               | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 UJ               | 11 U             | 12 U                | 12 UJ              | 13 UJ              | R                    |
| 1,1-Dichloroethene             | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,1-Dichloroethane             | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,2-Dichloroethene (cis/trans) | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Chloroform                     | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,2-Dichloroethane             | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 2-Butanone                     | 11 UJ                         | 11 UJ             | 11 U             | 11 U                | 12 U             | 11 U             | 11 UJ            | 11 U                | 11 U             | 25                  | 12 U               | 48                 | R                    |
| 1,1,1-Trichloroethane          | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Carbon tetrachloride           | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Bromodichloromethane           | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,2-Dichloropropane            | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| cis-1,3-Dichloropropene        | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Trichloroethene                | 11 U                          | 11 U              | 11 U             | 11 U                | 6 J              | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Dibromochloromethane           | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,1,2-Trichloroethane          | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Benzene                        | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| trans-1,3-Dichloropropene      | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Bromoform                      | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 4-Methyl-2-pentanone           | 11 UJ                         | 11 UJ             | 11 U             | 11 U                | 12 U             | 11 U             | 11 UJ            | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 2-Hexanone                     | 11 UJ                         | 11 UJ             | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,1,2,2-Tetrachloroethane      | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 UJ            | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Tetrachloroethene              | 200 D                         | 15                | 72               | 100                 | 170              | 23               | 11 U             | 11 U                | 11 U             | 12 U                | 2 J                | 1 J                | R                    |
| Toluene                        | 11 U                          | 11 U              | 2 J              | 3 J                 | 12               | 11 J             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Chlorobenzene                  | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Ethylbenzene                   | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Styrene                        | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| Xylenes (total)                | 11 U                          | 11 U              | 11 U             | 11 U                | 12 U             | 11 U             | 11 U             | 11 U                | 11 U             | 12 U                | 12 U               | 13 U               | R                    |
| 1,2-Dibromoethane (EDB)        | 5.7 U                         | 5.4 U             | 5.7 U            | 5.7 U               | 6 U              | 5.6 U            | 5.8 U            | 5.6 U               | 5.7 U            | 6 U                 | 5.9 U              | 6.3 U              | R                    |
| tert-Butyl methyl ether        | 11 UJ                         | 11 UJ             | 11 UJ            | 11 UJ               | 12 UJ            | 11 UJ            | 12 U             | 11 UJ               | 11 UJ            | 12 UJ               | 12 UJ              | 13 U               | R                    |
| n-Propylbenzene                | 5.7 UJ                        | 5.4 UJ            | 5.7 UJ           | 5.7 UJ              | 6 UJ             | 5.6 UJ           | 5.8 UJ           | 5.6 UJ              | 5.7 UJ           | 6 UJ                | 5.9 UJ             | 6.3 UJ             | R                    |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Ensco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample. TUT 005 1888

Table 4-1. Concentrations of Volatile Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: MW-5<br>(0-4.0') | MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-16.0') | MW-7 FR<br>(14.0-16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|--------------------------------|-----------------------------|------------------|-------------------|----------------------|-------------------------|--------------------|------------------|---------------------|--------------------|------------------------|----------------------|----------------------|-------------------|
| Date:                          | 11-Aug-92                   | 21-Jul-92        | 6-Aug-92          | 16-Jul-92            | 16-Jul-92               | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92              | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| Chloromethane                  | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Bromomethane                   | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Vinyl chloride                 | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Chloroethane                   | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Methylene chloride             | 11 UJ                       | 22               | 11 UJ             | 12                   | 18                      | 25                 | 18 U             | 17 J                | 20 J               | 4 J                    | 18 U                 | 11 U                 | 34 B              |
| Acetone                        | 11 UJ                       | 22 U             | 6 J               | 17 U                 | 16 U                    | 27 U               | 11 U             | 35                  | 11 U               | 11 U                   | 12 U                 | 11 U                 | 16 U              |
| Carbon disulfide               | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 UJ                  | 11 U                 | 11 U                 | 12 U              |
| 1,1-Dichloroethene             | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,1-Dichloroethane             | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,2-Dichloroethene (cis/trans) | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Chloroform                     | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,2-Dichloroethane             | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 2-Butanone                     | 11 UJ                       | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 5 J                 | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,1,1-Trichloroethane          | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Carbon tetrachloride           | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Bromodichloromethane           | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,2-Dichloropropane            | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| cis-1,3-Dichloropropene        | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Trichloroethene                | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Dibromochloromethane           | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,1,2-Trichloroethane          | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Benzene                        | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| trans-1,3-Dichloropropene      | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Bromoform                      | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 4-Methyl-2-pentanone           | 11 UJ                       | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 2-Hexanone                     | 11 UJ                       | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| 1,1,2,2-Tetrachloroethane      | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Tetrachloroethene              | 11 U                        | 6 J              | 11 U              | 10 U                 | 10 U                    | 2 J                | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Toluene                        | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 1 J                | 11 U             | 11 U                | 1 J                | 1 J                    | 11 U                 | 11 U                 | 2 J               |
| Chlorobenzene                  | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Ethylbenzene                   | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Styrene                        | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| Xylenes (total)                | 11 U                        | 11 U             | 11 U              | 10 U                 | 10 U                    | 11 U               | 11 U             | 11 U                | 11 U               | 11 U                   | 11 U                 | 11 U                 | 1 J               |
| 1,2-Dibromoethane (EDB)        | 5.3 U                       | 5.5 U            | 5.3 U             | 5 U                  | 5.2 U                   | 5.6 U              | 5 U              | 5 U                 | 5.5 U              | 5.5 U                  | 5.4 U                | 5.4 U                | 5.9 U             |
| tert-Butyl methyl ether        | 11 UJ                       | 11 UJ            | 11 UJ             | 10 UJ                | 10 UJ                   | 11 UJ              | 10 U             | 10 UJ               | 11 UJ              | 11 U                   | 11 U                 | 11 U                 | 12 U              |
| n-Propylbenzene                | 5.3 UJ                      | 5.5 UJ           | 5.3 UJ            | 5 UJ                 | 5.2 UJ                  | 5.6 UJ             | 5 U              | 5 UJ                | 5.5 UJ             | 5.5 UJ                 | 5.4 U                | 5.4 U                | 5.9 U             |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

TUT 005 1889

GERAGHTY &amp; MILLER, INC.

Table 4-1. Concentrations of Volatile Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: SS-3      SS-4      SS-5      SS-6      SS-7 |           |           |           |           |
|--------------------------------|---------------------------------------------------------|-----------|-----------|-----------|-----------|
|                                | Date:                                                   | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 |
| Chloromethane                  |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Bromomethane                   |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Vinyl chloride                 |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Chloroethane                   |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Methylene chloride             |                                                         | 22        | 8 J       | 10 J      | 22        |
| Acetone                        |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Carbon disulfide               |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,1-Dichloroethene             |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,1-Dichloroethane             |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,2-Dichloroethene (cis/trans) |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Chloroform                     |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,2-Dichloroethane             |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 2-Butanone                     |                                                         | 35        | 11 U      | 11 U      | 11 U      |
| 1,1,1-Trichloroethane          |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Carbon tetrachloride           |                                                         | 13 U      | 11 UJ     | 11 UJ     | 11 U      |
| Bromodichloromethane           |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,2-Dichloropropane            |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| cis-1,3-Dichloropropene        |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Trichloroethene                |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Dibromochloromethane           |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,1,2-Trichloroethane          |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Benzene                        |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| trans-1,3-Dichloropropene      |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Bromoform                      |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 4-Methyl-2-pentanone           |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 2-Hexanone                     |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| 1,1,2,2-Tetrachloroethane      |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Tetrachloroethene              |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Toluene                        |                                                         | 4 J       | 11 U      | 11 U      | 11 U      |
| Chlorobenzene                  |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Ethylbenzene                   |                                                         | 3 J       | 11 U      | 11 U      | 11 U      |
| Styrene                        |                                                         | 13 U      | 11 U      | 11 U      | 11 U      |
| Xylenes (total)                |                                                         | 19        | 11 U      | 11 U      | 11 U      |
| 1,2-Dibromoethane (EDB)        |                                                         | 6.4 U     | 5.5 U     | 5.5 U     | 5.7 U     |
| tert-Butyl methyl ether        |                                                         | 13 UJ     | 11 UJ     | 11 UJ     | 11 UJ     |
| n-Propylbenzene                |                                                         | 6.4 UJ    | 5.5 UJ    | 5.5 UJ    | 5.7 UJ    |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                     | Sample ID: B-1<br>(4.0-8.0')<br>Date: 30-Jul-92 | B-2<br>(0-2.0')<br>3-Aug-92 | B-3<br>(2.0-4.0')<br>3-Aug-92 | B-4<br>(8.0-10.0')<br>9-Jun-92 | B-5<br>(0-2.0')<br>13-Aug-92 | B-6<br>(4.0-8.0')<br>30-Jul-92 | B-7<br>(2.0-4.0')<br>31-Jul-92 | B-8<br>(0-2.0')<br>12-Aug-92 | B-8 FR<br>(0-2.0')<br>12-Aug-92 | B-9<br>(2.0-6.0')<br>29-Jul-92 | B-10<br>(6.0-8.0')<br>10-Aug-92 | B-11<br>(0-2.0')<br>10-Aug-92 | B-12<br>(6.0-8.0')<br>11-Aug-92 |
|-----------------------------|-------------------------------------------------|-----------------------------|-------------------------------|--------------------------------|------------------------------|--------------------------------|--------------------------------|------------------------------|---------------------------------|--------------------------------|---------------------------------|-------------------------------|---------------------------------|
| Acenaphthene                | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Acenaphthylene              | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Anthracene                  | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Carbazole                   | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Benzo(a)anthracene          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 180 J                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Benzo(a)pyrene              | 1300 U                                          | 270 J                       | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 200 J                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Benzo(b)fluoranthene        | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 250 J                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Benzo(g,h,i)perylene        | 1300 U                                          | 290 J                       | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 84 J                         | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Benzo(k)fluoranthene        | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 96 J                         | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 4-Bromophenyl phenyl ether  | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Butyl benzyl phthalate      | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 220 J                           | 400 U                         | 380 U                           |
| 4-Chloroaniline             | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| bis(2-Chloroethoxy)methane  | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| bis(2-Chloroethyl)ether     | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| bis(2-Chloroisopropyl)ether | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 340 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 4-Chloro-3-methylphenol     | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 2-Chloronaphthalene         | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 2-Chlorophenol              | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 4-Chlorophenyl phenyl ether | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Chrysene                    | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 210 J                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Di-n-butyl phthalate        | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 160 J                           | 400 U                         | 380 U                           |
| Dibenz(a,h)anthracene       | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Dibenzofuran                | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 1,2-Dichlorobenzene         | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 1,3-Dichlorobenzene         | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 1,4-Dichlorobenzene         | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 3,3'-Dichlorobenzidine      | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 2,4-Dichlorophenol          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Diethyl phthalate           | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 2,4-Dimethylphenol          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Dimethyl phthalate          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 4,6-Dinitro-2-methylphenol  | 3100 U                                          | 3400 U                      | 910 U                         | 950 U                          | 910 U                        | 2000 U                         | 830 U                          | 910 U                        | 850 U                           | 840 U                          | 940 U                           | 980 U                         | 920 U                           |
| 2,4-Dinitrophenol           | 3100 U                                          | 3400 U                      | 910 U                         | 950 U                          | 910 U                        | 2000 U                         | 830 U                          | 910 U                        | 850 U                           | 840 U                          | 940 U                           | 980 U                         | 920 U                           |
| 2,4-Dinitrotoluene          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| 2,6-Dinitrotoluene          | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |
| Di-n-octyl phthalate        | 1300 U                                          | 1400 U                      | 380 U                         | 390 U                          | 370 U                        | 820 U                          | 340 U                          | 370 U                        | 350 U                           | 350 U                          | 390 U                           | 400 U                         | 380 U                           |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

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B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: B-1<br>(4.0-8.0') | B-2<br>(0-2.0') | B-3<br>(2.0-4.0') | B-4<br>(8.0-10.0') | B-5<br>(0-2.0') | B-6<br>(4.0-8.0') | B-7<br>(2.0-4.0') | B-8<br>(0-2.0') | B-8 FR<br>(0-2.0') | B-9<br>(2.0-6.0') | B-10<br>(6.0-8.0') | B-11<br>(0-2.0') | B-12<br>(6.0-8.0') |
|----------------------------|------------------------------|-----------------|-------------------|--------------------|-----------------|-------------------|-------------------|-----------------|--------------------|-------------------|--------------------|------------------|--------------------|
| Date:                      | 30-Jul-92                    | 3-Aug-92        | 3-Aug-92          | 9-Jun-92           | 13-Aug-92       | 30-Jul-92         | 31-Jul-92         | 12-Aug-92       | 12-Aug-92          | 29-Jul-92         | 10-Aug-92          | 10-Aug-92        | 11-Aug-92          |
| bis(2-Ethylhexyl)phthalate | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 220 J             | 390 U              | 400 U            | 380 U              |
| Fluoranthene               | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 290 J           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Fluorene                   | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Hexachlorobenzene          | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Hexachlorobutadiene        | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Hexachlorocyclopentadiene  | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Hexachloroethane           | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Indeno(1,2,3-cd)pyrene     | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 87 J            | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Isophorone                 | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 2-Methylnaphthalene        | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 2-Methylphenol             | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 4-Methylphenol             | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Naphthalene                | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 2-Nitroaniline             | 3100 U                       | 3400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| 3-Nitroaniline             | 3100 U                       | 3400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| 4-Nitroaniline             | 3100 U                       | 3400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| Nitrobenzene               | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 2-Nitrophenol              | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 4-Nitrophenol              | 3100 U                       | 1400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| N-Nitrosodiphenylamine     | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| N-Nitroso-di-n-propylamine | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Pentachlorophenol          | 3100 U                       | 3400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| Phenanthrene               | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 160 J           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Phenol                     | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| Pyrene                     | 1300 U                       | 220 J           | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 300 J           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 1,2,4-Trichlorobenzene     | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |
| 2,4,5-Trichlorophenol      | 3100 U                       | 3400 U          | 910 U             | 950 U              | 910 U           | 2000 U            | 830 U             | 910 U           | 850 U              | 840 U             | 940 U              | 980 U            | 920 U              |
| 2,4,6-Trichlorophenol      | 1300 U                       | 1400 U          | 380 U             | 390 U              | 370 U           | 820 U             | 340 U             | 370 U           | 350 U              | 350 U             | 390 U              | 400 U            | 380 U              |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                     | Sample ID: B-13<br>(4.0-6.0') | B-13A<br>(0-2.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') |
|-----------------------------|-------------------------------|-------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|
| Date:                       | 10-Aug-92                     | 12-Aug-92         | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             |
| Acenaphthene                | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Acenaphthylene              | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Anthracene                  | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Carbazole                   | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Benzo(a)anthracene          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Benzo(a)pyrene              | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 140 J              | 390 U                |
| Benzo(b)fluoranthene        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Benzo(g,h,i)perylene        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Benzo(k)fluoranthene        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Bromophenyl phenyl ether  | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Butyl benzyl phthalate      | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 58 J             | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Chloroaniline             | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| bis(2-Chloroethoxy)methane  | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| bis(2-Chloroethyl)ether     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| bis(2-Chloroisopropyl)ether | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Chloro-3-methylphenol     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Chloronaphthalene         | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Chlorophenol              | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Chlorophenyl phenyl ether | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Chrysene                    | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Di-n-butyl phthalate        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 170 J              | 1900 B             | 390 U                |
| Dibenz(a,h)anthracene       | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Dibenzofuran                | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 1,2-Dichlorobenzene         | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 1,3-Dichlorobenzene         | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 1,4-Dichlorobenzene         | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 3,3'-Dichlorobenzidine      | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2,4-Dichlorophenol          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Diethyl phthalate           | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2,4-Dimethylphenol          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Dimethyl phthalate          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4,6-Dinitro-2-methylphenol  | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| 2,4-Dinitrophenol           | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| 2,4-Dinitrotoluene          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2,6-Dinitrotoluene          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Di-n-octyl phthalate        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |

Analyte concentrations in micrograms per kilogram (parts per billion (ppb)).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: B-13<br>(4.0-6.0') | B-13A<br>(0-2.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') |
|----------------------------|-------------------------------|-------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|
| Date:                      | 10-Aug-92                     | 12-Aug-92         | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             |
| bis(2-Ethylhexyl)phthalate | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 110 J            | 380 U            | 110 J               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Fluoranthene               | 42 J                          | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Fluorene                   | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Hexachlorobenzene          | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Hexachlorobutadiene        | 380 U                         | 340 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Hexachlorocyclopentadiene  | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Hexachloroethane           | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Indeno(1,2,3-cd)pyrene     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Isophorone                 | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Methylnaphthalene        | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Methylphenol             | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Methylphenol             | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Naphthalene                | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Nitroaniline             | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| 3-Nitroaniline             | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| 4-Nitroaniline             | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| Nitrobenzene               | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2-Nitrophenol              | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 4-Nitrophenol              | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 870 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| N-Nitrosodiphenylamine     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| N-Nitroso-di-n-propylamine | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Pentachlorophenol          | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| Phenanthrene               | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Phenol                     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| Pyrene                     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 1,2,4-Trichlorobenzene     | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |
| 2,4,5-Trichlorophenol      | 910 U                         | 840 U             | 910 U            | 920 U               | 950 U            | 890 U            | 920 U            | 890 U               | 910 U            | 960 U               | 950 U              | 1000 U             | 950 U                |
| 2,4,6-Trichlorophenol      | 380 U                         | 350 U             | 370 U            | 380 U               | 390 U            | 370 U            | 380 U            | 370 U               | 380 U            | 400 U               | 390 U              | 420 U              | 390 U                |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.



Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                     | Sample ID: MW-5<br>(0-4.0') | MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-<br>16.0') | MW-7 FR<br>(14.0-<br>16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-<br>11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|-----------------------------|-----------------------------|------------------|-------------------|--------------------------|-----------------------------|--------------------|------------------|---------------------|--------------------|----------------------------|----------------------|----------------------|-------------------|
| Date:                       | 11-Aug-92                   | 21-Jul-92        | 6-Aug-92          | 16-Jul-92                | 16-Jul-92                   | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92                  | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| Acenaphthene                | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Acenaphthylene              | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Anthracene                  | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Carbazole                   | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Benzo(a)anthracene          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Benzo(a)pyrene              | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Benzo(b)fluoranthene        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Benzo(g,h,i)perylene        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Benzo(k)fluoranthene        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Bromophenyl phenyl ether  | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Butyl benzyl phthalate      | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Chloroaniline             | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| bis(2-Chloroethoxy)methane  | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| bis(2-Chloroethyl)ether     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| bis(2-Chloroisopropyl)ether | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Chloro-3-methylphenol     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Chloronaphthalene         | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Chlorophenol              | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Chlorophenyl phenyl ether | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Chrysene                    | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Di-n-butyl phthalate        | 350 UJ                      | 370 U            | 220 BJ            | 340 U                    | 340 U                       | 730 B              | 350 U            | 200 BJ              | 130 BJ             | 370 U                      | 350 U                | 350 U                | 890 B             |
| Dibenz(a,h)anthracene       | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Dibenzofuran                | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 1,2-Dichlorobenzene         | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 1,3-Dichlorobenzene         | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 1,4-Dichlorobenzene         | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 3,3'-Dichlorobenzidine      | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2,4-Dichlorophenol          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Diethyl phthalate           | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 40 J              |
| 2,4-Dimethylphenol          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Dimethyl phthalate          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4,6-Dinitro-2-methylphenol  | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| 2,4-Dinitrophenol           | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| 2,4-Dinitrotoluene          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2,6-Dinitrotoluene          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Di-n-octyl phthalate        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: MW-5<br>(0-4.0') | MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-<br>16.0') | MW-7 FR<br>(14.0-<br>16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-<br>11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|----------------------------|-----------------------------|------------------|-------------------|--------------------------|-----------------------------|--------------------|------------------|---------------------|--------------------|----------------------------|----------------------|----------------------|-------------------|
|                            | Date: 11-Aug-92             | 21-Jul-92        | 6-Aug-92          | 16-Jul-92                | 16-Jul-92                   | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92                  | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| bis(2-Ethylhexyl)phthalate | 45 J                        | 370 U            | 100 BJ            | 340 U                    | 340 U                       | 370 U              | 46 J             | 43 BJ               | 370 U              | 370 U                      | 350 U                | 350 U                | 41 J              |
| Fluoranthene               | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Fluorene                   | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Hexachlorobenzene          | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Hexachlorobutadiene        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Hexachlorocyclopentadiene  | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Hexachloroethane           | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Indeno(1,2,3-cd)pyrene     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Isophorone                 | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Methylnaphthalene        | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Methylphenol             | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Methylphenol             | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Naphthalene                | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Nitroaniline             | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| 3-Nitroaniline             | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| 4-Nitroaniline             | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| Nitrobenzene               | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2-Nitrophenol              | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 4-Nitrophenol              | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| N-Nitrosodiphenylamine     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| N-Nitroso-di-n-propylamine | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Pentachlorophenol          | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| Phenanthrene               | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Phenol                     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| Pyrene                     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 1,2,4-Trichlorobenzene     | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |
| 2,4,5-Trichlorophenol      | 860 UJ                      | 890 U            | 850 U             | 830 U                    | 830 U                       | 900 U              | 860 U            | 880 U               | 890 U              | 890 U                      | 860 U                | 860 U                | 940 U             |
| 2,4,6-Trichlorophenol      | 350 UJ                      | 370 U            | 350 U             | 340 U                    | 340 U                       | 370 U              | 350 U            | 360 U               | 370 U              | 370 U                      | 350 U                | 350 U                | 390 U             |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                     | Sample ID: SS-3 SS-4 SS-5 SS-6 SS-7 |           |           |           |           |
|-----------------------------|-------------------------------------|-----------|-----------|-----------|-----------|
|                             | Date: 19-Aug-92                     | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 |
| Acenaphthene                | R                                   | R         | 390 U     | R         | 370 U     |
| Acenaphthylene              | R                                   | R         | 390 U     | R         | 370 U     |
| Anthracene                  | R                                   | R         | 390 U     | R         | 370 U     |
| Carbazole                   | R                                   | R         | 390 U     | R         | 370 U     |
| Benzo(a)anthracene          | R                                   | R         | 390 U     | R         | 370 U     |
| Benzo(a)pyrene              | R                                   | R         | 390 U     | R         | 370 U     |
| Benzo(b)fluoranthene        | R                                   | R         | 84 J      | R         | 370 U     |
| Benzo(g,h,i)perylene        | R                                   | R         | 82 J      | R         | 370 U     |
| Benzo(k)fluoranthene        | R                                   | R         | 390 U     | R         | 370 U     |
| 4-Bromophenyl phenyl ether  | R                                   | R         | 390 U     | R         | 370 U     |
| Butyl benzyl phthalate      | R                                   | R         | 190 J     | 58 J      | 75 J      |
| 4-Chloroaniline             | R                                   | R         | 390 U     | R         | 370 U     |
| bis(2-Chloroethoxy)methane  | R                                   | R         | 390 U     | R         | 370 U     |
| bis(2-Chloroethyl)ether     | R                                   | R         | 390 U     | R         | 370 U     |
| bis(2-Chloroisopropyl)ether | R                                   | R         | 390 U     | R         | 370 U     |
| 4-Chloro-3-methylphenol     | R                                   | R         | 390 U     | R         | 370 U     |
| 2-Chloronaphthalene         | R                                   | R         | 390 U     | R         | 370 U     |
| 2-Chlorophenol              | R                                   | R         | 390 U     | R         | 370 U     |
| 4-Chlorophenyl phenyl ether | R                                   | R         | 390 U     | R         | 370 U     |
| Chrysene                    | R                                   | R         | 59 J      | R         | 370 U     |
| Di-n-butyl phthalate        | 3400 J                              | R         | 55 J      | R         | 62 J      |
| Dibenz(a,h)anthracene       | R                                   | R         | 390 U     | R         | 370 U     |
| Dibenzofuran                | R                                   | R         | 390 U     | R         | 370 U     |
| 1,2-Dichlorobenzene         | R                                   | R         | 390 U     | R         | 370 U     |
| 1,3-Dichlorobenzene         | R                                   | R         | 390 U     | R         | 370 U     |
| 1,4-Dichlorobenzene         | R                                   | R         | 390 U     | R         | 370 U     |
| 3,3'-Dichlorobenzidine      | R                                   | R         | 390 U     | R         | 370 U     |
| 2,4-Dichlorophenol          | R                                   | R         | 390 U     | R         | 370 U     |
| Diethyl phthalate           | R                                   | R         | 390 U     | R         | 370 U     |
| 2,4-Dimethylphenol          | R                                   | R         | 390 U     | R         | 370 U     |
| Dimethyl phthalate          | R                                   | R         | 390 U     | R         | 370 U     |
| 4,6-Dinitro-2-methylphenol  | R                                   | R         | 950 U     | R         | 910 U     |
| 2,4-Dinitrophenol           | R                                   | R         | 950 U     | R         | 910 U     |
| 2,4-Dinitrotoluene          | R                                   | R         | 390 U     | R         | 370 U     |
| 2,6-Dinitrotoluene          | R                                   | R         | 390 U     | R         | 370 U     |
| Di-n-octyl phthalate        | R                                   | R         | 390 U     | R         | 370 U     |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 4-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: SS-3 |           | SS-4      | SS-5      | SS-6      | SS-7      |
|----------------------------|-----------------|-----------|-----------|-----------|-----------|-----------|
|                            | Date:           | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 |
| bis(2-Ethylhexyl)phthalate | R               |           | R         | 430       | 290 J     | 270 J     |
| Fluoranthene               | R               |           | R         | 100 J     | R         | 370 U     |
| Fluorene                   | R               |           | R         | 390 U     | R         | 370 U     |
| Hexachlorobenzene          | R               |           | R         | 390 U     | R         | 370 U     |
| Hexachlorobutadiene        | R               |           | R         | 390 U     | R         | 370 U     |
| Hexachlorocyclopentadiene  | R               |           | R         | 390 U     | R         | 370 U     |
| Hexachloroethane           | R               |           | R         | 390 U     | R         | 370 U     |
| Indeno(1,2,3-cd)pyrene     | R               |           | R         | 390 U     | R         | 370 U     |
| Isophorone                 | R               |           | R         | 390 U     | R         | 370 U     |
| 2-Methylnaphthalene        | R               |           | R         | 390 U     | R         | 370 U     |
| 2-Methylphenol             | R               |           | R         | 390 U     | R         | 370 U     |
| 4-Methylphenol             | R               |           | R         | 390 U     | R         | 370 U     |
| Naphthalene                | R               |           | R         | 390 U     | R         | 370 U     |
| 2-Nitroaniline             | R               |           | R         | 950 U     | R         | 910 U     |
| 3-Nitroaniline             | R               |           | R         | 950 U     | R         | 910 U     |
| 4-Nitroaniline             | R               |           | R         | 950 U     | R         | 910 U     |
| Nitrobenzene               | R               |           | R         | 390 U     | R         | 370 U     |
| 2-Nitrophenol              | R               |           | R         | 390 U     | R         | 370 U     |
| 4-Nitrophenol              | R               |           | R         | 950 U     | R         | 910 U     |
| N-Nitrosodiphenylamine     | R               |           | R         | 390 U     | R         | 370 U     |
| N-Nitroso-di-n-propylamine | R               |           | R         | 390 U     | R         | 370 U     |
| Pentachlorophenol          | R               |           | R         | 950 U     | R         | 910 U     |
| Phenanthrene               | R               |           | R         | 390 U     | R         | 370 U     |
| Phenol                     | R               |           | R         | 390 U     | R         | 370 U     |
| Pyrene                     | R               |           | R         | 76 J      | R         | 370 U     |
| 1,2,4-Trichlorobenzene     | R               |           | R         | 390 U     | R         | 370 U     |
| 2,4,5-Trichlorophenol      | R               |           | R         | 950 U     | R         | 910 U     |
| 2,4,6-Trichlorophenol      | R               |           | R         | 390 U     | R         | 370 U     |

Analyte concentrations in micrograms per kilogram (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

R Result rejected.

FR Field replicate of previous sample.

Table 4-3. Concentrations of Total Petroleum Hydrocarbons in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: B-1<br>(4.0-8.0') | B-2<br>(0-2.0') | B-3<br>(2.0-4.0') | B-4<br>(8.0-10.0') | B-5<br>(0-2.0') | B-6<br>(4.0-8.0') | B-7<br>(2.0-4.0') | B-8<br>(0-2.0') | B-8 FR<br>(0-2.0') | B-9<br>(2.0-6.0') | B-10<br>(6.0-8.0') | B-11<br>(0-2.0') | B-12<br>(6.0-8.0') |
|------------------------------|------------------------------|-----------------|-------------------|--------------------|-----------------|-------------------|-------------------|-----------------|--------------------|-------------------|--------------------|------------------|--------------------|
|                              | Date: 30-Jul-92              | 3-Aug-92        | 3-Aug-92          | 9-Jun-92           | 13-Aug-92       | 30-Jul-92         | 31-Jul-92         | 12-Aug-92       | 12-Aug-92          | 29-Jul-92         | 10-Aug-92          | 10-Aug-92        | 11-Aug-92          |
| Total Petroleum Hydrocarbons | 77 U                         | 110             | 23 U              | 24 U               | 53              | 170               | 28                | 23 U            | 77                 | 160               | 27                 | 41               | 25                 |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using U.S. Army Corps of Engineers Method CE81-1 and USEPA 418.1.

D Analyte identified at a secondary dilution.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 FR Field replicate of previous sample.

TUT  
005  
1899  
6687

Table 4-3. Concentrations of Total Petroleum Hydrocarbons in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: B-13<br>(4.0-6.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') | MW-5<br>(0-4.0') |
|------------------------------|-------------------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|------------------|
|                              | Date: 10-Aug-92               | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             | 11-Aug-92        |
| Total Petroleum Hydrocarbons | 28                            | 250 DJ           | 56 J                | 24 U             | 82 J             | 140              | 84                  | 66 J             | 86 J                | 24 U               | 130                | 24 U                 | 590 D            |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using U.S. Army Corps of Engineers Method CE81-1 and USEPA 418.1.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

TUT 005 1900

Table 4-3. Concentrations of Total Petroleum Hydrocarbons in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-<br>16.0') | MW-7 FR<br>(14.0-<br>16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-<br>11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|------------------------------|-----------------------------|-------------------|--------------------------|-----------------------------|--------------------|------------------|---------------------|--------------------|----------------------------|----------------------|----------------------|-------------------|
|                              | Date: 21-Jul-92             | 6-Aug-92          | 16-Jul-92                | 16-Jul-92                   | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92                  | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| Total Petroleum Hydrocarbons | 120                         | 61                | 27                       | 21 U                        | 22 U               | 230 D            | 22 U                | 22 U               | 22 U                       | 22 U                 | 21 U                 | 220 D             |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Ensco-East of Somerset, New Jersey, using U.S. Army Corps of Engineers Method CE81-1 and USEPA 418.1.

D Analyte identified at a secondary dilution.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 FR Field replicate of previous sample.

TUT 005 1901

Table 4-4. Concentrations of Metals in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: B-1<br>(4.0-8.0') | B-2<br>(0-2.0') | B-3<br>(2.0-4.0') | B-4<br>(8.0-10.0') | B-5<br>(0-2.0') | B-6<br>(4.0-8.0') | B-7<br>(2.0-4.0') | B-8<br>(0-2.0') | B-8 FR<br>(0-2.0') | B-9<br>(2.0-6.0') | B-10<br>(6.0-8.0') | B-11<br>(0-2.0') | B-12<br>(6.0-8.0') |
|-----------|------------------------------|-----------------|-------------------|--------------------|-----------------|-------------------|-------------------|-----------------|--------------------|-------------------|--------------------|------------------|--------------------|
| Date:     | 30-Jul-92                    | 3-Aug-92        | 3-Aug-92          | 9-Jun-92           | 13-Aug-92       | 30-Jul-92         | 31-Jul-92         | 12-Aug-92       | 12-Aug-92          | 29-Jul-92         | 10-Aug-92          | 10-Aug-92        | 11-Aug-92          |
| Aluminum  | 25100                        | 26000           | 24200             | 32200              | 22900           | 35700             | 28400             | 23600           | 19700              | 20800             | 14300              | 19200            | 15300              |
| Antimony  | 7.4 B                        | 5.9 B           | 4.7 U             | 3 U                | 7.9 BNJ         | 4.5 B             | 5.9 B             | 4.6 UNJ         | 5 BNJ              | 4.4 B             | 5.2 B              | 4.7 U            | 4.4 U              |
| Arsenic   | 0.96 B                       | 2.1 U           | 1.2 B             | 0.54 BWJ           | 0.46 U          | 0.74 B            | 1 B               | 4.3             | 94 J               | 1.6 B             | 2.2 U              | 5                | 18.3               |
| Barium    | 42.1 B                       | 67.2            | 184               | 42.9 B             | 38.4 B          | 41 B              | 36.9 B            | 98.4            | 53                 | 33.8 B            | 498                | 124              | 172                |
| Beryllium | 0.23 U                       | 0.26 B          | 0.42 B            | 0.27 B             | 0.23 U          | 0.22 U            | 0.21 U            | 0.37 B          | 0.35 B             | 0.23 B            | 0.22 U             | 0.33 B           | 0.29 B             |
| Cadmium   | 0.68 U                       | 0.64 U          | 0.7 U             | 0.7 U              | 0.69 U          | 0.67 U            | 0.62 U            | 0.69 U          | 0.66 U             | 0.64 U            | 0.65 U             | 0.7 U            | 0.65 U             |
| Calcium   | 39600                        | 47200           | 65900             | 7360               | 67200 *         | 6490              | 51600             | 72800 *         | 65200 *            | 15400             | 14400              | 5150             | 6060               |
| Chromium  | 29.2                         | 31.7            | 35.8              | 31.3               | 33.6 NJ         | 36                | 28.6              | 29.7            | 22.3               | 35.2              | 13                 | 19.5             | 21.2               |
| Cobalt    | 23                           | 21.9            | 22.8              | 28.2               | 18.9            | 30.3              | 23.4              | 20.5            | 16.3               | 23.7              | 17.2               | 15.1             | 18.2               |
| Copper    | 85.6                         | 79.1            | 104               | 74.7               | 47.3 NJ         | 67.6              | 73.1              | 157 J           | 49.8 J             | 105               | 88.7               | 76.6             | 74.2               |
| Iron      | 35700                        | 38400           | 42500             | 41500              | 29800           | 42700             | 35400             | 31500           | 29100              | 33100             | 33600 EJ           | 34100 EJ         | 28100 EJ           |
| Lead      | 31 S                         | 26 S            | 4.5               | 1.5                | 3.6 J           | 6.2 S             | 19.8              | R               | 10 J               | 5.5               | 5.2                | 6.9 S            | 5.4 S              |
| Magnesium | 17600                        | 17100           | 12700             | 23600              | 19400           | 21300             | 21500             | 18000           | 16100              | 16300             | 9970               | 5920             | 5570               |
| Manganese | 757                          | 834             | 506               | 941                | 861             | 895               | 828               | 700             | 791                | 760               | 2200               | 768              | 2070               |
| Mercury   | 0.06 U                       | 0.06 U          | 0.06 U            | 0.12 B             | 0.06 U          | 0.06 U            | 0.05 U            | 0.12            | 0.06 U             | 0.05 U            | 0.05 U             | 0.08 B           | 0.05 U             |
| Nickel    | 18.9                         | 17.5            | 17.1              | 18.6               | 19.4            | 19                | 17.8              | 14.9            | 14.1               | 21.8 J            | 4.7 B              | 12.8             | 16.4               |
| Potassium | 634 B                        | 1170            | 471 B             | 569 B              | 386 B           | 833 B             | 460 B             | 3320 J          | 870 BJ             | 528 B             | 1900               | 2830             | 2280               |
| Selenium  | 0.46 U                       | 0.42 U          | 0.47 UJ           | 0.47 U             | 0.46 UWJ        | 0.45 U            | 0.41 UWJ          | 0.46 U          | 0.44 U             | 0.43 U            | 0.43 U             | 0.47 U           | 0.44 U             |
| Silver    | 0.91 U                       | 2.2             | 2.1 B             | 2.1 B              | 0.92 U          | 0.98 B            | 0.83 U            | 3.9 NJ          | 1.6 BNJ            | 0.85 U            | 2 B                | 1.9 B            | 1.8 B              |
| Sodium    | 472 B                        | 319 B           | 2040              | 217 BJ             | 271 B           | 274 B             | 561 B             | 465 B           | 453 B              | 248 B             | 352 B              | 270 B            | 297 B              |
| Thallium  | 0.68 U                       | 0.64 UJ         | 0.7 U             | 0.7 UW             | 0.69 U          | 0.67 U            | 0.62 U            | 0.69 UJ         | 0.66 UJ            | 0.64 U            | 0.65 UJ            | 0.7 UJ           | 0.65 UJ            |
| Vanadium  | 102                          | 119             | 157               | 137                | 94.9 NJ         | 119               | 94.8              | 79.1            | 76.2               | 85.8              | 119                | 88.8             | 87.8               |
| Zinc      | 56.5                         | 108             | 42.6              | 53.1               | 49.9            | 51                | 62.4              | 149             | 63.8               | 58.4              | 68.2 EJ            | 99.5 EJ          | 89.1 EJ            |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- \* Duplicate analysis not within control limits.  
 B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 E Inductively coupled plasma (ICP) serial dilution result not within control limits or graphite furnace atomic absorption (GFAA) interference present.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 N Spiked sample recovery not within control limits.  
 S Reported value was determined by the Method of Standard Additions (MSA).  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.  
 R Result rejected.  
 FR Field replicate of previous sample.



Table 4-4. Concentrations of Metals in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: B-13<br>(4.0-6.0') | B-13A<br>(0-2.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') |
|-----------|-------------------------------|-------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|
| Date:     | 10-Aug-92                     | 12-Aug-92         | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             |
| Aluminum  | 18000                         | 21100             | 25300            | 19000               | 26400            | 18900            | 26700            | 37000               | 13300            | 15700               | 25800              | 22800              | 21700                |
| Antimony  | 4.9 B                         | 4.3 UNJ           | 7.3 BNJ          | 4.6 UNJ             | 6.4 BNJ          | 6.8 BNJ          | 5.7 B            | 8.1 B               | 4.5 UNJ          | 4.6 UNJ             | 3 U                | 6.2 B              | 3.5 B                |
| Arsenic   | 185                           | 13.7              | 0.46 U           | 0.46 U              | 1.3 B            | 11.6             | 0.45 B           | 0.46 UW             | 3                | 1.2 B               | R                  | 1.8 B              | 0.46 U               |
| Barium    | 29 B                          | 59.3              | 34.5 B           | 33.6 B              | 32.1 B           | 39.9 B           | 59.1             | 23.1 B              | 81               | 45.6 B              | 59.8               | 55                 | 59.4                 |
| Beryllium | 0.22 U                        | 0.22 U            | 0.23 U           | 0.23 U              | 0.23 U           | 0.22 U           | 0.23 U           | 0.23 B              | 0.22 U           | 0.23 U              | 0.23 U             | 0.24 U             | 0.23 U               |
| Cadmium   | 0.67 U                        | 0.65 U            | 0.7 U            | 0.69 U              | 0.7 U            | 0.99 B           | 0.68 U           | 0.68 U              | 0.67 U           | 0.69 U              | 0.68 U             | 0.73 B             | 0.69 U               |
| Calcium   | 12800                         | 73200 *           | 120000 *         | 73000 *             | 89400 *          | 68800 *          | 48300            | 41200               | 68500 *J         | 8720 *J             | 57300              | 9810               | 7790                 |
| Chromium  | 20.1                          | 23.6              | 13.8 NJ          | 17.4 NJ             | 27.3 NJ          | 36.4 NJ          | 18.6             | 28.7                | 16.1 NJ          | 7.6 NJ              | 31.8               | 38 EJ              | 27                   |
| Cobalt    | 15.2                          | 16.3              | 20               | 18.2                | 23.2             | 19               | 22.6             | 28.8                | 11.3             | 12.8                | 21.6               | 32.7 J             | 28.5                 |
| Copper    | 46.4                          | 52                | 48.3 NJ          | 77.6 NJ             | 65.9 NJ          | 72.1 NJ          | 47.8             | 75.2                | 40 NJ            | 58 NJ               | 57.4               | 73.9 EJ            | 75.3                 |
| Iron      | 26800 EJ                      | 29400             | 28000            | 23100               | 32600            | 30600            | 37100 EJ         | 39900               | 21700            | 30800               | 31500              | 39400 EJ           | 38000                |
| Lead      | 1.2                           | 4.8 J             | 2.9 J            | 2 J                 | 12.2 J           | 45.6 N*J         | 3                | 9.2                 | 5.6 J            | 1.9 J               | 3.9                | 3.6 B              | 2.8                  |
| Magnesium | 14600                         | 18300             | 26200            | 17800               | 22900            | 16300            | 24600            | 23600               | 9160             | 9640                | 15000              | 14000 EJ           | 17800                |
| Manganese | 430                           | 870               | 757              | 640                 | 809              | 599              | 734              | 833                 | 582              | 1110                | 725                | 947 EJ             | 717                  |
| Mercury   | 0.06 U                        | 0.05 U            | 0.06 U           | 0.06 U              | 0.06 U           | 0.57             | 0.06 U           | 0.06 U              | 0.06 U           | 0.06 U              | 0.06 U             | 0.06 U             | 0.06 U               |
| Nickel    | 12.3                          | 14.7              | 11.1             | 13.1                | 16.5             | 15.7             | 12.8             | 19.9                | 12.7             | 5.6 B               | 16.7               | 18.8               | 19.1                 |
| Potassium | 591 B                         | 841 B             | 161 B            | 201 B               | 389 B            | 506 B            | 278 B            | 655 B               | 557 B            | 299 B               | 919 B              | 1270 J             | 505 B                |
| Selenium  | 0.44 U                        | 0.43 U            | 0.46 UWJ         | 0.46 UJ             | 0.46 UWJ         | 0.44 UWJ         | 0.45 UW          | 0.46 UWJ            | 0.45 UJ          | 0.46 UJ             | 0.46 UWJ           | 0.55 BWJ           | 0.53 BWJ             |
| Silver    | 1.6 B                         | 1.6 BNJ           | 0.93 B           | 0.92 U              | 1.1 B            | 1.3 B            | 0.68 U           | 2.3                 | 0.89 U           | 1.2 B               | 1.4 B              | 0.72 U             | 2 B                  |
| Sodium    | 133 B                         | 474 B             | 181 B            | 191 B               | 281 B            | 396 B            | 305 B            | 632 B               | 717 B            | 536 B               | 665 B              | 274 B              | 318 B                |
| Thallium  | 0.67 UJ                       | 0.65 UJ           | 0.7 U            | 0.69 U              | 0.7 U            | 0.67 U           | 0.68 U           | 0.68 UW             | 0.67 U           | 0.69 U              | 0.68 UW            | 0.72 UJ            | 0.69 UW              |
| Vanadium  | 83.9                          | 83.1              | 95.8 NJ          | 69.3 NJ             | 98.8 NJ          | 79.7 NJ          | 132              | 113                 | 58 NJ            | 52.8 NJ             | 93.4               | 121 EJ             | 120                  |
| Zinc      | 45.7 EJ                       | 63.1              | 50.9             | 60.1                | 206              | 459              | 56 EJ            | 52.1                | 66.2             | 119                 | 42.6               | 49 EJ              | 46.8                 |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

\* Duplicate analysis not within control limits.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).

E Inductively coupled plasma (ICP) serial dilution result not within control limits or graphite furnace atomic absorption (GFAA) interference present.

J Result is detected below the reporting limit and/or is an estimated concentration.

N Spiked sample recovery not within control limits.

S Reported value was determined by the Method of Standard Additions (MSA).

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

R Result rejected.

FR Field replicate of previous sample.

Table 4-4. Concentrations of Metals in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: MW-5<br>(0-4.0') | MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-<br>16.0') | MW-7 FR<br>(14.0-<br>16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-<br>11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|-----------|-----------------------------|------------------|-------------------|--------------------------|-----------------------------|--------------------|------------------|---------------------|--------------------|----------------------------|----------------------|----------------------|-------------------|
| Date:     | 11-Aug-92                   | 21-Jul-92        | 6-Aug-92          | 16-Jul-92                | 16-Jul-92                   | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92                  | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| Aluminum  | 27400                       | 20800            | 14700             | 26000                    | 29800                       | 22500              | 22400            | 14900               | 14100              | 17800                      | 13600                | 23400 EJ             | 28700 EJ          |
| Antimony  | 5.1 BNJ                     | 5 B              | 4.3 U             | 6.7 B                    | 8.5 B                       | 5.6 B              | 6 B              | 4.7 U               | 4.3 U              | 3.6 B                      | 3.2 B                | 3.7 B                | 3.4 B             |
| Arsenic   | 0.77 B                      | 1.9 B            | 2.2 U             | 0.71 B                   | 0.53 B                      | 0.44 U             | 0.7 B            | 2.4 U               | 2.2 U              | 0.49 B                     | 0.7 B                | 1.7 B                | 0.67 B            |
| Barium    | 50.7                        | 137              | 122               | 42.5 B                   | 25.1 B                      | 21.7 B             | 18.7 B           | 120                 | 199                | 194                        | 60.5                 | 17.9 B               | 40.2 BEJ          |
| Beryllium | 0.46 B                      | 0.22 U           | 0.22 B            | 0.21 U                   | 0.21 U                      | 0.22 U             | 0.21 U           | 0.27 B              | 0.28 B             | 0.22 U                     | 0.21 U               | 0.21 U               | 0.22 U            |
| Cadmium   | 0.64 U                      | 0.67 U           | 0.65 U            | 0.64 U                   | 0.82 B                      | 0.65 U             | 0.64 U           | 0.71 U              | 0.65 U             | 0.68 B                     | 0.63 U               | 0.63 U               | 0.67 U            |
| Calcium   | 54400 *                     | 26300            | 23700             | 28200                    | 47700                       | 28400              | 31600            | 3480                | 5260               | 3810                       | 2220                 | 37900 EJ             | 29900             |
| Chromium  | 24.2                        | 28.2             | 16.8 J            | 16.3                     | 19.6                        | 15.3 J             | 15.6             | 5.7                 | 4.5                | 12.7                       | 20.4                 | 20                   | 36 EJ             |
| Cobalt    | 24.3                        | 31.9             | 13.9              | 30.8                     | 32.8                        | 19                 | 18.9             | 8.8 B               | 7.9 B              | 28.7                       | 29.6                 | 26.3 J               | 28.3              |
| Copper    | 115                         | 71.4             | 51.8              | 60.6                     | 60.9                        | 49.7               | 50.7             | 42.2                | 40.2               | 131                        | 63.9                 | 102 EJ               | 86.4 EJ           |
| Iron      | 37700                       | 36200            | 29600             | 38100                    | 43100                       | 26500              | 25700            | 30000               | 33600              | 48700 EJ                   | 31300                | 39000 EJ             | 40000 EJ          |
| Lead      | R                           | 25.4 J           | 83.7              | 0.96 J                   | 1.8 J                       | 0.48 BJ            | 3.2 J            | 3.4                 | 3.2                | 2                          | 1.9                  | 3.4                  | 3.2               |
| Magnesium | 26200                       | 16400            | 9350              | 28000                    | 32000                       | 15400              | 15100            | 5770                | 5770               | 12800                      | 10400                | 17400 EJ             | 20300 EJ          |
| Manganese | 763                         | 1440             | 769               | 941                      | 861                         | 688                | 631              | 480                 | 435                | 1070                       | 491                  | 820 EJ               | 883 EJ            |
| Mercury   | 0.05 U                      | 0.06 U           | 0.05 U            | 0.05 U                   | 0.05 U                      | 0.05 U             | 0.05 U           | 0.06 U              | 0.05 U             | 0.06 U                     | 0.08 B               | 0.05 U               | 0.06 U            |
| Nickel    | 15.3                        | 19.5             | 7.5 B             | 16.3 J                   | 19.3 J                      | 11.3               | 12.4             | 3.2 B               | 3.5 B              | 15.6                       | 13.1                 | 17.2                 | 18.9              |
| Potassium | 1180                        | 544 B            | 911 B             | 1520 J                   | 1400 J                      | 204 B              | 205 B            | 621 B               | 529 B              | 2200                       | 306 B                | 205 B                | 689 B             |
| Selenium  | 0.43 UW                     | 0.44 UWJ         | 0.43 U            | 0.43 UWJ                 | 0.42 UWJ                    | 0.44 UWJ           | 0.43 U           | 0.47 U              | 0.43 U             | 0.44 UJ                    | 0.42 UJ              | 0.42 UJ              | 0.45 UJ           |
| Silver    | 2.2 NJ                      | 0.67 U           | 1.4 B             | 0.64 U                   | 0.64 U                      | 0.65 U             | 0.64 U           | 2.2 B               | 2 B                | 0.67 UJ                    | 0.63 UJ              | 0.63 U               | 0.67 U            |
| Sodium    | 381 B                       | 596 B            | 728 B             | 263 B                    | 255 B                       | 491 B              | 654 B            | 413 BJ              | 373 BJ             | 3300                       | 1520                 | 581 B                | 500 B             |
| Thallium  | 0.64 UJ                     | 0.67 U           | 0.65 UJ           | 0.64 U                   | 0.64 U                      | 0.65 U             | 0.64 U           | 0.71 UJ             | 0.65 UJ            | 0.67 UJ                    | 0.63 UJ              | 0.63 UJ              | 0.67 UJ           |
| Vanadium  | 108                         | 102              | 80                | 107                      | 110                         | 59.5               | 56.3             | 57.9                | 69.5               | 163                        | 103                  | 95.1 EJ              | 113 EJ            |
| Zinc      | 164                         | 56.7             | 59.8 EJ           | 51.7                     | 54.5                        | 31.8               | 32.4             | 57.7                | 58.2               | 94.9 EJ                    | 48.6 EJ              | 59.5 EJ              | 57.4 EJ           |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

\* Duplicate analysis not within control limits.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).

E Inductively coupled plasma (ICP) serial dilution result not within control limits or graphite furnace atomic absorption (GFAA) interference present.

J Result is detected below the reporting limit and/or is an estimated concentration.

N Spiked sample recovery not within control limits.

S Reported value was determined by the Method of Standard Additions (MSA).

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

R Result rejected.

FR Field replicate of previous sample.

Table 4-4. Concentrations of Metals in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: | SS-1      | SS-2      | SS-3      | SS-4      | SS-5      | SS-6      | SS-7      | SS-8      |
|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|           | Date:      | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 |
| Aluminum  |            | 23600     | 16100     | 23100     | 23000     | 17700     | 14300 J   | 13800 J   | 21500 J   |
| Antimony  |            | 6.1 BNJ   | 4.2 UNJ   | 7.2 BNJ   | 6.5 BNJ   | 8.2 BNJ   | 7.4 BNJ   | 6 BNJ     | 14.7 BNJ  |
| Arsenic   |            | 0.44 U    | 0.42 U    | 1.7 B     | 0.92 BWJ  | 3.5       | 17.3 J    | 19.1 J    | 0.99 BJ   |
| Barium    |            | 41.9 B    | 30.1 B    | 94.2      | 39.4 B    | 97        | 89 J      | 90.9 J    | 29.3 BJ   |
| Beryllium |            | 0.22 U    | 0.21 U    | 0.26 U    | 0.22 U    | 0.22 U    | 0.23 UJ   | 0.23 UJ   | 0.41 UJ   |
| Cadmium   |            | 0.66 U    | 0.62 U    | 0.77 U    | 0.66 U    | 0.66 U    | 0.68 UJ   | 0.7 UJ    | 1.2 UJ    |
| Calcium   |            | 75100     | 9630      | 56500     | 61100     | 35800     | 59200 J   | 30700 J   | 144000 J  |
| Chromium  |            | 23.4 NJ   | 25.8 NJ   | 33.8 NJ   | 25.1 NJ   | 17.6 NJ   | 23.3 NJ   | 18.8 NJ   | 16.2 NJ   |
| Cobalt    |            | 25.7 J    | 18 J      | 22.1 J    | 20.9 J    | 19.4 J    | 14 J      | 13.8 J    | 16.9 BJ   |
| Copper    |            | 55.3 NJ   | 40.3 NJ   | 72.8 NJ   | 62.9 NJ   | 79.2 NJ   | 55.4 NJ   | 54.8 NJ   | 43.1 NJ   |
| Iron      |            | 31300     | 22600     | 55400     | 29800     | 28100     | 39500 J   | 23800 J   | 25400 J   |
| Lead      |            | 2.1 SJ    | 1.7 J     | 12.2 J    | 9.1 J     | 149 SJ    | 14.4 J    | 11.4 J    | 2.5 SJ    |
| Magnesium |            | 20500     | 13200     | 18700     | 19300     | 13600     | 9960 J    | 9670 J    | 21400 J   |
| Manganese |            | 763       | 535       | 886       | 634       | 708       | 662 J     | 672 J     | 888 J     |
| Mercury   |            | 0.05 U    | 0.05 U    | 0.06 U    | 0.05 U    | 0.19      | 0.06 U    | 0.06 U    | 0.05 U    |
| Nickel    |            | 18.9      | 15.5      | 19.2      | 16.8      | 12.6      | 14.1 J    | 10.7 J    | 12.9 BJ   |
| Potassium |            | 412 B     | 568 B     | 7140      | 673 B     | 4170      | 1910 J    | 2070 J    | 325 BJ    |
| Selenium  |            | 0.44 UJ   | 0.42 UJ   | 0.51 UJ   | 0.44 UJ   | 0.44 UJ   | 0.46 UJ   | 0.47 UJ   | 0.41 UJ   |
| Silver    |            | 0.98 B    | 0.99 B    | 2.1 B     | 0.93 B    | 2.8       | 1.6 BJ    | 0.93 UJ   | 1.7 UJ    |
| Sodium    |            | 557 B     | 157 B     | 476 B     | 352 B     | 349 B     | 340 BJ    | 251 BJ    | 187 BJ    |
| Thallium  |            | 0.66 U    | 0.62 U    | 0.77 U    | 0.66 U    | 0.66 U    | 0.68 UJ   | 0.7 UJ    | 0.62 UJ   |
| Vanadium  |            | 109 NJ    | 74.9 NJ   | 88.3 NJ   | 86 NJ     | 78.8 NJ   | 71.3 NJ   | 73.1 NJ   | 82.1 NJ   |
| Zinc      |            | 50.6      | 40.1      | 258       | 265       | 216       | 91.7 J    | 97.1 J    | 43.8 J    |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- \* Duplicate analysis not within control limits.
- B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).
- E Inductively coupled plasma (ICP) serial dilution result not within control limits or graphite furnace atomic absorption (GFAA) interference present.
- J Result is detected below the reporting limit and/or is an estimated concentration.
- N Spiked sample recovery not within control limits.
- S Reported value was determined by the Method of Standard Additions (MSA).
- U Compound or element analyzed for, but not detected at the corresponding reporting limit.
- W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.
- R Result rejected.
- FR Field replicate of previous sample.

Table 4-5. Concentrations of Total Cyanide in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: B-1<br>(4.0-8.0') | B-2<br>(0-2.0') | B-3<br>(2.0-4.0') | B-4<br>(8.0-<br>10.0') | B-5<br>(0-2.0') | B-6<br>(4.0-8.0') | B-7<br>(2.0-4.0') | B-8<br>(0-2.0') | B-8 FR<br>(0-2.0') | B-9<br>(2.0-6.0') | B-10<br>(6.0-8.0') | B-11<br>(0-2.0') | B-12<br>(6.0-8.0') |
|----------------|------------------------------|-----------------|-------------------|------------------------|-----------------|-------------------|-------------------|-----------------|--------------------|-------------------|--------------------|------------------|--------------------|
|                | Date: 30-Jul-92              | 3-Aug-92        | 3-Aug-92          | 9-Jun-92               | 13-Aug-92       | 30-Jul-92         | 31-Jul-92         | 12-Aug-92       | 12-Aug-92          | 29-Jul-92         | 10-Aug-92          | 10-Aug-92        | 11-Aug-92          |
| Cyanide, Total | 0.57 U                       | 1.1             | 0.58 U            | 0.59 U                 | 0.58 U          | 0.56 U            | 0.52 U            | 0.58 U          | 2.7                | 0.53 U            | 0.54 U             | 0.58 U           | 0.57 U             |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

TUT 005 1906

Table 4-5. Concentrations of Total Cyanide in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: B-13<br>(4.0-6.0') | B-13A<br>(0-2.0') | B-14<br>(0-2.0') | B-14 FR<br>(0-2.0') | B-15<br>(0-2.0') | B-16<br>(0-2.0') | MW-1<br>(0-2.0') | MW-1D<br>(1.0-2.5') | MW-2<br>(0-2.0') | MW-2 FR<br>(0-2.0') | MW-3<br>(0.4-2.0') | MW-4<br>(2.7-4.7') | MW-4D<br>(8.7-10.7') |
|----------------|-------------------------------|-------------------|------------------|---------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|--------------------|--------------------|----------------------|
|                | Date: 10-Aug-92               | 12-Aug-92         | 14-Aug-92        | 14-Aug-92           | 14-Aug-92        | 14-Aug-92        | 30-Jun-92        | 5-Jun-92            | 13-Aug-92        | 13-Aug-92           | 10-Jun-92          | 16-Jun-92          | 4-Jun-92             |
| Cyanide, Total | 0.56 U                        | 0.54 U            | 0.58 U           | 0.58 U              | 0.75             | 0.55 U           | 0.88             | 0.57 U              | 0.56 U           | 0.57 U              | 0.57 U             | 0.65               | 0.57 U               |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

TUT 005 1907

Table 4-5. Concentrations of Total Cyanide in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: MW-5<br>(0-4.0') | MW-6<br>(0-2.0') | MW-6D<br>(0-2.0') | MW-7<br>(14.0-<br>16.0') | MW-7 FR<br>(14.0-<br>16.0') | MW-8<br>(2.0-4.0') | MW-9<br>(0-4.0') | MW-10<br>(2.0-4.0') | MW-10D<br>(0-2.0') | MW-11D<br>(10.0-<br>11.0') | MW-12D<br>(4.0-6.0') | MW-13D<br>(4.0-6.0') | MW-14<br>(0-2.0') |
|----------------|-----------------------------|------------------|-------------------|--------------------------|-----------------------------|--------------------|------------------|---------------------|--------------------|----------------------------|----------------------|----------------------|-------------------|
|                | Date: 11-Aug-92             | 21-Jul-92        | 6-Aug-92          | 16-Jul-92                | 16-Jul-92                   | 20-Jul-92          | 24-Jul-92        | 4-Aug-92            | 4-Aug-92           | 26-Jun-92                  | 6-Jul-92             | 19-Jun-92            | 1-Jul-92          |
| Cyanide, Total | 0.53 U                      | 0.56 U           | 0.54 U            | 0.53 U                   | 0.53 U                      | 0.55               | 0.53 U           | 0.59 U              | 0.54 U             | 0.56 U                     | 0.53 U               | 0.52 U               | 0.56 U            |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

TUT 005 1908

Table 4-5. Concentrations of Total Cyanide in Soil Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: SS-1 SS-2 SS-3 SS-4 SS-5 SS-6 SS-7 SS-8 |           |           |           |           |           |           |           |           |
|----------------|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                | Date:                                              | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 | 19-Aug-92 |
| Cyanide, Total |                                                    | 1.2       | 0.52 U    | 0.96      | 0.57 U    | 0.55 U    | 0.57 U    | 1.3       | 1.1       |

Analyte concentrations in milligrams per kilogram (parts per million [ppm]).  
Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
FR Field replicate of previous sample.

TUT 005 1909

Table 4-6. Concentrations of Volatile Organic Compounds in Potable-Water Samples Collected in June 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Sample ID: WAPA                |       |           |
|--------------------------------|-------|-----------|
| Analyte                        | Date: | 15-Jun-92 |
| Chloromethane                  |       | 10 UJ     |
| Bromomethane                   |       | 10 UJ     |
| Vinyl chloride                 |       | 10 UJ     |
| Chloroethane                   |       | 10 UJ     |
| Methylene chloride             |       | 10 UJ     |
| Acetone                        |       | 10 UJ     |
| Carbon disulfide               |       | 10 UJ     |
| 1,1-Dichloroethene             |       | 10 UJ     |
| 1,1-Dichloroethane             |       | 10 UJ     |
| 1,2-Dichloroethene (cis/trans) |       | 10 UJ     |
| Chloroform                     |       | 2 J       |
| 1,2-Dichloroethane             |       | 10 UJ     |
| 2-Butanone                     |       | 10 UJ     |
| 1,1,1-Trichloroethane          |       | 10 UJ     |
| Carbon tetrachloride           |       | 10 UJ     |
| Bromodichloromethane           |       | 3 J       |
| 1,2-Dichloropropane            |       | 10 UJ     |
| trans-1,3-Dichloropropene      |       | 10 UJ     |
| Trichloroethene                |       | 10 UJ     |
| Dibromochloromethane           |       | 3 J       |
| 1,1,2-Trichloroethane          |       | 10 UJ     |
| Benzene                        |       | 10 UJ     |
| cis-1,3-Dichloropropene        |       | 10 UJ     |
| Bromoform                      |       | 2 J       |
| 4-Methyl-2-pentanone           |       | 10 UJ     |
| 2-Hexanone                     |       | 10 UJ     |
| 1,1,2,2-Tetrachloroethane      |       | 10 UJ     |
| Tetrachloroethene              |       | 10 UJ     |
| Toluene                        |       | 10 UJ     |
| Chlorobenzene                  |       | 10 UJ     |
| Ethylbenzene                   |       | 10 UJ     |
| Styrene                        |       | 10 UJ     |
| Xylenes (total)                |       | 10 UJ     |
| 1,2-Dibromoethane (EDB)        |       | 5 UJ      |
| tert-Butyl methyl ether        |       | 10 UJ     |
| n-Propylbenzene                |       | 5 UJ      |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.



Table 4-7. Concentrations of Volatile Organic Compounds in the Field Blanks and Trip Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: Date: | Field Blank<br>4-Jun-92 | Field Blank<br>5-Jun-92 | Field Blank<br>9-Jun-92 | Field Blank<br>16-Jun-92 | Field Blank<br>19-Jun-92 | Field Blank<br>26-Jun-92 | Field Blank<br>30-Jun-92 | Field Blank<br>1-Jul-92 | Field Blank<br>6-Jul-92 | Field Blank<br>16-Jul-92 | Field Blank<br>20-Jul-92 | Field Blank<br>21-Jul-92 | Field Blank<br>24-Jul-92 |
|--------------------------------|------------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Chloromethane                  |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Bromomethane                   |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 UJ                    | 10 UJ                    | 10 UJ                    | 10 UJ                    |
| Vinyl chloride                 |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 UJ                    | 10 UJ                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Chloroethane                   |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 UJ                    | 10 UJ                    | 10 UJ                    | 10 UJ                    |
| Methylene chloride             |                  | 10 U                    | 1 J                     | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 1 BJ                     | 1 BJ                     | 2 BJ                     | 4 BJ                     |
| Acetone                        |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 5 BJ                     | 10 B                     |
| Carbon disulfide               |                  | 10 U                    | 7 J                     | 10 U                    | 7 J                      | 6 J                      | 3 J                      | 16                       | 25                      | 4 J                     | 10 U                     | 4 J                      | 10 U                     | 4 J                      |
| 1,1-Dichloroethene             |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,1-Dichloroethane             |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,2-Dichloroethene (cis/trans) |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Chloroform                     |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,2-Dichloroethane             |                  | 10 U                    | 10 U                    | 10 U                    | 10 UJ                    | 10 UJ                    | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 2-Butanone                     |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,1,1-Trichloroethane          |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Carbon tetrachloride           |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Bromodichloromethane           |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,2-Dichloropropane            |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| trans-1,3-Dichloropropene      |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Trichloroethene                |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Dibromochloromethane           |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,1,2-Trichloroethane          |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Benzene                        |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| cis-1,3-Dichloropropene        |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Bromoform                      |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 4-Methyl-2-pentanone           |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 2-Hexanone                     |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,1,2,2-Tetrachloroethane      |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Tetrachloroethene              |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Toluene                        |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Chlorobenzene                  |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Ethylbenzene                   |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Styrene                        |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| Xylenes (total)                |                  | 10 U                    | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 U                    | 10 U                    | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| 1,2-Dibromoethane (EDB)        |                  | 5 U                     | 5 U                     | 5 U                     | 5 U                      | 5 U                      | 5 U                      | 5 U                      | 5 U                     | 5 U                     | 5 U                      | 5 U                      | 5 U                      | 5 U                      |
| tert-Butyl methyl ether        |                  | 10 U                    | 10 U                    | 10 UJ                   | 10 U                     | 10 U                     | 10 U                     | 10 U                     | 10 UJ                   | 10 UJ                   | 10 U                     | 10 U                     | 10 U                     | 10 U                     |
| n-Propylbenzene                |                  | 5 UJ                    | 5 UJ                    | 5 UJ                    | 5 UJ                     | 5 UJ                     | 5 U                      | 5 U                      | 5 UJ                    | 5 UJ                    | 5 UJ                     | 5 UJ                     | 5 UJ                     | 5 UJ                     |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-7. Concentrations of Volatile Organic Compounds in the Field Blanks and Trip Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Trip Blank |
|--------------------------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
|                                | Date:                  | 29-Jul-92   | 30-Jul-92   | 31-Jul-92   | 3-Aug-92    | 4-Aug-92    | 6-Aug-92    | 10-Aug-92   | 11-Aug-92   | 12-Aug-92   | 13-Aug-92   | 14-Aug-92   | 19-Aug-92   | 5-Jun-92   |
| Chloromethane                  |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Bromomethane                   |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Vinyl chloride                 |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Chloroethane                   |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Methylene chloride             |                        | 1 J         | 2 BJ        | 2 J         | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Acetone                        |                        | 10 UJ       | 10 U        | 10 UJ       | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Carbon disulfide               |                        | 5 J         | 3 J         | 2 J         | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,1-Dichloroethene             |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,1-Dichloroethane             |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,2-Dichloroethene (cis/trans) |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Chloroform                     |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,2-Dichloroethane             |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 2-Butanone                     |                        | 10 UJ       | 10 U        | 10 UJ       | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,1,1-Trichloroethane          |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Carbon tetrachloride           |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Bromodichloromethane           |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,2-Dichloropropane            |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| trans-1,3-Dichloropropene      |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Trichloroethene                |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Dibromochloromethane           |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,1,2-Trichloroethane          |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Benzene                        |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| cis-1,3-Dichloropropene        |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Bromoform                      |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 4-Methyl-2-pentanone           |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 2-Hexanone                     |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,1,2,2-Tetrachloroethane      |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Tetrachloroethene              |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Toluene                        |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Chlorobenzene                  |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Ethylbenzene                   |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Styrene                        |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| Xylenes (total)                |                        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U       |
| 1,2-Dibromoethane (EDB)        |                        | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U         | 5 U        |
| tert-Butyl methyl ether        |                        | 10 U        | 10 U        | 10 U        | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 U       |
| n-Propylbenzene                |                        | 5 UJ        | 5 U         | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ        | 5 UJ       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-7. Concentrations of Volatile Organic Compounds in the Field Blanks and Trip Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                                | Sample ID: Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank |
|--------------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Analyte                        | Date:                 | 9-Jun-92   | 10-Jun-92  | 15-Jun-92  | 16-Jun-92  | 19-Jun-92  | 26-Jun-92  | 30-Jun-92  | 1-Jul-92   | 6-Jul-92   | 16-Jul-92  | 20-Jul-92  | 21-Jul-92  | 24-Jul-92  |
| Chloromethane                  |                       | 10 U       | 10 U       | 1 J        | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromomethane                   |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      |
| Vinyl chloride                 |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chloroethane                   |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      |
| Methylene chloride             |                       | 10 U       | 10 U       | 10 U       | 10 U       | 1 J        | 10 U       | 10 U       | 2 J        | 10 U       | 1 BJ       | 1 BJ       | 10 UJ      | 5 BJ       |
| Acetone                        |                       | 10 U       | 10 U       | 10 U       | 8 J        | 5 J        | 4 J        | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 4 BJ       |
| Carbon disulfide               |                       | 10 U       | 10 U       | 10 U       | 10 U       | 1 J        | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethene             |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethane             |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethene (cis/trans) |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chloroform                     |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethane             |                       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 2-Butanone                     |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,1-Trichloroethane          |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Carbon tetrachloride           |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromodichloromethane           |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloropropane            |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| trans-1,3-Dichloropropene      |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Trichloroethene                |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Dibromochloromethane           |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,2-Trichloroethane          |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Benzene                        |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| cis-1,3-Dichloropropene        |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromoform                      |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 4-Methyl-2-pentanone           |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 2-Hexanone                     |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,2,2-Tetrachloroethane      |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Tetrachloroethene              |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Toluene                        |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chlorobenzene                  |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Ethylbenzene                   |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Styrene                        |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Xylenes (total)                |                       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dibromoethane (EDB)        |                       | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        |
| tert-Butyl methyl ether        |                       | 10 UJ      | 10 UJ      | 10 UJ      | 10 U       | 10 UJ      | 10 U       | 10 U       | 10 UJ      | 10 UJ      | 10 U       | 10 U       | 10 U       | 10 U       |
| n-Propylbenzene                |                       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 U        | 5 U        | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-7. Concentrations of Volatile Organic Compounds in the Field Blanks and Trip Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                                | Sample ID: | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank |
|--------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Analyte                        | Date:      | 29-Jul-92  | 30-Jul-92  | 31-Jul-92  | 3-Aug-92   | 4-Aug-92   | 6-Aug-92   | 10-Aug-92  | 11-Aug-92  | 12-Aug-92  | 13-Aug-92  | 14-Aug-92  | 19-Aug-92  |
| Chloromethane                  |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromomethane                   |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Vinyl chloride                 |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chloroethane                   |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Methylene chloride             |            | 3 J        | 4 BJ       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 1 J        | 10 U       | 10 U       | 2 J        | 10 U       |
| Acetone                        |            | 10 UJ      | 10 U       | 16 J       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Carbon disulfide               |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethene             |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethane             |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethene (cis/trans) |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chloroform                     |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethane             |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 2-Butanone                     |            | 10 UJ      | 10 U       | 10 UJ      | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,1-Trichloroethane          |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Carbon tetrachloride           |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromodichloromethane           |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloropropane            |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| trans-1,3-Dichloropropene      |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Trichloroethene                |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Dibromochloromethane           |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,2-Trichloroethane          |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Benzene                        |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| cis-1,3-Dichloropropene        |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromoform                      |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 4-Methyl-2-pentanone           |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 2-Hexanone                     |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,2,2-Tetrachloroethane      |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Tetrachloroethene              |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Toluene                        |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chlorobenzene                  |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Ethylbenzene                   |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Styrene                        |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Xylenes (total)                |            | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dibromoethane (EDB)        |            | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        |
| tert-Butyl methyl ether        |            | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      |
| n-Propylbenzene                |            | 5 UJ       | 5 U        | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-8. Concentrations of Base Neutral and Acid Extractable Organic Compounds in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                             | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Analyte                     | Date:      | 4-Jun-92    | 5-Jun-92    | 9-Jun-92    | 16-Jun-92   | 19-Jun-92   | 26-Jun-92   | 30-Jun-92   | 1-Jul-92    | 6-Jul-92    | 16-Jul-92   | 20-Jul-92   | 21-Jul-92   | 24-Jul-92   |
| Acenaphthene                |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Acenaphthylene              |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Anthracene                  |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Carbazole                   |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(a)anthracene          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(b)fluoranthene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(k)fluoranthene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(g,h,i)perylene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(a)pyrene              |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Bromophenyl phenyl ether  |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Butyl benzyl phthalate      |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Chloroaniline             |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroethoxy)methane  |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroethyl)ether     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroisopropyl)ether |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Chloro-3-methylphenol     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Chloronaphthalene         |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Chlorophenol              |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Chlorophenyl phenyl ether |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Chrysene                    |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Dibenz(a,h)anthracene       |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Dibenzofuran                |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Di-n-butyl phthalate        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dichlorobenzene         |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,3-Dichlorobenzene         |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,4-Dichlorobenzene         |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 3,3'-Dichlorobenzidine      |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4-Dichlorophenol          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Diethyl phthalate           |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4-Dimethylphenol          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Dimethyl phthalate          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4,6-Dinitro-2-methylphenol  |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4-Dinitrophenol           |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4-Dinitrotoluene          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,6-Dinitrotoluene          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Di-n-octyl phthalate        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Ethylhexyl)phthalate  |            | 3 BJ        | 2 BJ        | 7 BJ        | 150 BD      | 10 U        | 5 BJ        | 10 U        | 1 BJ        | 23 B        | 19 B        | 41 U        | 6 J         | 12 B        |
| Fluoranthene                |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Fluorene                    |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-8. Concentrations of Base Neutral and Acid Extractable Organic Compounds in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                            | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|----------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Analyte                    | Date:      | 4-Jun-92    | 5-Jun-92    | 9-Jun-92    | 16-Jun-92   | 19-Jun-92   | 26-Jun-92   | 30-Jun-92   | 1-Jul-92    | 6-Jul-92    | 16-Jul-92   | 20-Jul-92   | 21-Jul-92   | 24-Jul-92   |
| Hexachlorobenzene          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachlorobutadiene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachlorocyclopentadiene  |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachloroethane           |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Indeno(1,2,3-cd)pyrene     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Isophorone                 |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Methylnaphthalene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Methylphenol             |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Methylphenol             |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Naphthalene                |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Nitroaniline             |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 3-Nitroaniline             |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 4-Nitroaniline             |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| Nitrobenzene               |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Nitrophenol              |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Nitrophenol              |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| N-Nitrosodiphenylamine     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| N-Nitroso-di-n-propylamine |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Pentachlorophenol          |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| Phenanthrene               |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Phenol                     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Pyrene                     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2,4-Trichlorobenzene     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4,5-Trichlorophenol      |            | 26 U        | 26 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4,6-Trichlorophenol      |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-8. Concentrations of Base Neutral and Acid Extractable Organic Compounds in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                             | Sample ID: Field | Field     | Field     | Field     | Field    | Field    | Field    | Field     | Field     | Field     | Field     | Field     | Field     |
|-----------------------------|------------------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                             | Blank            | Blank     | Blank     | Blank     | Blank    | Blank    | Blank    | Blank     | Blank     | Blank     | Blank     | Blank     | Blank     |
| Analyte                     | Date:            | 29-Jul-92 | 30-Jul-92 | 31-Jul-92 | 3-Aug-92 | 4-Aug-92 | 6-Aug-92 | 10-Aug-92 | 11-Aug-92 | 12-Aug-92 | 13-Aug-92 | 14-Aug-92 | 19-Aug-92 |
| Acenaphthene                |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Acenaphthylene              |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Anthracene                  |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Carbazole                   |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Benzo(a)anthracene          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Benzo(b)fluoranthene        |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Benzo(k)fluoranthene        |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Benzo(g,h,i)perylene        |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Benzo(a)pyrene              |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 4-Bromophenyl phenyl ether  |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Butyl benzyl phthalate      |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 4-Chloroaniline             |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| bis(2-Chloroethoxy)methane  |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| bis(2-Chloroethyl)ether     |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| bis(2-Chloroisopropyl)ether |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 4-Chloro-3-methylphenol     |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 2-Chloronaphthalene         |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 2-Chlorophenol              |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 4-Chlorophenyl phenyl ether |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Chrysene                    |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Dibenz(a,h)anthracene       |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Dibenzofuran                |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Di-n-butyl phthalate        |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 1,2-Dichlorobenzene         |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 1,3-Dichlorobenzene         |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 1,4-Dichlorobenzene         |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 3,3'-Dichlorobenzidine      |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 2,4-Dichlorophenol          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Diethyl phthalate           |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 2,4-Dimethylphenol          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Dimethyl phthalate          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 4,6-Dinitro-2-methylphenol  |                  | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 10 U     | 25 U      | 25 U      | 25 U      | 25 U      | 25 U      | 25 U      |
| 2,4-Dinitrophenol           |                  | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 10 U     | 25 U      | 25 U      | 25 U      | 25 U      | 25 U      | 25 U      |
| 2,4-Dinitrotoluene          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| 2,6-Dinitrotoluene          |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Di-n-octyl phthalate        |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| bis(2-Ethylhexyl)phthalate  |                  | 10 U      | 10 U      | 10 U      | 16 B     | 10 U     | 3.2 J    | 10 U      | 10 U      | 19 B      | 65 B      | 47 B      | 16 B      |
| Fluoranthene                |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |
| Fluorene                    |                  | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      | 10 U      |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 4-8. Concentrations of Base Neutral and Acid Extractable Organic Compounds in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                            | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|----------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Analyte                    | Date:      | 29-Jul-92   | 30-Jul-92   | 31-Jul-92   | 3-Aug-92    | 4-Aug-92    | 6-Aug-92    | 10-Aug-92   | 11-Aug-92   | 12-Aug-92   | 13-Aug-92   | 14-Aug-92   | 19-Aug-92   |
| Hexachlorobenzene          |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachlorobutadiene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachlorocyclopentadiene  |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Hexachloroethane           |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Indeno(1,2,3-cd)pyrene     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Isophorone                 |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Methylnaphthalene        |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Methylphenol             |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Methylphenol             |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Naphthalene                |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Nitroaniline             |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 3-Nitroaniline             |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 4-Nitroaniline             |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| Nitrobenzene               |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Nitrophenol              |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Nitrophenol              |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| N-Nitrosodiphenylamine     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| N-Nitroso-di-n-propylamine |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Pentachlorophenol          |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| Phenanthrene               |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Phenol                     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| Pyrene                     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2,4-Trichlorobenzene     |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4,5-Trichlorophenol      |            | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4,6-Trichlorophenol      |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.



Table 4-9. Concentrations of Total Petroleum Hydrocarbons in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|------------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                              | Date:      | 4-Jun-92    | 5-Jun-92    | 9-Jun-92    | 19-Jun-92   | 26-Jun-92   | 30-Jun-92   | 1-Jul-92    | 6-Jul-92    | 16-Jul-92   | 20-Jul-92   | 21-Jul-92   | 24-Jul-92   | 29-Jul-92   |
| Total Petroleum Hydrocarbons |            | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 1.4         | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       |

Analyte concentrations in milligrams per liter (parts per million [ppm]).  
Analyses were performed by Ensco-East of Somerset, New Jersey, using USEPA Method 418.1.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

TUT 005 1919

Table 4-9. Concentrations of Total Petroleum Hydrocarbons in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|------------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                              | Date:      | 30-Jul-92   | 31-Jul-92   | 3-Aug-92    | 4-Aug-92    | 6-Aug-92    | 10-Aug-92   | 11-Aug-92   | 12-Aug-92   | 13-Aug-92   | 14-Aug-92   |
| Total Petroleum Hydrocarbons |            | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       |

Analyte concentrations in milligrams per liter (parts per million [ppm]).  
Analyses were performed by Enseco-East of Somerset, New Jersey, using USEPA Method 418.1.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

TUT 005 1920

Table 4-10. Concentrations of Metals in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|           | Date:                  | 4-Jun-92    | 5-Jun-92    | 9-Jun-92    | 16-Jun-92   | 19-Jun-92   | 26-Jun-92   | 30-Jun-92   | 1-Jul-92    | 6-Jul-92    | 16-Jul-92   | 20-Jul-92   | 21-Jul-92   | 24-Jul-92   |
| Aluminum  |                        | 35 U        | 35 U        | 149 B       | 35 U        | 35 U        | 35 U        | 35 U        | 35 U        | 35 U        | 46.3 B      | 74.4 B      | 35 U        | 35 U        |
| Antimony  |                        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 13 U        | 15.8 B      | 13 U        | 13 U        |
| Arsenic   |                        | 2 U         | 2 U         | 2 UWJ       | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 UJ        |
| Barium    |                        | 1.3 B       | 1 U         | 1.3 B       | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1.3 B       | 1 U         | 1 U         | 1 U         |
| Beryllium |                        | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Cadmium   |                        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Calcium   |                        | 135 B       | 122 B       | 68.3 B      | 23 B        | 19.7 B      | 8 U         | 8 U         | 8 U         | 8 U         | 51.8 B      | 32.1 B      | 16.8 B      | 31.4 B      |
| Chromium  |                        | 3 U         | 4.9 B       | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Cobalt    |                        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Copper    |                        | 5.3 B       | 4.5 B       | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Iron      |                        | 11 B        | 17.8 B      | 165         | 3 U         | 13.5 B      | 3 U         | 3 U         | 3 U         | 3 U         | 36.4 B      | 44.9 B      | 3 U         | 14.4 B      |
| Lead      |                        | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Magnesium |                        | 32.1 B      | 42.8 B      | 518 B       | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 196 B       | 269 B       | 35.9 B      | 32 U        |
| Manganese |                        | 1 U         | 1 U         | 1.9 B       | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Mercury   |                        | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       |
| Nickel    |                        | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         | 9 U         |
| Potassium |                        | 484 U       | 652 B       | 677 B       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       | 484 U       |
| Selenium  |                        | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 UJ        | 2 UJ        | 2 UJ        | 2 UJ        |
| Silver    |                        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Sodium    |                        | 397 B       | 458 B       | 297 B       | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 1350 U      | 1350 U      | 1350 U      | 1350 U      |
| Thallium  |                        | 3 UW        | 3 UW        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Vanadium  |                        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Zinc      |                        | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4.2 B       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

TUT  
005  
1991

Table 4-10. Concentrations of Metals in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|           | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Analyte   | Date:      | 29-Jul-92   | 30-Jul-92   | 31-Jul-92   | 3-Aug-92    | 4-Aug-92    | 6-Aug-92    | 10-Aug-92   | 11-Aug-92   | 12-Aug-92   | 13-Aug-92   | 14-Aug-92   | 19-Aug-92   |
| Aluminum  |            | 43.3 B      | 64.3 B      | 39.8 B      | 44 B        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        | 32 U        |
| Antimony  |            | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        | 20 U        |
| Arsenic   |            | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         |
| Barium    |            | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Beryllium |            | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Cadmium   |            | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Calcium   |            | 82.1 B      | 43.7 B      | 33 B        | 42.8 B      | 54 B        | 54.9 B      | 55.7 B      | 38.8 B      | 74.6 B      | 71.4 B      | 73.2 B      | 122 B       |
| Chromium  |            | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         |
| Cobalt    |            | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         |
| Copper    |            | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 5.9 B       | 4.3 B       | 4 U         | 4 U         | 4 U         | 4 U         | 4.3 B       |
| Iron      |            | 38 B        | 55.5 B      | 16.4 B      | 45.1 B      | 29.4 B      | 7.5 B       | 8.1 B       | 12.8 B      | 9.6 B       | 7.7 B       | 9.5 B       | 29.2 B      |
| Lead      |            | 1 BJ        | 1.1 BJ      | 2.6 BJ      | 1.7 BJ      | 1 UJ        | 1.1 BJ      | 1 UJ        | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         |
| Magnesium |            | 84.9 B      | 166 B       | 35 U        | 107 B       | 35 U        | 35 U        | 35 U        | 35 U        | 35 U        | 35 U        | 35 U        | 51 B        |
| Manganese |            | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1 U         | 1.2 B       | 1 U         | 1.1 B       | 1.1 B       | 2.1 B       |
| Mercury   |            | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       |
| Nickel    |            | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         | 8 U         |
| Potassium |            | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       | 560 U       |
| Selenium  |            | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         | 2 U         |
| Silver    |            | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         |
| Sodium    |            | 900 U       | 900 U       | 900 U       | 900 U       | 132 B       | 97.9 B      | 113 B       | 49.8 B      | 152 B       | 183 B       | 222 B       | 316 B       |
| Thallium  |            | 3 UWJ       | 3 UWJ       | 3 UWJ       | 3 UWJ       | 3 UJ        | 3 UJ        | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         | 3 U         |
| Vanadium  |            | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         | 4 U         |
| Zinc      |            | 2 U         | 2 U         | 2 U         | 2 U         | 7.7 B       | 33          | 5 B         | 54.9        | 5.4 B       | 2.6 B       | 2 U         | 2 U         |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

TUT 005 1922

Table 4-11. Concentrations of Total Cyanide in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|----------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                | Date:      | 4-Jun-92    | 5-Jun-92    | 9-Jun-92    | 16-Jun-92   | 19-Jun-92   | 26-Jun-92   | 30-Jun-92   | 1-Jul-92    | 6-Jul-92    | 16-Jul-92   | 20-Jul-92   | 21-Jul-92   | 24-Jul-92   |
| Cyanide, Total |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

TUT 005 1923

Table 4-11. Concentrations of Total Cyanide in the Field Blanks Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte        | Sample ID: | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|----------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                | Date:      | 29-Jul-92   | 30-Jul-92   | 31-Jul-92   | 3-Aug-92    | 4-Aug-92    | 6-Aug-92    | 10-Aug-92   | 11-Aug-92   | 12-Aug-92   | 13-Aug-92   | 14-Aug-92   | 19-Aug-92   |
| Cyanide, Total |            | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

TUT 005 1924

Table 5-1. Concentrations of Volatile Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: MW-1 | MW-1D    | MW-2      | MW-3      | MW-4      | MW-4D    | MW-5     | MW-5 FR  | MW-6D     | MW-6R     | MW-7     | MW-8      | MW-9     |
|--------------------------------|-----------------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|-----------|----------|
| Date:                          | 6-Oct-92        | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 7-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 29-Sep-92 | 7-Oct-92 |
| Chloromethane                  | 50 Uu           | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 Uu   | 500 Uu   | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Bromomethane                   | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Vinyl chloride                 | 50 U            | 12 J     | 10 U      | 140       | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Chloroethane                   | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Methylene chloride             | 50 UJ           | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Acetone                        | 50 U            | R        | 10 UJ     | 25 UJ     | 10 UJ     | 10 UJ    | 500 UJ   | 500 UJ   | 12 UJ     | 10 UJ     | 10 U     | 10 UJ     | 10 J     |
| Carbon disulfide               | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| 1,1-Dichloroethene             | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| 1,1-Dichloroethane             | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| 1,2-Dichloroethene (cis/trans) | 1000            | 600 J    | 26        | 530 E     | 86        | 150      | 500 U    | 500 U    | 10 UJ     | 39        | 170      | 140       | 10 U     |
| Chloroform                     | 6 J             | 10 J     | 1 J       | 25 U      | 10 U      | 1 J      | 500 U    | 500 U    | 5 J       | 10 U      | 3 J      | 18        | 10 U     |
| 1,2-Dichloroethane             | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| 2-Butanone                     | 50 UJ           | R        | 10 UJ     | 25 UJ     | 10 UJ     | 10 UJ    | 500 UJ   | 500 UJ   | 10 UJ     | 10 UJ     | 10 UJ    | 10 UJ     | 10 UJ    |
| 1,1,1-Trichloroethane          | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Carbon tetrachloride           | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Bromodichloromethane           | 50 U            | 4 J      | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 21 J      | 10 U      | 10 U     | 10 U      | 10 U     |
| 1,2-Dichloropropane            | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| trans-1,3-Dichloropropene      | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Trichloroethene                | 190             | 52 J     | 3 J       | 19 J      | 8 J       | 11       | 500 U    | 500 U    | 10 UJ     | 3 J       | 29       | 14        | 10 U     |
| Dibromochloromethane           | 50 U            | 6 J      | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 31 J      | 10 U      | 10 U     | 10 U      | 10 U     |
| 1,1,2-Trichloroethane          | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Benzene                        | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 1000     | 950      | 10 UJ     | 10 U      | 10 U     | 10 U      | 26       |
| cis-1,3-Dichloropropene        | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Bromoform                      | 50 UJ           | 8 J      | 10 UJ     | 25 UJ     | 10 UJ     | 10 UJ    | 500 UJ   | 500 UJ   | 18 J      | 10 UJ     | 10 UJ    | 10 UJ     | 10 UJ    |
| 4-Methyl-2-pentanone           | 50 UJ           | R        | 10 U      | 25 U      | 10 U      | 10 UJ    | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 UJ    |
| 2-Hexanone                     | 50 UJ           | R        | 10 U      | 25 U      | 10 U      | 10 UJ    | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 UJ    |
| 1,1,2,2-Tetrachloroethane      | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Tetrachloroethene              | 590             | 190 J    | 15        | 58        | 25        | 44       | 500 U    | 500 U    | 10 UJ     | 13        | 110      | 38        | 10 U     |
| Toluene                        | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 180 J    | 170 J    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Chlorobenzene                  | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Ethylbenzene                   | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 930      | 890      | 10 UJ     | 10 U      | 10 U     | 10 U      | 19       |
| Styrene                        | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 500 U    | 500 U    | 10 UJ     | 10 U      | 10 U     | 10 U      | 10 U     |
| Xylenes (total)                | 50 U            | R        | 10 U      | 25 U      | 10 U      | 10 U     | 1600     | 1500     | 10 UJ     | 10 U      | 10 U     | 10 U      | 2 J      |
| 1,2-Dibromoethane (EDB)        | 25 U            | R        | 5 U       | 12 U      | 5 U       | 5 U      | 250 U    | 250 U    | 5 UJ      | 5 U       | 5 U      | 5 U       | 5 U      |
| tert-Butyl methyl ether        | 50 U            | R        | 10 U      | 24 J      | 1.2 J     | 10 U     | 6200     | 6200     | 10 UJ     | 10 U      | 5.8 J    | 51        | 2700 D   |
| n-Propylbenzene                | 25 UJ           | R        | 5 UJ      | 12 UJ     | 5 UJ      | 5 UJ     | 180 J    | 170 J    | 5 UJ      | 5 UJ      | 5 UJ     | 5 UJ      | 8 J      |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

E Concentration exceeds calibration range.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

u All reporting limits raised due to high levels of target analytes.

R Result rejected.

FR Field replicate of previous sample.

Table 5-1. Concentrations of Volatile Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: | MW-9 FR  | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP | Field Blank | Field Blank | Field Blank | Field Blank |
|--------------------------------|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|
|                                | Date:      | 7-Oct-92 | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92 | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92    |
| Chloromethane                  |            | 10 U     | 10 U     | 33 Uu    | 50 Uu    | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Bromomethane                   |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Vinyl chloride                 |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 17       | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Chloroethane                   |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Methylene chloride             |            | 10 U     | 10 U     | 21 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 4 BJ        | 4 BJ        | 2 BJ        | 5 BJ        |
| Acetone                        |            | 10 J     | 10 UJ    | 45 J     | 50 UJ    | 12 UJ    | 11 U     | 56 J     | 10 UJ    | R        | 6 J         | 8 J         | 7 BJ        | 6 BJ        |
| Carbon disulfide               |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 3 J      | R        | 10 U        | 3 J         | 10 U        | 10 U        |
| 1,1-Dichloroethene             |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,1-Dichloroethane             |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dichloroethene (cis/trans) |            | 10 U     | 2 J      | 130      | 180      | 10 UJ    | 2 J      | 10 U     | 44       | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Chloroform                     |            | 10 U     | 10 U     | 33 U     | 50 U     | 8 J      | 16       | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dichloroethane             |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Butanone                     |            | 10 UJ    | 2 J      | 33 UJ    | 50 UJ    | 10 UJ    | 10 UJ    | 12 J     | 10 UJ    | R        | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       |
| 1,1,1-Trichloroethane          |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Carbon tetrachloride           |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Bromodichloromethane           |            | 10 U     | 10 U     | 33 U     | 50 U     | 20 J     | 30       | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dichloropropane            |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| trans-1,3-Dichloropropene      |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Trichloroethene                |            | 10 U     | 10 U     | 29 J     | 18 J     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Dibromochloromethane           |            | 10 U     | 10 U     | 33 U     | 50 U     | 36 J     | 55       | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,1,2-Trichloroethane          |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzene                        |            | 28       | 16       | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| cis-1,3-Dichloropropene        |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Bromoform                      |            | 10 UJ    | 10 UJ    | 33 UJ    | 50 UJ    | 29 J     | 44 J     | 10 UJ    | 10 UJ    | R        | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       |
| 4-Methyl-2-pentanone           |            | 10 UJ    | 10 UJ    | 33 UJ    | 50 UJ    | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Hexanone                     |            | 10 UJ    | 10 UJ    | 33 UJ    | 50 UJ    | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,1,2,2-Tetrachloroethane      |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Tetrachloroethene              |            | 10 U     | 10 U     | 25 J     | 40 J     | 10 UJ    | 10 U     | 7 J      | 1 J      | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Toluene                        |            | 10 U     | 2 J      | 33 U     | 50 U     | 10 UJ    | 1 J      | 1 J      | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Chlorobenzene                  |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Ethylbenzene                   |            | 24       | 5 J      | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Styrene                        |            | 10 U     | 10 U     | 33 U     | 50 U     | 10 UJ    | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| Xylenes (total)                |            | 3 J      | 2 J      | 33 U     | 50 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dibromoethane (EDB)        |            | 5 U      | 5 U      | 16 U     | 25 U     | 5 UJ     | 5 U      | 5 U      | 5 U      | R        | 5 U         | 5 U         | 5 U         | 5 U         |
| tert-Butyl methyl ether        |            | 2900 D   | 2200 D   | 660      | 780      | 10 UJ    | 11       | 10 U     | 10 U     | R        | 10 U        | 10 U        | 10 U        | 10 U        |
| n-Propylbenzene                |            | 13 J     | 12 J     | 16 UJ    | 25 UJ    | 5 UJ     | 5 UJ     | 5 UJ     | 5 U      | R        | 5 UJ        | 5 UJ        | 5 U         | 5 UJ        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

E Concentration exceeds calibration range.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

u All reporting limits raised due to high levels of target analytes.

R Result rejected.

FR Field replicate of previous sample.



Table 5-1. Concentrations of Volatile Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID: | Field Blank | Field Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank | Trip Blank |
|--------------------------------|------------|-------------|-------------|------------|------------|------------|------------|------------|------------|------------|
|                                | Date:      | 6-Oct-92    | 7-Oct-92    | 29-Sep-92  | 30-Sep-92  | 1-Oct-92   | 2-Oct-92   | 5-Oct-92   | 6-Oct-92   | 7-Oct-92   |
| Chloromethane                  |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromomethane                   |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Vinyl chloride                 |            | 10 UJ       | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 U       |
| Chloroethane                   |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Methylene chloride             |            | 1 J         | 5 BJ        | 3 BJ       | 4 BJ       | 1 BJ       | 2 BJ       | 4 BJ       | 1 J        | 4 BJ       |
| Acetone                        |            | 10 UJ       | R           | 7 J        | 7 J        | 10 UJ      | 9 BJ       | 6 BJ       | 10 UJ      | 10 UJ      |
| Carbon disulfide               |            | 10 U        | R           | 10 U       | 1 J        | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethene             |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1-Dichloroethane             |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethene (cis/trans) |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chloroform                     |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloroethane             |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 2-Butanone                     |            | 10 UJ       | R           | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      |
| 1,1,1-Trichloroethane          |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Carbon tetrachloride           |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromodichloromethane           |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dichloropropane            |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| trans-1,3-Dichloropropene      |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Trichloroethene                |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Dibromochloromethane           |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,1,2-Trichloroethane          |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Benzene                        |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| cis-1,3-Dichloropropene        |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Bromoform                      |            | 10 UJ       | R           | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      | 10 UJ      |
| 4-Methyl-2-pentanone           |            | 10 UJ       | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      |
| 2-Hexanone                     |            | 10 UJ       | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 UJ      | 10 UJ      |
| 1,1,2,2-Tetrachloroethane      |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Tetrachloroethene              |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Toluene                        |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Chlorobenzene                  |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Ethylbenzene                   |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Styrene                        |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| Xylenes (total)                |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| 1,2-Dibromoethane (EDB)        |            | 5 U         | R           | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        | 5 U        |
| tert-Butyl methyl ether        |            | 10 U        | R           | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       | 10 U       |
| n-Propylbenzene                |            | 5 UJ        | R           | 5 UJ       | 5 UJ       | 5 U        | 5 UJ       | 5 UJ       | 5 UJ       | 5 UJ       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Ensco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

E Concentration exceeds calibration range.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

u All reporting limits raised due to high levels of target analytes.

R Result rejected.

FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                             | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|-----------------------------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte                     | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| Acenaphthene                |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Acenaphthylene              |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Anthracene                  |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Carbazole                   |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Benzo(a)anthracene          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Benzo(b)fluoranthene        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Benzo(k)fluoranthene        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Benzo(g,h,i)perylene        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Benzo(a)pyrene              |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Bromophenyl phenyl ether  |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Butyl benzyl phthalate      |                 | 10 UJ    | 10 UJ    | 10 UJ     | 10 UJ     | 10 UJ     | 10 U     | 10 UJ    | 10 UJ    | 10 UJ     | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Chloroaniline             |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| bis(2-Chloroethoxy)methane  |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| bis(2-Chloroethyl)ether     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| bis(2-Chloroisopropyl)ether |                 | 10 U     | 10 U     | 10 UJ     | 10 U      | 10 UJ     | 10 U     | 10 UJ    | 10 UJ    | 10 UJ     | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Chloro-3-methylphenol     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Chloronaphthalene         |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Chlorophenol              |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Chlorophenyl phenyl ether |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Chrysene                    |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Dibenz(a,h)anthracene       |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 UJ    | 10 U     | 10 U     | 10 U      | 10 U      | 10 UJ    | 10 UJ    | 10 U      |
| Dibenzofuran                |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Di-n-butyl phthalate        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 1,2-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U      | 2 J       | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 1,3-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 1,4-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 3,3'-Dichlorobenzidine      |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2,4-Dichlorophenol          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| Diethyl phthalate           |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2,4-Dimethylphenol          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 7 J      | 7 J      | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| Dimethyl phthalate          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 8 J      | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 4,6-Dinitro-2-methylphenol  |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | R         | 25 U      | 25 U     | 25 U     | 25 U      |
| 2,4-Dinitrophenol           |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 UJ    | 25 U     | 25 U     | R         | 25 U      | 25 UJ    | 25 UJ    | 25 U      |
| 2,4-Dinitrotoluene          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2,6-Dinitrotoluene          |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Di-n-octyl phthalate        |                 | 10 UJ    | 10 UJ    | 10 UJ     | 10 UJ     | 10 UJ     | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ     | 1 J       | 10 UJ    | 10 U     | 10 U      |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

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D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

t Reporting limit raised due to sample volume limitations.

R Result rejected.

FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                            | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|----------------------------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte                    | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| bis(2-Ethylhexyl)phthalate |                 | 30 U     | 10 UJ    | 11 UJ     | 18 UJ     | 56 UJ     | 10 U     | 22 UJ    | 22 UJ    | 10 U      | 64 U      | 10 U     | 10 U     | 10 U      |
| Fluoranthene               |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Fluorene                   |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Hexachlorobenzene          |                 | 10 U     | 10 U     | 10 UJ     | 10 U      | 10 UJ     | 10 U     | 10 UJ    | 10 UJ    | 10 UJ     | 10 U      | 10 U     | 10 U     | 10 U      |
| Hexachlorobutadiene        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Hexachlorocyclopentadiene  |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Hexachloroethane           |                 | 10 UJ    | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Indeno(1,2,3-cd)pyrene     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Isophorone                 |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Methylnaphthalene        |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 130 D    | 110 D    | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Methylphenol             |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Methylphenol             |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 3 J      | 3 J      | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| Naphthalene                |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 310 D    | 230 D    | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Nitroaniline             |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | 25 U      | 25 U      | 25 U     | 25 U     | 25 U      |
| 3-Nitroaniline             |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | 25 U      | 25 U      | 25 U     | 25 U     | 25 U      |
| 4-Nitroaniline             |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | 25 U      | 25 U      | 25 U     | 25 U     | 25 U      |
| Nitrobenzene               |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2-Nitrophenol              |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| 4-Nitrophenol              |                 | 25 UJ    | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | R         | 25 U      | 25 U     | 25 U     | 25 U      |
| N-Nitrosodiphenylamine     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| N-Nitroso-di-n-propylamine |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Pentachlorophenol          |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 UJ    | 25 U     | 25 U     | R         | 25 UJ     | 25 UJ    | 25 U     | 25 UJ     |
| Phenanthrene               |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| Phenol                     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |
| Pyrene                     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 1,2,4-Trichlorobenzene     |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | 10 U      | 10 U      | 10 U     | 10 U     | 10 U      |
| 2,4,5-Trichlorophenol      |                 | 25 U     | 25 U     | 25 U      | 25 U      | 25 U      | 25 U     | 25 U     | 25 U     | R         | 25 U      | 25 U     | 25 U     | 25 U      |
| 2,4,6-Trichlorophenol      |                 | 10 U     | 10 U     | 10 U      | 10 U      | 10 U      | 10 U     | 10 U     | 10 U     | R         | 10 U      | 10 U     | 10 U     | 10 U      |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

t Reporting limit raised due to sample volume limitations.

R Result rejected.

FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                             | Sample ID: MW-9 |          | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP          | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|-------------------|-------------|-------------|-------------|-------------|
| Analyte                     | Date:           | 7-Oct-92 | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92          | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92    |
| Acenaphthene                |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U <sup>t</sup> | 10 U        | 10 U        | 10 U        | 10 U        |
| Acenaphthylene              |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Anthracene                  |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Carbazole                   |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(a)anthracene          |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(b)fluoranthene        |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(k)fluoranthene        |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(g,h,i)perylene        |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Benzo(a)pyrene              |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Bromophenyl phenyl ether  |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Butyl benzyl phthalate      |                 | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 U     | 10 UJ    | 10 UJ    | 14 UJ             | 10 UJ       | 10 UJ       | 10 UJ       | 10 U        |
| 4-Chloroaniline             |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroethoxy)methane  |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroethyl)ether     |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| bis(2-Chloroisopropyl)ether |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 UJ    | 14 U              | 10 U        | 10 UJ       | 10 UJ       | 10 U        |
| 4-Chloro-3-methylphenol     |                 | 10 U     | 10 U     | 10 U     | 10 U     | R        | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Chloronaphthalene         |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 2-Chlorophenol              |                 | 10 U     | 10 U     | 10 U     | 10 U     | R        | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 4-Chlorophenyl phenyl ether |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Chrysene                    |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Dibenz(a,h)anthracene       |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 UJ    | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Dibenzofuran                |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 2 J      | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Di-n-butyl phthalate        |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,2-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,3-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 1,4-Dichlorobenzene         |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 3,3'-Dichlorobenzidine      |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4-Dichlorophenol          |                 | 10 U     | 10 U     | 10 U     | 10 U     | R        | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Diethyl phthalate           |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,4-Dimethylphenol          |                 | 10 U     | 10 U     | 10 U     | 10 U     | R        | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Dimethyl phthalate          |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 4,6-Dinitro-2-methylphenol  |                 | 25 U     | 25 U     | 25 U     | 25 U     | R        | 25 U     | 25 U     | 25 U     | 36 U              | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4-Dinitrophenol           |                 | 25 U     | 25 U     | 25 U     | 25 U     | R        | 25 UJ    | 25 U     | 25 U     | 36 U              | 25 U        | 25 U        | 25 U        | 25 U        |
| 2,4-Dinitrotoluene          |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| 2,6-Dinitrotoluene          |                 | 10 U     | 10 U     | 10 U     | 10 U     | 10 UJ    | 10 U     | 10 U     | 10 U     | 14 U              | 10 U        | 10 U        | 10 U        | 10 U        |
| Di-n-octyl phthalate        |                 | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | 14 UJ             | 10 UJ       | 10 UJ       | 10 UJ       | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

t Reporting limit raised due to sample volume limitations.

R Result rejected.

FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: MW-9<br>Date: 7-Oct-92 | MW-9S<br>7-Oct-92 | MW-10<br>6-Oct-92 | MW-10D<br>6-Oct-92 | MW-11D<br>2-Oct-92 | MW-12D<br>5-Oct-92 | MW-13D<br>6-Oct-92 | MW-14<br>1-Oct-92 | ESSO-TAP<br>7-Oct-92 | Field Blank<br>29-Sep-92 | Field Blank<br>30-Sep-92 | Field Blank<br>1-Oct-92 | Field Blank<br>5-Oct-92 |
|----------------------------|-----------------------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|-------------------|----------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| bis(2-Ethylhexyl)phthalate | 10 U                              | 13 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 23 U               | 10 UJ             | 14 U                 | 50 BJ                    | 17 J                     | 15 J                    | 16                      |
| Fluoranthene               | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Fluorene                   | 5 J                               | 9 J               | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Hexachlorobenzene          | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 UJ             | 14 U                 | 10 U                     | 10 UJ                    | 10 UJ                   | 10 U                    |
| Hexachlorobutadiene        | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 UJ                    | 10 U                     | 10 U                    | 10 U                    |
| Hexachlorocyclopentadiene  | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Hexachloroethane           | 10 UJ                             | 10 UJ             | 10 UJ             | 10 UJ              | 10 UJ              | 10 U               | 10 UJ              | 10 U              | 14 UJ                | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Indeno(1,2,3-cd)pyrene     | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Isophorone                 | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 2-Methylnaphthalene        | 1 J                               | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 2-Methylphenol             | 10 U                              | 10 U              | 10 U              | 10 U               | R                  | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 4-Methylphenol             | 10 U                              | 10 U              | 10 U              | 10 U               | R                  | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Naphthalene                | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 2-Nitroaniline             | 25 U                              | 25 U              | 25 U              | 25 U               | 25 UJ              | 25 U               | 25 U               | 25 U              | 36 U                 | 25 U                     | 25 U                     | 25 U                    | 25 U                    |
| 3-Nitroaniline             | 25 U                              | 25 U              | 25 U              | 25 U               | 25 UJ              | 25 U               | 25 U               | 25 U              | 36 U                 | 25 U                     | 25 U                     | 25 U                    | 25 U                    |
| 4-Nitroaniline             | 25 U                              | 25 U              | 25 U              | 25 U               | 25 UJ              | 25 U               | 25 U               | 25 U              | 36 U                 | 25 U                     | 25 U                     | 25 U                    | 25 U                    |
| Nitrobenzene               | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 2-Nitrophenol              | 10 U                              | 10 U              | 10 U              | 10 U               | R                  | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 4-Nitrophenol              | 25 UJ                             | 25 UJ             | 25 UJ             | 25 UJ              | R                  | 25 U               | 25 UJ              | 25 U              | 36 UJ                | 25 UJ                    | 25 U                     | 25 U                    | 25 U                    |
| N-Nitrosodiphenylamine     | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| N-Nitroso-di-n-propylamine | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Pentachlorophenol          | 25 U                              | 25 U              | 25 U              | 25 U               | R                  | 25 UJ              | 25 U               | 25 U              | 36 U                 | 25 UJ                    | 25 U                     | 25 U                    | 25 U                    |
| Phenanthrene               | 10 U                              | 2 J               | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 2 J               | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Phenol                     | 3 J                               | 10 U              | 10 U              | 10 U               | R                  | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| Pyrene                     | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 1,2,4-Trichlorobenzene     | 10 U                              | 10 U              | 10 U              | 10 U               | 10 UJ              | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |
| 2,4,5-Trichlorophenol      | 25 U                              | 25 U              | 25 U              | 25 U               | R                  | 25 U               | 25 U               | 25 U              | 36 U                 | 25 U                     | 25 U                     | 25 U                    | 25 U                    |
| 2,4,6-Trichlorophenol      | 10 U                              | 10 U              | 10 U              | 10 U               | R                  | 10 U               | 10 U               | 10 U              | 14 U                 | 10 U                     | 10 U                     | 10 U                    | 10 U                    |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Analyte is detected in the laboratory blank.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

t Reporting limit raised due to sample volume limitations.

R Result rejected.

FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                     | Sample ID: | Field Blank | Field Blank |
|-----------------------------|------------|-------------|-------------|
|                             | Date:      | 6-Oct-92    | 7-Oct-92    |
| Acenaphthene                |            | 10 U        | 10 U        |
| Acenaphthylene              |            | 10 U        | 10 U        |
| Anthracene                  |            | 10 U        | 10 U        |
| Carbazole                   |            | 10 U        | 10 U        |
| Benzo(a)anthracene          |            | 10 U        | 10 U        |
| Benzo(b)fluoranthene        |            | 10 U        | 10 U        |
| Benzo(k)fluoranthene        |            | 10 U        | 10 U        |
| Benzo(g,h,i)perylene        |            | 10 U        | 10 U        |
| Benzo(a)pyrene              |            | 10 U        | 10 U        |
| 4-Bromophenyl phenyl ether  |            | 10 U        | 10 U        |
| Butyl benzyl phthalate      |            | 10 UJ       | 10 U        |
| 4-Chloroaniline             |            | 10 U        | 10 U        |
| bis(2-Chloroethoxy)methane  |            | 10 U        | 10 U        |
| bis(2-Chloroethyl)ether     |            | 10 U        | 10 U        |
| bis(2-Chloroisopropyl)ether |            | 10 U        | 10 U        |
| 4-Chloro-3-methylphenol     |            | 10 U        | 10 U        |
| 2-Chloronaphthalene         |            | 10 U        | 10 U        |
| 2-Chlorophenol              |            | 10 U        | 10 U        |
| 4-Chlorophenyl phenyl ether |            | 10 U        | 10 U        |
| Chrysene                    |            | 10 U        | 10 U        |
| Dibenz(a,h)anthracene       |            | 10 U        | 10 U        |
| Dibenzofuran                |            | 10 U        | 10 U        |
| Di-n-butyl phthalate        |            | 10 U        | 10 U        |
| 1,2-Dichlorobenzene         |            | 10 U        | 10 U        |
| 1,3-Dichlorobenzene         |            | 10 U        | 10 U        |
| 1,4-Dichlorobenzene         |            | 10 U        | 10 U        |
| 3,3'-Dichlorobenzidine      |            | 10 U        | 10 U        |
| 2,4-Dichlorophenol          |            | 10 U        | 10 U        |
| Diethyl phthalate           |            | 10 U        | 10 U        |
| 2,4-Dimethylphenol          |            | 10 U        | 10 U        |
| Dimethyl phthalate          |            | 10 U        | 10 U        |
| 4,6-Dinitro-2-methylphenol  |            | 25 U        | 25 U        |
| 2,4-Dinitrophenol           |            | 25 U        | 25 U        |
| 2,4-Dinitrotoluene          |            | 10 U        | 10 U        |
| 2,6-Dinitrotoluene          |            | 10 U        | 10 U        |
| Di-n-octyl phthalate        |            | 10 U        | 10 U        |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- B Analyte is detected in the laboratory blank.  
 D Analyte identified at a secondary dilution.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 t Reporting limit raised due to sample volume limitations.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 5-2. Concentrations of Base Neutral and Acid Extractable Organic Compounds in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                    | Sample ID: Field |          | Field |
|----------------------------|------------------|----------|-------|
|                            | Date:            | Blank    | Blank |
|                            | 6-Oct-92         | 7-Oct-92 |       |
| bis(2-Ethylhexyl)phthalate | 16               | 41       |       |
| Fluoranthene               | 10 U             | 10 U     |       |
| Fluorene                   | 10 U             | 10 U     |       |
| Hexachlorobenzene          | 10 U             | 10 U     |       |
| Hexachlorobutadiene        | 10 U             | 10 U     |       |
| Hexachlorocyclopentadiene  | 10 U             | 10 U     |       |
| Hexachloroethane           | 10 U             | 10 U     |       |
| Indeno(1,2,3-cd)pyrene     | 10 U             | 10 U     |       |
| Isophorone                 | 10 U             | 10 U     |       |
| 2-Methylnaphthalene        | 10 U             | 10 U     |       |
| 2-Methylphenol             | 10 U             | 10 U     |       |
| 4-Methylphenol             | 10 U             | 10 U     |       |
| Naphthalene                | 10 U             | 10 U     |       |
| 2-Nitroaniline             | 25 U             | 25 U     |       |
| 3-Nitroaniline             | 25 U             | 25 U     |       |
| 4-Nitroaniline             | 25 U             | 25 U     |       |
| Nitrobenzene               | 10 U             | 10 U     |       |
| 2-Nitrophenol              | 10 U             | 10 U     |       |
| 4-Nitrophenol              | 25 U             | 25 U     |       |
| N-Nitrosodiphenylamine     | 10 U             | 10 U     |       |
| N-Nitroso-di-n-propylamine | 10 U             | 10 U     |       |
| Pentachlorophenol          | 25 U             | 25 U     |       |
| Phenanthrene               | 10 U             | 10 U     |       |
| Phenol                     | 10 U             | 10 U     |       |
| Pyrene                     | 10 U             | 10 U     |       |
| 1,2,4-Trichlorobenzene     | 10 U             | 10 U     |       |
| 2,4,5-Trichlorophenol      | 25 U             | 25 U     |       |
| 2,4,6-Trichlorophenol      | 10 U             | 10 U     |       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Ensco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- B Analyte is detected in the laboratory blank.  
 D Analyte identified at a secondary dilution.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 t Reporting limit raised due to sample volume limitations.  
 R Result rejected.  
 FR Field replicate of previous sample.

**Table 5-3. Concentrations of Total Petroleum Hydrocarbons in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.**

|                              | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|------------------------------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte                      | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| Total Petroleum Hydrocarbons | 0.5 U           | 0.5 U    | 0.5 U    | 0.5 U     | 0.5 U     | 0.5 U     | 0.5 U    | 4.2 J    | 2.2 J    | 0.5 U     | 0.7       | 0.5 U    | 0.5 U    | 0.5 U     |

Analyte concentrations in milligrams per liter (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using USEPA Method 418.1.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

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Table 5-3. Concentrations of Total Petroleum Hydrocarbons in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: MW-9 |          | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP | Field Blank | Field Blank | Field Blank | Field Blank |
|------------------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|
|                              | Date:           | 7-Oct-92 | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92 | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92    |
| Total Petroleum Hydrocarbons |                 | 1.7      | 21 D     | 0.5 U    | 0.5 U    | 0.5 U    | 0.5 U    | 0.5 U    | 0.5 U    | 0.5 U    | 0.5 U       | 0.5 U       | 0.5 U       | 0.5 U       |

Analyte concentrations in milligrams per liter (parts per million [ppm]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using USEPA Method 418.1.

D Analyte identified at a secondary dilution.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

FR Field replicate of previous sample.

TUT 005 1935

Table 5-3. Concentrations of Total Petroleum Hydrocarbons in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                      | Sample ID: | Field<br>Blank | Field<br>Blank |
|------------------------------|------------|----------------|----------------|
|                              | Date:      | 6-Oct-92       | 7-Oct-92       |
| Total Petroleum Hydrocarbons |            | 0.5 U          | 0.5 U          |

Analyte concentrations in milligrams per liter (parts per million [ppm]).  
Analyses were performed by Enseco-East of Somerset, New Jersey, using USEPA Method 418.1.

D Analyte identified at a secondary dilution.  
J Result is detected below the reporting limit and/or is an estimated concentration.  
U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
FR Field replicate of previous sample.

TUT 005 1936

Table 5-4. Concentrations of Total Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|           | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|-----------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte   | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| Aluminum  | 20100           | 19500 J  | 2440     | 3600      | 6790      | 52.9 B    | 1490     | 1140     | 61.9 B   | 16600     | 3640      | 4000     | 973      |           |
| Antimony  | 20 U            | 20 UJ    | 20 U     | 20 U      | 20 U      | 20 U      | 20 U     | 20 U     | 20 U     | 20 U      | 20 U      | 20 U     | 20 U     |           |
| Arsenic   | 2 U             | 2 UJ     | 2 UW     | 2 UW      | 2 UW      | 2 U       | 3.9 B    | 4 B      | 2 UW     | 2 UW      | 2 U       | 2 U      | 2 UW     |           |
| Barium    | 42 B            | 20.8 BJ  | 132 B    | 43.3 B    | 61.8 B    | 7 B       | 167 B    | 167 B    | 2.3 B    | 110 B     | 18.8 B    | 16.5 B   | 72.6 B   |           |
| Beryllium | 1 U             | 1 UJ     | 1 U      | 1 U       | 1 U       | 1 U       | 1 U      | 1 U      | 1 U      | 1 U       | 1 B       | 1 U      | 1 U      |           |
| Cadmium   | 3 U             | 3 UJ     | 3 U      | 3 U       | 3 U       | 3 U       | 3 U      | 3 U      | 3 U      | 3 U       | 3 U       | 3 U      | 3 U      |           |
| Calcium   | 100000          | 38800 J  | 53900    | 56900     | 44700     | 45000     | 40100    | 40100 J  | 6870     | 64600     | 49200     | 51700    | 47500    |           |
| Chromium  | 12.7 U          | 23.4 J   | 4.1 B    | 17.8      | 19        | 4 U       | 15.7     | 12.5     | 208      | 22.5      | 12.7      | 10.4     | 11       |           |
| Cobalt    | 14.5 B          | 14.6 BJ  | 4.8 B    | 5.8 B     | 10.2 B    | 4 U       | 6.9 B    | 6.5 B    | 4 U      | 12.3 B    | 5.1 B     | 4.8 B    | 4 U      |           |
| Copper    | 34.7            | 35.8 J   | 16.4 B   | 16.8 B    | 28        | 7.1 B     | 9.2 B    | 10.9 B   | 4 U      | 56.4      | 19.9 B    | 14.4 B   | 10.2 B   |           |
| Iron      | 19300           | 22000 J  | 2730     | 5050      | 10700     | 89.8 B    | 2280     | 1910     | 411      | 21400     | 5120      | 5470     | 1370     |           |
| Lead      | 8.5 J           | 5.9 J    | 1 UW     | 1.8 BJ    | 2.4 BJ    | 2.3 B     | 1 U      | 1 U      | 1 UW     | 4.7 S     | 1 U       | 1 U      | 1 UW     |           |
| Magnesium | 36400           | 13700 J  | 35500    | 32500     | 36500     | 36900     | 21700    | 21400    | 1870 B   | 41700     | 30300     | 30500    | 35000    |           |
| Manganese | 563             | 423 J    | 85.4     | 1560      | 1020      | 38.9 J    | 407      | 406      | 9.3 B    | 314       | 120 J     | 132 J    | 81.4     |           |
| Mercury   | 0.1 U           | 0.1 UJ   | 0.1 U    | 0.1 U     | 0.1 U     | 0.1 U     | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U     | 0.1 U     | 0.1 U    | 0.1 U    |           |
| Nickel    | 13 B            | 10.3 BJ  | 21.2 B   | 8.7 B     | 15.2 B    | 8 U       | 54.3     | 49       | 62       | 17.1 B    | 8 U       | 8 U      | 25.2 B   |           |
| Potassium | 1910 B          | 13900 J  | 3900 B   | 1710 B    | 2810 B    | 1840 B    | 9310     | 8970     | 783 B    | 3540 B    | 21100     | 22100    | 13800    |           |
| Selenium  | 2.2 BJ          | 2 UJ     | 3.3 B    | 2 U       | 2.6 B     | 2 U       | 2 U      | 2 U      | 2 U      | 3.5 BJ    | 2 UW      | 2 U      | 2 U      |           |
| Silver    | 4 U             | 4 UJ     | 4 U      | 4 U       | 4 U       | 4 U       | 4 U      | 4 U      | 4 U      | 4 U       | 4 U       | 4 U      | 4 U      |           |
| Sodium    | 196000 J        | 506000 J | 226000   | 216000    | 256000    | 228000 J  | 214000   | 213000   | 15600    | 229000    | 199000 J  | 201000 J | 226000   |           |
| Thallium  | 3 UJ            | 3 UJ     | 3 U      | 3 U       | 3 UJ      | 6 U       | 3 U      | 3 U      | 3 U      | 3 UJ      | 3 U       | 3 U      | 3 UJ     |           |
| Vanadium  | 93.1 J          | 64.8 J   | 36.8 B   | 36.2 B    | 64.9      | 38.8 B    | 6.4 B    | 4.9 B    | 4 U      | 110       | 103       | 106      | 42 B     |           |
| Zinc      | 37.7 J          | 44.8 J   | 16.2 B   | 19 B      | 27        | 62.4 J    | 26.1 J   | 26.4 J   | 22.8     | 47        | 16 B      | 17 B     | 7.8 B    |           |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 S Reported value was determined by the Method of Standard Additions (MSA).  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 5-4. Concentrations of Total Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: MW-9 |          | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|
|           | Date:           | 7-Oct-92 | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92 | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92    |
| Aluminum  |                 | 17000    | 13200    | 17300    | 164 B    | 169 B    | 258      | 2690     | 5280     | 443 U    | 84.2 B      | 82.5 B      | 86.3 B      | 46.8 B      |
| Antimony  |                 | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U        | 20 U        | 20 U        | 20 U        |
| Arsenic   |                 | 9.2 J    | R        | 5.5 B    | 2 U      | 2 U      | 2 U      | 2 U      | 2 UW     | 2 U      | 2 UW        | 2 UW        | 2 U         | 2 U         |
| Barium    |                 | 419      | 383      | 482      | 6 B      | 5.1 B    | 6 B      | 138 B    | 123 B    | 17 B     | 1.1 B       | 1 U         | 1 U         | 1 U         |
| Beryllium |                 | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U         | 1 U         | 1 U         | 1 U         |
| Cadmium   |                 | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U         | 3 U         | 3 U         | 3 U         |
| Calcium   |                 | 87400    | 68600    | 46600    | 44600    | 7330     | 9760     | 126000   | 89800    | 8470     | 130 B       | 131 B       | 146 B       | 109 B       |
| Chromium  |                 | 22 U     | 39.8 U   | 19.1     | 4.2 B    | 95.1     | 63.7     | 71.7     | 13.9     | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Cobalt    |                 | 21.4 B   | 17.4 B   | 20.2 B   | 4 U      | 4 U      | 4 U      | 4 U      | 7.3 B    | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Copper    |                 | 50.7 J   | 46 J     | 56.9     | 4 U      | 8.5 B    | 20.7 B   | 12.9 B   | 20.3 B   | 6.5 B    | 6.1 B       | 4 U         | 4 U         | 4 U         |
| Iron      |                 | 25700    | 17300    | 22800    | 281      | 461      | 643      | 674      | 7160     | 371 U    | 73.7 B      | 66.2 B      | 71.7 B      | 54.1 B      |
| Lead      |                 | 8.3 J    | 21.2 J   | 7.6 J    | 1 UJ     | 3.2      | 4.7      | 124 J    | 1.8 B    | 1 UJ     | 1 UW        | 1 U         | 1 U         | 1.1 B       |
| Magnesium |                 | 44600    | 37500    | 28200    | 33600    | 1130 B   | 1950 B   | 654 B    | 42300    | 1040 B   | 257 B       | 240 B       | 125 B       | 117 B       |
| Manganese |                 | 2580     | 1700     | 1450     | 156      | 5.8 B    | 12.6 B   | 15.8     | 2480     | 5.6 B    | 1 B         | 1 B         | 1 U         | 1 U         |
| Mercury   |                 | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       |
| Nickel    |                 | 19.2 B   | 61.8     | 18.1 B   | 8 U      | 10.7 B   | 10.4 B   | 8 U      | 14.6 B   | 8 U      | 8 U         | 8 U         | 8 U         | 8 U         |
| Potassium |                 | 4200 B   | 3790 B   | 9060 J   | 11000 J  | 1280 B   | 1280 B   | 50300 J  | 1300 B   | 914 B    | 560 U       | 560 U       | 560 U       | 560 U       |
| Selenium  |                 | 2 UJ     | 2 UJ     | 2 U      | 2 U      | 2 U      | 2 UW     | 2 U      | 2 UJ     | 2 U      | 2 U         | 2 U         | 2 U         | 2 U         |
| Silver    |                 | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Sodium    |                 | 234000   | 237000   | 200000   | 229000   | 11300 J  | 16200 J  | 215000   | 131000   | 4920 B   | 571 B       | 498 B       | 752 B       | 900 U       |
| Thallium  |                 | 3 U      | 3 U      | 3 UJ     | 3 UJ     | 3 U      | 3 U      | 3 UJ     | 3 U      | 3 U      | 3 U         | 3 U         | 3 U         | 3 U         |
| Vanadium  |                 | 84.1     | 65.1     | 66.9 J   | 69.7 J   | 4 U      | 4 U      | 12.3 B   | 21 B     | 4 B      | 4 U         | 4 U         | 4 U         | 4 U         |
| Zinc      |                 | 97       | 105      | 88.5 J   | 6.7 B    | 19.3 B   | 35 J     | 18.6 B   | 34.9 J   | 22.4     | 2 U         | 3.4 B       | 6 B         | 3.3 B       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).

J Result is detected below the reporting limit and/or is an estimated concentration.

S Reported value was determined by the Method of Standard Additions (MSA).

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

R Result rejected.

FR Field replicate of previous sample.

Table 5-4. Concentrations of Total Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: | Field Blank | Field Blank |
|-----------|------------|-------------|-------------|
|           | Date:      | 6-Oct-92    | 7-Oct-92    |
| Aluminum  |            | 32 U        | 776         |
| Antimony  |            | 20 U        | 20 U        |
| Arsenic   |            | 2 U         | 2 U         |
| Barium    |            | 1 U         | 15.8 B      |
| Beryllium |            | 1 U         | 1 U         |
| Cadmium   |            | 3 U         | 3 U         |
| Calcium   |            | 77.1 B      | 140 B       |
| Chromium  |            | 4 U         | 16.2        |
| Cobalt    |            | 4 U         | 4 U         |
| Copper    |            | 4 U         | 4 U         |
| Iron      |            | 9.5 B       | 820         |
| Lead      |            | 1 UJ        | 1 UJ        |
| Magnesium |            | 39.3 B      | 1320 B      |
| Manganese |            | 1.1 B       | 9.7 B       |
| Mercury   |            | 0.1 U       | 0.1 U       |
| Nickel    |            | 8 U         | 8 U         |
| Potassium |            | 560 U       | 738 B       |
| Selenium  |            | 2 U         | 2 U         |
| Silver    |            | 4 U         | 4 U         |
| Sodium    |            | 799 B       | 523 B       |
| Thallium  |            | 3 U         | 3 U         |
| Vanadium  |            | 4 U         | 5.2 B       |
| Zinc      |            | 2.3 B       | 4.4 B       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 S Reported value was determined by the Method of Standard Additions (MSA).  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 5-5. Concentrations of Dissolved Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|           | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|-----------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte   | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| Aluminum  |                 | 32 U     | 230      | 33.4 B    | 71.7 B    | 36.5 B    | 90 B     | 34.9 B   | 36.1 B   | 58 B      | 57.8 B    | 32 U     | 32 U     | 46.8 B    |
| Antimony  |                 | 20 U     | 20 U     | 20 U      | 20 U      | 20 U      | 20 U     | 20 U     | 24.8 B   | 20 U      | 20 U      | 20.1 B   | 20 U     | 20 U      |
| Arsenic   |                 | 2 UW     | 2 U      | 2 U       | 2 U       | 2 U       | 2 UW     | 3.9 B    | 3.9 B    | 2 U       | 2 U       | 2 UW     | 2 UW     | 2 U       |
| Barium    |                 | 114 B    | 123 B    | 123 B     | 36.9 B    | 56.2 B    | 7.6 B    | 172 B    | 162 B    | 2.4 B     | 95.3 B    | 4.8 B    | 7.4 B    | 72.6 B    |
| Beryllium |                 | 1 U      | 1 U      | 1 U       | 1 U       | 1 U       | 1 U      | 1 U      | 1 U      | 1 U       | 1 U       | 1 U      | 1 U      | 1 U       |
| Cadmium   |                 | 3 U      | 3 U      | 3 U       | 3 U       | 3 U       | 3 U      | 3 U      | 3 U      | 3 U       | 3 U       | 3 U      | 3 U      | 3 U       |
| Calcium   |                 | 60400    | 11600    | 53800     | 57100     | 44000     | 45700    | 40300    | 39500 J  | 7090      | 48700     | 41200    | 41100    | 50200     |
| Chromium  |                 | 4 U      | 4 U      | 4 U       | 4 U       | 4 U       | 4 U      | 4 U      | 4 U      | 195       | 4 U       | 4 U      | 4 U      | 4 U       |
| Cobalt    |                 | 4 U      | 4 U      | 4 U       | 4 U       | 4 U       | 4 U      | 4 U      | 5.4 B    | 4 U       | 4 U       | 4 U      | 4 U      | 4 U       |
| Copper    |                 | 4 U      | 4 U      | 4 U       | 4 U       | 4 U       | 4 U      | 4 U      | 4 U      | 4 U       | 4 U       | 4 U      | 4 U      | 4.1 B     |
| Iron      |                 | 15.7 B   | 27.1 B   | 30.6 B    | 55.6 B    | 21.6 B    | 39.8 B   | 278      | 278      | 26.8 B    | 53.1 B    | 7 U      | 10.5 B   | 28.5 B    |
| Lead      |                 | 1 U      | 1 U      | 1 U       | 1 U       | 1 U       | 2.4 B    | 1 U      | 1 U      | 1 U       | 1 U       | 1 U      | 1 U      | 1 U       |
| Magnesium |                 | 28600    | 2450 B   | 36800     | 32500     | 34000     | 38800    | 21600    | 23200    | 1910 B    | 32700     | 28600    | 28700    | 34900     |
| Manganese |                 | 42.7     | 2.8 B    | 40        | 1490      | 650       | 45.8 J   | 373      | 383      | 1 U       | 43.2      | 1.2 B    | 2 B      | 45.6      |
| Mercury   |                 | 0.1 U    | 0.1 U    | 0.1 U     | 0.1 U     | 0.1 U     | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U     | 0.1 U     | 0.1 U    | 0.1 U    | 0.1 U     |
| Nickel    |                 | 8 U      | 8 U      | 23.3 B    | 8 U       | 8 U       | 8 U      | 39.7 B   | 48.8     | 54.1      | 8 U       | 8 U      | 8 U      | 18 B      |
| Potassium |                 | 1570 B   | 14400    | 3270 B    | 1130 B    | 2200 B    | 2250 B   | 9850     | 9380     | 560 U     | 3220 B    | 20100    | 22400    | 13100     |
| Selenium  |                 | 2 U      | 2 U      | 2 U       | 2 UJ      | 2 U       | 2.3 B    | 2 U      | 2 U      | 3.2 B     | 10 U      | 2.1 B    | 2 U      | 2 U       |
| Silver    |                 | 4 U      | 4 U      | 4 U       | 4 U       | 4 U       | 4 U      | 4 U      | 4 U      | 4 U       | 4 U       | 4 U      | 4 U      | 4 U       |
| Sodium    |                 | 219000 J | 164000   | 241000    | 233000    | 267000    | 242000   | 233000   | 236000   | 16100     | 247000    | 209000   | 211000   | 236000    |
| Thallium  |                 | 3 UW     | 3 UJ     | 3 UJ      | 3 UJ      | 3 UJ      | 3 U      | 3 UJ     | 3 UJ     | 3 U       | 3 UJ      | 3 UW     | 3 U      | 3 UJ      |
| Vanadium  |                 | 48.3 B   | 9.1 B    | 32.9 B    | 23.8 B    | 33.7 B    | 40.6 B   | 4 U      | 4 U      | 4 U       | 42.8 B    | 96.8     | 99.2     | 42.1 B    |
| Zinc      |                 | 32       | 6 B      | 10.1 B    | 12 B      | 8.7 B     | 67.5     | 7.5 B    | 5.6 B    | 4.8 B     | 10.1 B    | 3.9 B    | 7.4 B    | 4.3 B     |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

- B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 S Reported value was determined by the Method of Standard Additions (MSA).  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.  
 R Result rejected.  
 FR Field replicate of previous sample.

Table 5-5. Concentrations of Dissolved Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: MW-9 | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP | Field Blank | Field Blank | Field Blank | Field Blank |
|-----------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|
|           | Date: 7-Oct-92  | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92 | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92    |
| Aluminum  | 95.6 B          | 32 U     | 67.9 B   | 32 U     | 94.9 B   | 138 B    | 2180     | 42 B     | 75.2 B   | 32 U        | 32 U        | 32 U        | 32 U        |
| Antimony  | 20 U            | 21 B     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U     | 20 U        | 20 U        | 20 U        | 20 U        |
| Arsenic   | 11 J            | R        | 7.4 BJ   | 2 UW     | 2 U      | 2 UW     | 2 U      | 2 U      | 2 UW     | 2 U         | 2 U         | 2 U         | 2 U         |
| Barium    | 408             | 365      | 472      | 5.3 B    | 4.3 B    | 4.9 B    | 121 B    | 114 B    | 9.5 B    | 1 U         | 1 U         | 1 U         | 1 U         |
| Beryllium | 1 U             | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U      | 1 U         | 1 U         | 1 U         | 1 U         |
| Cadmium   | 3 U             | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U      | 3 U         | 3 U         | 3 U         | 3 U         |
| Calcium   | 67100           | 60900    | 43700    | 45000    | 6950     | 8870     | 105000   | 88200    | 8760     | 46.1 B      | 73.7 B      | 75.8 B      | 73.8 B      |
| Chromium  | 4 U             | 4 U      | 4 U      | 4 U      | 79.4     | 49 J     | 66.8     | 4 U      | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Cobalt    | 4 U             | 4 U      | 4.3 B    | 4 U      | 4 U      | 4 U      | 4 U      | 5.4 B    | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Copper    | 4 U             | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 7.2 B    | 4 U      | 5.5 B    | 4 U         | 4 U         | 4 U         | 4 U         |
| Iron      | 97 B            | 27.2 B   | 59.1 B   | 7 U      | 28.7 B   | 27.7 B   | 12 B     | 857      | 7 U      | 14.9 B      | 12.6 B      | 20.4 B      | 10.9 B      |
| Lead      | 1.6 B           | 1.3 B    | 1 U      | 1 U      | 1 U      | 1 U      | 81.5 S   | 1 U      | 1 U      | 1 U         | 1 U         | 1 U         | 1 U         |
| Magnesium | 32700           | 28400    | 22400    | 34300    | 1090 B   | 1930 B   | 35 U     | 41800    | 438 B    | 44.3 B      | 57.6 B      | 86.6 B      | 35 U        |
| Manganese | 1760            | 1350     | 1000     | 143      | 1 U      | 1.5 B    | 1.1 B    | 2470     | 2.3 B    | 1 U         | 1 U         | 1 U         | 1 U         |
| Mercury   | 0.1 U           | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U    | 0.1 U       | 0.1 U       | 0.1 U       | 0.1 U       |
| Nickel    | 8 U             | 15.2 B   | 8 U      | 8 U      | 8 U      | 8 U      | 8 U      | 8 U      | 8 U      | 8 U         | 8 U         | 8 U         | 8 U         |
| Potassium | 3730 B          | 3240 B   | 8490     | 10900    | 1420 B   | 1470 B   | 52800    | 1440 B   | 909 B    | 560 U       | 560 U       | 560 U       | 560 U       |
| Selenium  | 2 U             | 2 U      | 2 U      | 2 U      | 2.2 BJ   | 2 U      | 2 U      | 2 U      | 2 U      | 2 U         | 2 UW        | 2 U         | 2 U         |
| Silver    | 4 U             | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Sodium    | 238000          | 244000   | 214000   | 235000   | 12200    | 17700    | 236000   | 139000   | 5620     | 379 B       | 391 B       | 450 B       | 900 U       |
| Thallium  | 3 U             | 3 UW     | 3 UW     | 3 UJ     | 3 U      | 3 U      | 3 UJ     | 3 UJ     | 3 UW     | 3 U         | 3 U         | 3 U         | 3 U         |
| Vanadium  | 25.1 B          | 15.9 B   | 21.9 B   | 72.1     | 4 U      | 4 U      | 10.9 B   | 4.7 B    | 4 U      | 4 U         | 4 U         | 4 U         | 4 U         |
| Zinc      | 28.9 J          | 20.1 J   | 55.8     | 12.5 B   | 4.3 B    | 5.8 B    | 7.2 B    | 15.8 B   | 16.4 B   | 2 U         | 2 U         | 2.1 B       | 3.7 B       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).

J Result is detected below the reporting limit and/or is an estimated concentration.

S Reported value was determined by the Method of Standard Additions (MSA).

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.

R Result rejected.

FR Field replicate of previous sample.

Table 5-5. Concentrations of Dissolved Metals in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte   | Sample ID: Field | Field    |
|-----------|------------------|----------|
|           | Blank            | Blank    |
| Date:     | 6-Oct-92         | 7-Oct-92 |
| Aluminum  | 32 U             | 32 U     |
| Antimony  | 20 U             | 20 U     |
| Arsenic   | 2 U              | 2 U      |
| Barium    | 1 U              | 1 U      |
| Beryllium | 1 U              | 1 U      |
| Cadmium   | 3 U              | 3 U      |
| Calcium   | 84.9 B           | 67.7 B   |
| Chromium  | 4 U              | 4 U      |
| Cobalt    | 4 U              | 4 U      |
| Copper    | 4 U              | 4 U      |
| Iron      | 10.9 B           | 7 U      |
| Lead      | 1 U              | 1 U      |
| Magnesium | 35 U             | 35 U     |
| Manganese | 1 U              | 1 U      |
| Mercury   | 0.1 U            | 0.1 U    |
| Nickel    | 8 U              | 8 U      |
| Potassium | 560 U            | 560 U    |
| Selenium  | 2 U              | 2 U      |
| Silver    | 4 U              | 4 U      |
| Sodium    | 65.1 B           | 692 B    |
| Thallium  | 3 U              | 3 U      |
| Vanadium  | 4 U              | 4 U      |
| Zinc      | 3.1 B            | 2.3 B    |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

B Reported value is between contract required detection limit (CRDL) and instrument detection limit (IDL).  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 S Reported value was determined by the Method of Standard Additions (MSA).  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 W Post-digestion spike for graphite furnace atomic absorption (GFAA) out of control limits.  
 R Result rejected.  
 FR Field replicate of previous sample.



Table 5-6. Concentrations of Total Cyanide in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                | Sample ID: MW-1 | MW-1D    | MW-2     | MW-3      | MW-4      | MW-4D     | MW-5     | MW-5 FR  | MW-6D    | MW-6R     | MW-7      | MW-7 FR  | MW-8     |           |
|----------------|-----------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|----------|----------|-----------|
| Analyte        | Date:           | 6-Oct-92 | 2-Oct-92 | 30-Sep-92 | 30-Sep-92 | 30-Sep-92 | 5-Oct-92 | 1-Oct-92 | 1-Oct-92 | 30-Sep-92 | 29-Sep-92 | 5-Oct-92 | 5-Oct-92 | 29-Sep-92 |
| Cyanide, Total |                 | 10 UJ    | 10 UJ    | 10 UJ     | 10 UJ     | 10 UJ     | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ     | R         | 10 UJ    | 10 UJ    | R         |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.

TUT 005 1943

Table 5-6. Concentrations of Total Cyanide in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                | Sample ID: MW-9 | MW-9S    | MW-10    | MW-10D   | MW-11D   | MW-12D   | MW-13D   | MW-14    | ESSO-TAP | Field Blank | Field Blank | Field Blank | Field Blank |          |
|----------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|----------|
| Analyte        | Date:           | 7-Oct-92 | 7-Oct-92 | 6-Oct-92 | 6-Oct-92 | 2-Oct-92 | 5-Oct-92 | 6-Oct-92 | 1-Oct-92 | 7-Oct-92    | 29-Sep-92   | 30-Sep-92   | 1-Oct-92    | 5-Oct-92 |
| Cyanide, Total |                 | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ    | R        | 10 UJ    | 10 UJ    | 10 UJ    | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ       | 10 UJ    |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.

TUT 005 1944

**Table 5-6. Concentrations of Total Cyanide in Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.**

| Analyte        | Sample ID: Field Blank |          | Field Blank |
|----------------|------------------------|----------|-------------|
|                | Date:                  | 6-Oct-92 | 7-Oct-92    |
| Cyanide, Total |                        | 10 UJ    | 10 UJ       |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Result rejected.  
 FR Field replicate of previous sample.

TUT 005 1945

Table 5-7. Concentrations of Volatile Organic Compounds in Ground-Water Samples Collected in October and November 1992 During the Pumping Test, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analyte                        | Sample ID:<br>Date: | Water<br>Treatment<br>Effluent<br>30-Oct-92 | Water<br>Treatment<br>Effluent<br>2-Nov-92 | Water<br>Treatment<br>Effluent<br>3-Nov-92 | Water<br>Treatment<br>Effluent<br>4-Nov-92 | Water<br>Treatment<br>Effluent<br>5-Nov-92 | Water<br>Treatment<br>Effluent<br>6-Nov-92 | Water<br>Treatment<br>Influent<br>30-Oct-92 | Water<br>Treatment<br>Influent<br>2-Nov-92 | Water<br>Treatment<br>Influent<br>3-Nov-92 | Water<br>Treatment<br>Influent<br>4-Nov-92 | Water<br>Treatment<br>Influent<br>5-Nov-92 | Water<br>Treatment<br>Influent<br>6-Nov-92 | Trip Blank<br>30-Oct-92 |
|--------------------------------|---------------------|---------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|---------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|-------------------------|
| 1,2-Dibromoethane (EDB)        |                     | 5 U                                         | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                         | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                     |
| tert-Butyl methyl ether        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 38                                          | 60                                         | 120                                        | 170                                        | 160                                        | 160                                        | 10 U                    |
| n-Propylbenzene                |                     | 5 U                                         | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                         | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                                        | 5 U                     |
| Chloromethane                  |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Bromomethane                   |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Vinyl chloride                 |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Chloroethane                   |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Methylene chloride             |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                     |
| Acetone                        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 4 J                                         | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 4 J                     |
| Carbon disulfide               |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,1-Dichloroethene             |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,1-Dichloroethane             |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,2-Dichloroethene (cis/trans) |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 71                                          | 110                                        | 120                                        | 170                                        | 150                                        | 160                                        | 10 U                    |
| Chloroform                     |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 1 J                                         | 2 J                                        | 2 J                                        | 3 J                                        | 2 J                                        | 2 J                                        | 10 U                    |
| 1,2-Dichloroethane             |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 2-Butanone                     |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 19                                          | 2 J                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,1,1-Trichloroethane          |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 1 J                                        | 2 J                                        | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                                        | 10 U                    |
| Carbon tetrachloride           |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Bromodichloromethane           |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,2-Dichloropropane            |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| trans-1,3-Dichloropropene      |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Trichloroethene                |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 6 J                                        | 10                                         | 6 J                                         | 10                                         | 12                                         | 17                                         | 15                                         | 24                                         | 10 U                    |
| Dibromochloromethane           |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,1,2-Trichloroethane          |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Benzene                        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                                         | 3 J                                        | 7 J                                        | 14                                         | 13                                         | 12                                         | 10 U                    |
| cis-1,3-Dichloropropene        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Bromoform                      |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 4-Methyl-2-pentanone           |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 2-Hexanone                     |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| 1,1,2,2-Tetrachloroethane      |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Tetrachloroethene              |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                                        | 4 J                                        | 20                                          | 39                                         | 49                                         | 65                                         | 60                                         | 62                                         | 10 U                    |
| Toluene                        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 1 J                                        | 2 J                                        | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                                        | 10 U                    |
| Chlorobenzene                  |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Ethylbenzene                   |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 2 J                                        | 3 J                                        | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 3 J                                        | 10 U                    |
| Styrene                        |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                                       | 10 U                    |
| Xylenes (total)                |                     | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 6 J                                        | 10                                         | 10 U                                        | 10 U                                       | 10 U                                       | 10 U                                       | 1 J                                        | 14                                         | 10 U                    |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

Table 5-7. Concentrations of Volatile Organic Compounds in Ground-Water Samples Collected in October and November 1992 During the Pumping Test, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

|                                | Sample ID: Trip Blank | Trip Blank | Trip Blank | Trip Blank |          |
|--------------------------------|-----------------------|------------|------------|------------|----------|
| Analyte                        | Date:                 | 2-Nov-92   | 3-Nov-92   | 4-Nov-92   | 5-Nov-92 |
| 1,2-Dibromoethane (EDB)        |                       | 5 U        | 5 U        | 5 U        | 5 U      |
| tert-Butyl methyl ether        |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| n-Propylbenzene                |                       | 5 U        | 5 U        | 5 U        | 5 U      |
| Chloromethane                  |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Bromomethane                   |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Vinyl chloride                 |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Chloroethane                   |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Methylene chloride             |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Acetone                        |                       | 5 U        | 10 U       | 10 U       | 10 U     |
| Carbon disulfide               |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,1-Dichloroethene             |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,1-Dichloroethane             |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,2-Dichloroethene (cis/trans) |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Chloroform                     |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,2-Dichloroethane             |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 2-Butanone                     |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,1,1-Trichloroethane          |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Carbon tetrachloride           |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Bromodichloromethane           |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,2-Dichloropropane            |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| trans-1,3-Dichloropropene      |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Trichloroethene                |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Dibromochloromethane           |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,1,2-Trichloroethane          |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Benzene                        |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| cis-1,3-Dichloropropene        |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Bromoform                      |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 4-Methyl-2-pentanone           |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 2-Hexanone                     |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| 1,1,2,2-Tetrachloroethane      |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Tetrachloroethene              |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Toluene                        |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Chlorobenzene                  |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Ethylbenzene                   |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Styrene                        |                       | 10 U       | 10 U       | 10 U       | 10 U     |
| Xylenes (total)                |                       | 10 U       | 10 U       | 10 U       | 10 U     |

Analyte concentrations in micrograms per liter (parts per billion [ppb]).

Analyses were performed by Enseco-East of Somerset, New Jersey, using March 1990 Contract Laboratory Program (CLP) protocols.

J Result is detected below the reporting limit and/or is an estimated concentration.

U Compound or element analyzed for, but not detected at the corresponding reporting limit.

DATE: 12/17/92

PRJCT. NO.: PR01301

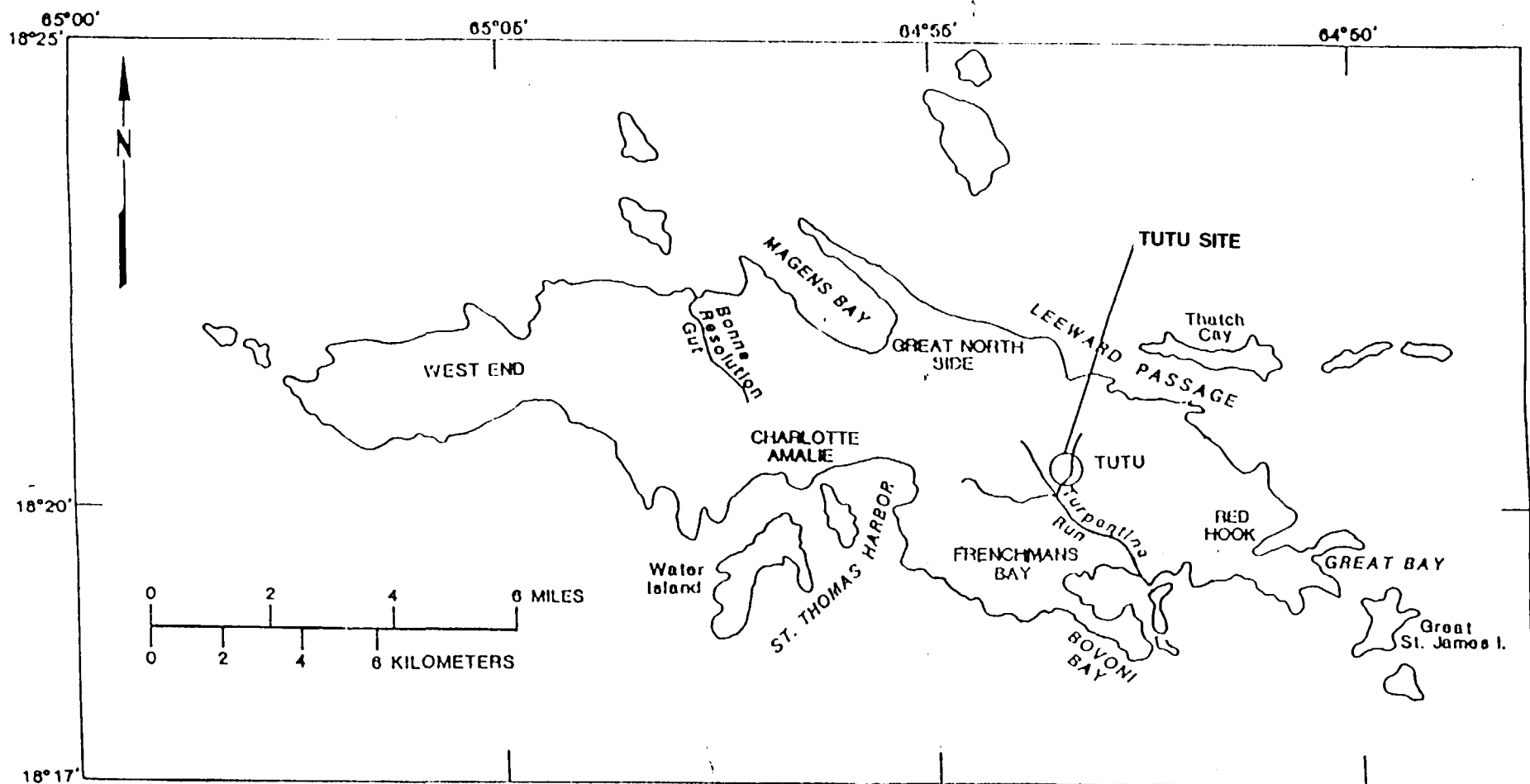
FILE NO.:

CAD FILE: NON-CAD

COMPILER: W.MORALES

MGR.:

DRAFTER: E.CALDERON



SCALE

**GERAGHTY  
& MILLER, INC.**  
Environmental Services

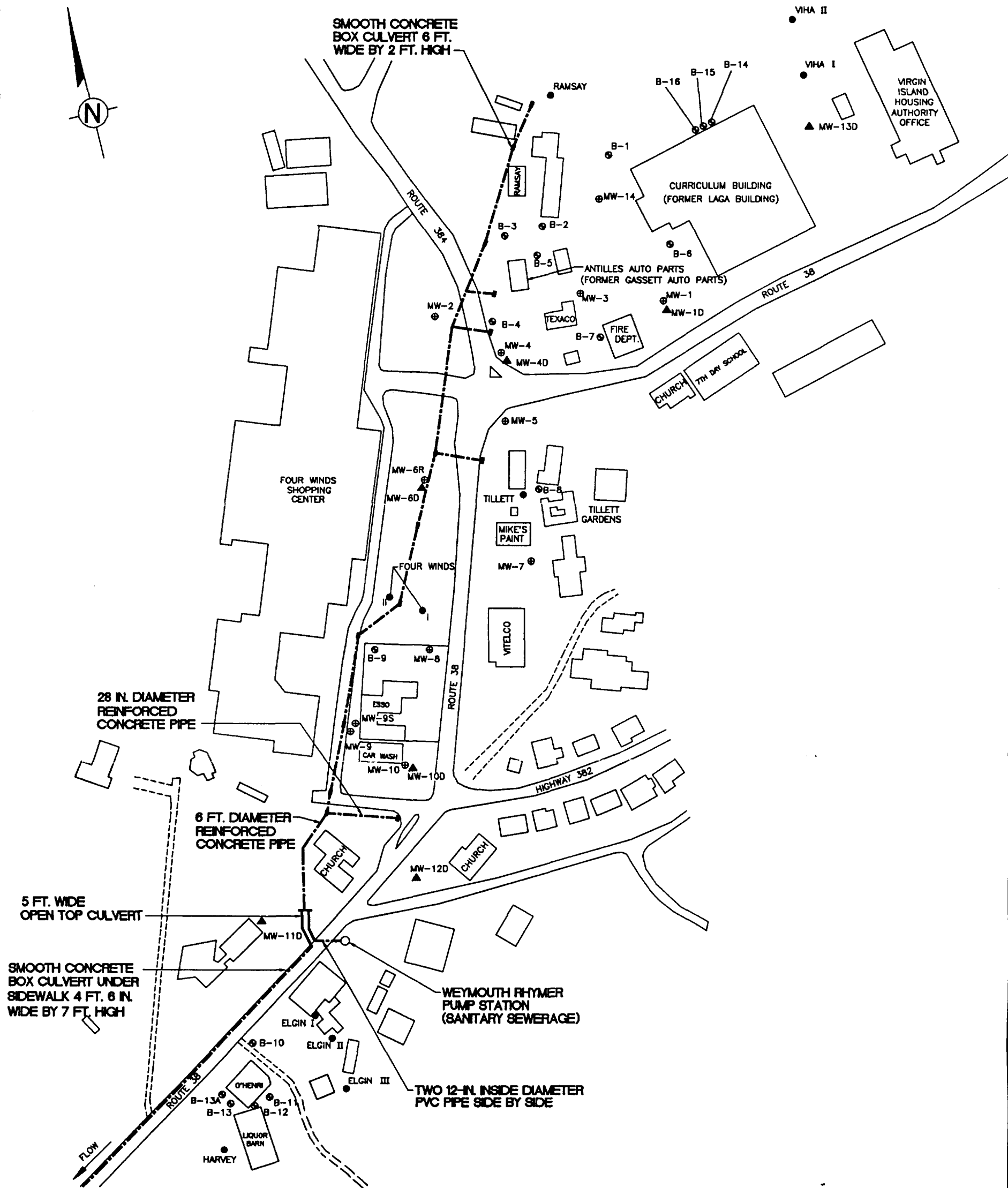
# **SITE LOCATION** **TUTU SERVICE STATION INVESTIGATION** **ST. THOMAS U.S. VIRGIN ISLANDS**

FIGURE

**1-1**

TUT 005 1948

46764



LEGEND

- SOIL BORING
- ⊙ SHALLOW MONITORING WELL
- ▲ DEEPER MONITORING WELL
- EXISTING SUPPLY WELL
- FT. FEET
- IN. INCH

SCALE  
(APPROXIMATE)  
0 200 FEET

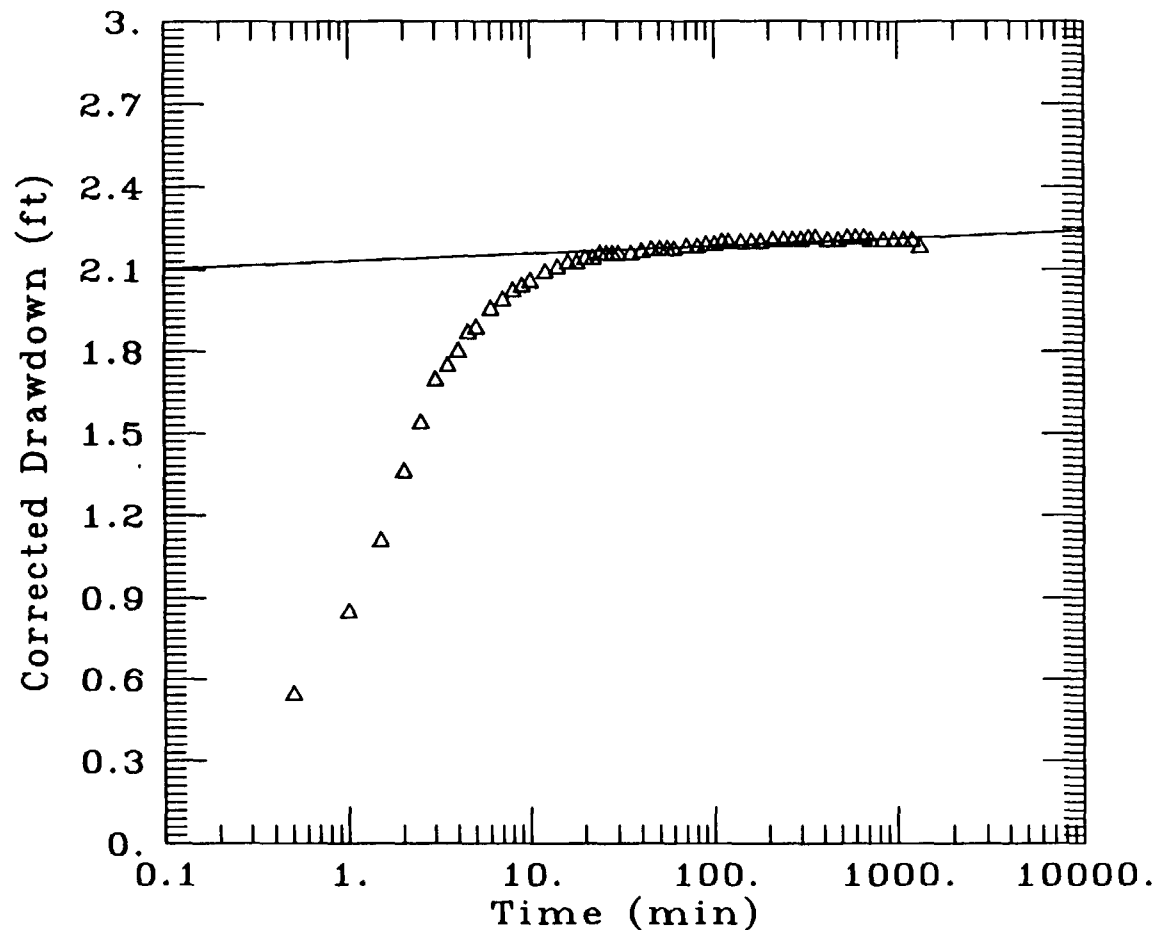


STORM SEWER LAYOUT

TUTU SERVICE STATION INVESTIGATION  
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

3-6



## DATA SET.

mw6r-6r. dra

02/11/93

## AQUIFER TYPE.

UNCONFINED

## SOLUTION METHOD.

Cooper-Jacob

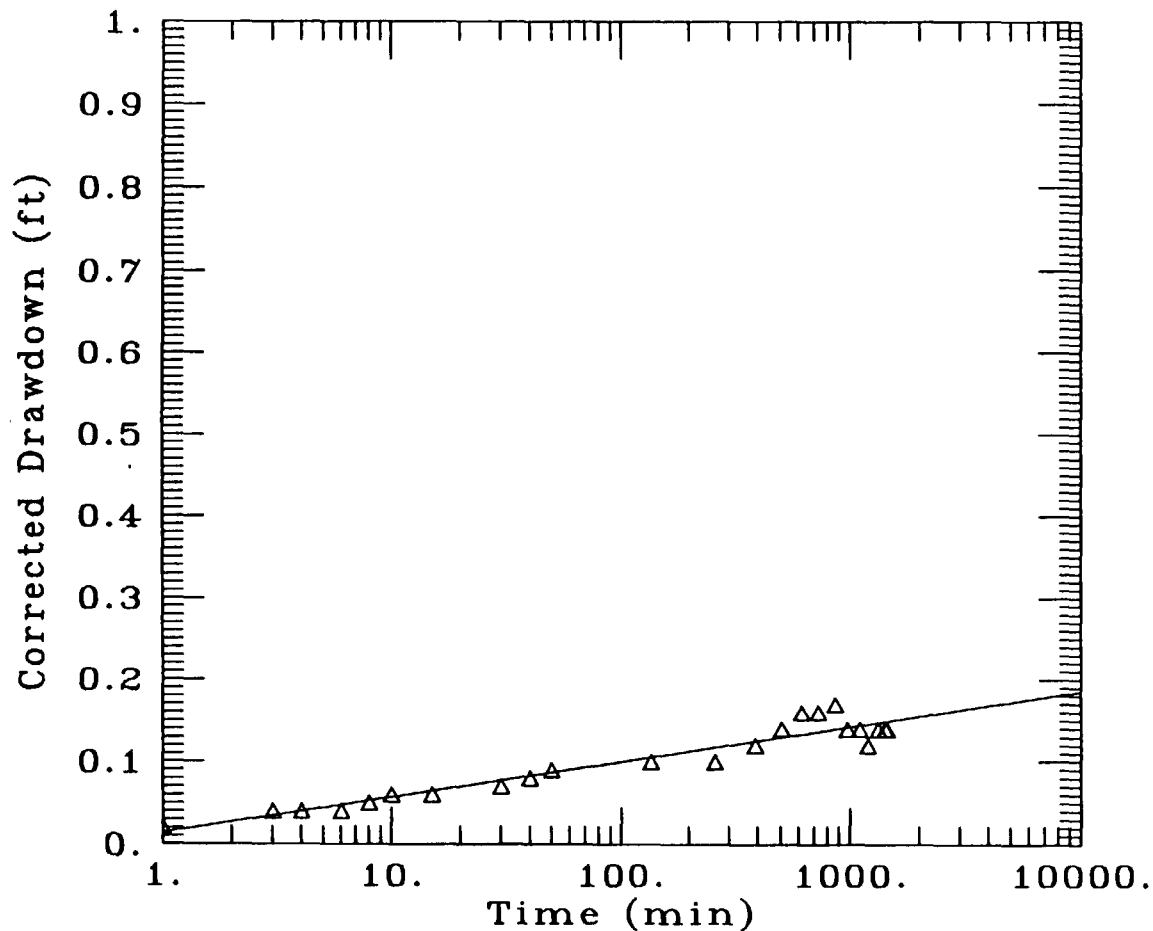
## ESTIMATED PARAMETERS.

 $T = 8.39 \text{ ft}^2/\text{min}$ 

## TEST DATA.

 $Q = 1.24 \text{ ft}^3/\text{min}$  $r = 0.17 \text{ ft}$  $b = 14.0 \text{ ft}$





DATA SET.

cht6-6d.n

02/11/93

AQUIFER TYPE.

UNCONFINED

SOLUTION METHOD.

Cooper-Jacob

ESTIMATED PARAMETERS.

$T = 8.14 \text{ ft}^2/\text{min}$

$S = 0.0007054$

TEST DATA.

$Q = 1.9 \text{ ft}^3/\text{min}$

$r = 110. \text{ ft}$

$b = 57.0 \text{ ft}$

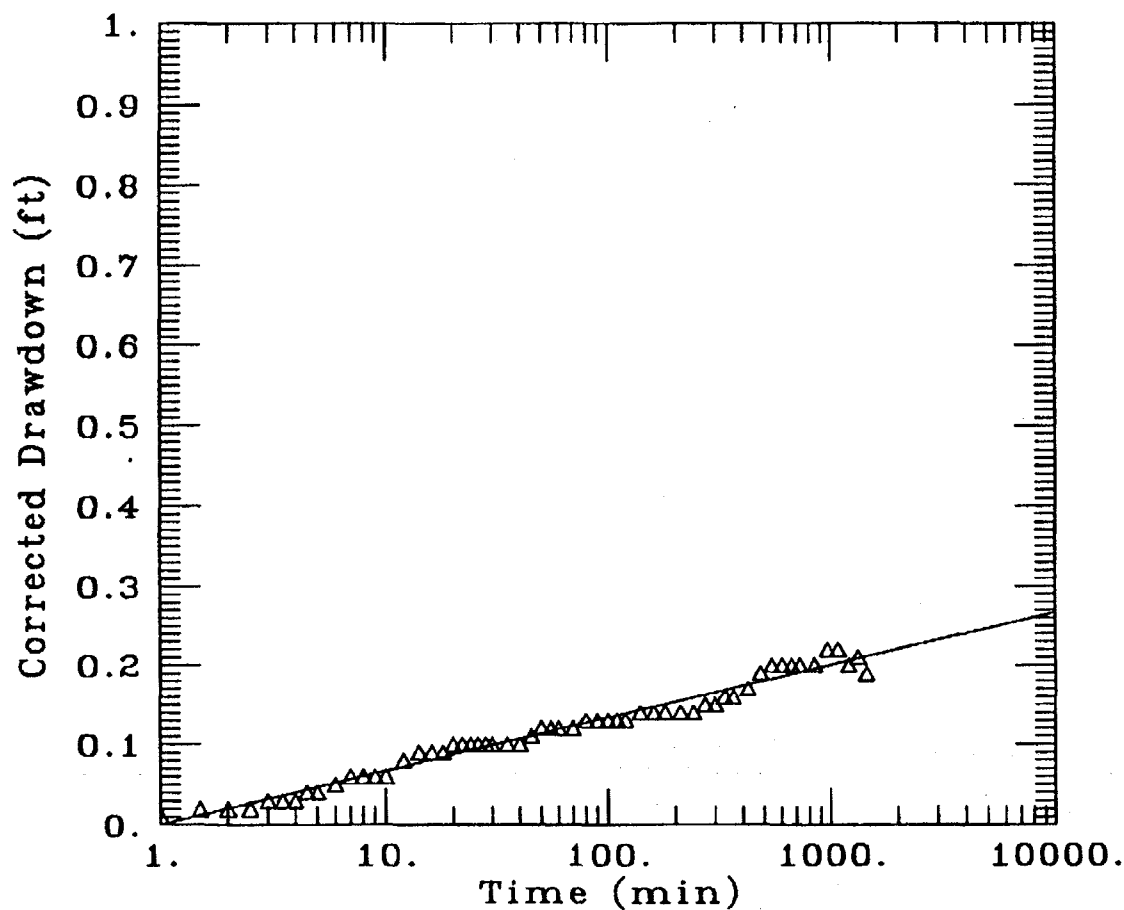


MONITORING WELL CHT-6D DRAWDOWN DATA,  
PUMP TEST OF MW-6D

TUTU SERVICE STATION INVESTIGATION  
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

3-8



DATA SET.

nw6d-6d.dra

02/11/93

AQUIFER TYPE.

UNCONFINED

SOLUTION METHOD.

Cooper-Jacob

ESTIMATED PARAMETERS.

$T = 5.225 \text{ ft}^2/\text{min}$

TEST DATA.

$Q = 1.9 \text{ ft}^3/\text{min}$

$r = 0.23 \text{ ft}$

$b = 65.0 \text{ ft}$



# MONITORING WELL MW-6D DRAWDOWN DATA, PUMP TEST OF MW-6D

TUTU SERVICE STATION INVESTIGATION  
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

3-9

**APPENDIX A**  
**GEOLOGIC LOGS**

GEOLOGIC LOGS  
TUTU SERVICE STATION  
ST. THOMAS, U.S. VIRGIN ISLANDS

DRAFT

**Geologic Log of B-1  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

CLAY; some Silt; little Rock Fragments, Small to Medium;  
trace Sand, Fine to Coarse; trace Gravel, Fine; Stiff to  
very stiff, dry, brown to light brown.

SILT; trace Clay; trace Sand, Very Fine; Stiff, moist,  
brown to tan.

Top of weathered bedrock inferred at 10.4 feet below land  
surface.

Sampled Interval  
(feet below land surface)

0 - 8.5

8.5 - 10.3

DRAFT

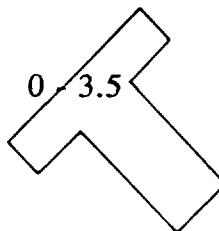
**Geologic Log of B-2  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

CLAY; some to trace Silt, trace Sand, Medium to Coarse;  
trace Rock Fragments; trace Root; Hard, dry, brown,  
reddish brown to red.

Top of bedrock inferred at 3.5 feet below land surface.

Sampled Interval  
(feet below land surface)



D  
R  
A  
F  
T

**Geologic Log of B-3  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

CLAY and SILT; little Rock Fragments, Small to Medium;  
trace Sand, Fine to very Coarse; trace Gravel, Fine;  
trace Root; Hard, dry, brown, black stains.

Top of weathered bedrock inferred at 3.3 feet below  
land surface.

Sampled Interval  
(feet below land surface)

0 - 3.3

D  
R  
A  
F  
T

**Geologic Log of B-4  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sample Interval  
(feet below land surface)

FILL

0 - 0.5

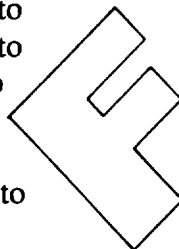
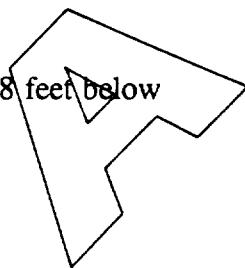
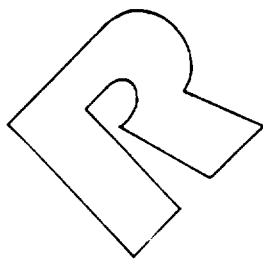
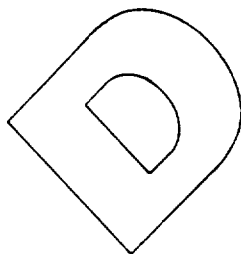
CLAY; some to little Silt; trace to little Sand, Medium to Coarse, Fine to Medium; trace Rock Fragments, Small to Large; trace Gravel, Fine; Hard, dry to moist, brown to reddish brown, greenish gray.

0.5 - 10.0

ROCK FRAGMENTS, Small to large; little Sand, Fine to Medium; little Silt; trace Clay; trace Sand, Coarse; Very hard, saturated, light gray.

10.0 - 10.8

Top of weathered bedrock inferred at 10.8 feet below land surface.





**Geologic Log of B-5  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

ASPHALT

CLAY; little Silt; little to trace Sand, Fine to Coarse; trace Gravel, Fine; trace Organic Material, Wood; Very stiff to very hard, dry, gray to reddish brown.

Top of bedrock inferred at 2.8 feet below land surface.

Sampled Interval  
(feet below land surface)

0 - 0.35

0.35 - 2.8

D

R

A

E

**Geologic Log of B-6  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

CLAY; some to little Silt; little Rock Fragments  
Small to Medium; trace Sand, Fine to Coarse; trace  
Root; Peat layer (2.5 - 2.9'); Hard to very stiff,  
dry, brown to dark brown, dark gray to black.

Bedrock, Highly Altered; Weak, grayish green.

Top of competent bedrock inferred at 7.3 feet below  
land surface.

Sample Interval  
(feet below land surface)

0 - 6.4

6.4 - 7.3

D  
R  
A  
F  
T

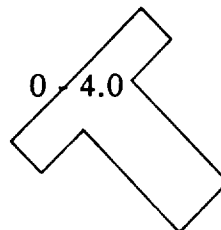
**Geologic Log of B-7  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

FILL, SILT; little Rock Fragments, Small; trace  
Clay; trace Sand, Fine to Coarse; trace Root;  
Hard, dry, light brown.

Auger resusal at 3.0 feet below land surface.

Sampled Interval  
(feet below land surface)



D  
R  
A  
F  
T

**Geologic Log of B-8  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sample Interval  
(feet below land surface)

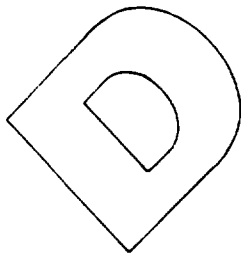
CONCRETE SLAB

0 - 0.3

FILL, CLAY; some Silt; trace Sand, Medium to Coarse  
trace Gravel, Fine; trace Rock Fragments, Small;  
trace Root; Very stiff to very hard, dry, brown to  
reddish brown.

0.3 - 3.6

Top of weathered bedrock inferred at 3.6 feet below  
land surface.



**Geologic Log of B-9  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

ASPHALT

FILL, CLAY; some Silt; little Rock Fragments,  
Small to Medium; trace Sand, Fine to Coarse;  
trace Gravel, Fine; Very Stiff, dry, dark gray  
to reddish brown.

Top of weathered bedrock inferred at 5.1 feet  
below land surface.

Sampled Interval  
(feet below land surface)

0 - 0.2

0.2 - 5.1

D

R

A

E

**Geologic Log of B-10**  
**Tutu Service Station Investigation**  
**St. Thomas, U.S. Virgin Islands**

Description

FILL, CLAY; some to little Silt; little Rock Fragments, Small to Medium; little to trace Sand, Fine to Medium; Very stiff to hard, dry to wet, brown to dark brown.

CLAY; little Silt; little Rock Fragments, Small to Medium; little Gravel, Fine to Medium; trace Sand, Coarse to very Coarse; Very hard, brown, moist to wet.

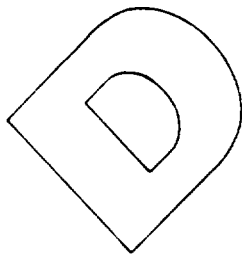
Top of bedrock not encountered.

Water encountered at 7.9 feet below land surface.

Sample Interval  
(feet below land surface)

0 - 5.3

5.3 - 7.8



**Geologic Log of B-11  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

CONCRETE SLAB

CLAY; some Silt; little Rock Fragments, Small;  
trace Sand, Fine to Medium; trace Root; Very  
stiff to hard, dry, brown.

Top of bedrock inferred at 3.5 feet below land  
surface.

0 - 0.6

0.6 - 3.5

D  
R  
A  
F  
T

**Geologic Log of B-12  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

CONCRETE SLAB

CLAY; some to little Silt; little Gravel  
Fine to Medium; trace to some Rock Fragments  
Small to Medium; trace to little Sand, Fine  
to Coarse; trace Peat, trace Root; Medium  
stiff to hard, moist, brown, gray, tan.

Top of weathered bedrock inferred at 8.4 feet  
below land surface.

0 - 0.5

0.5 - 8.4

D

R

A

E



**Geologic Log of B-13  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sample Interval  
(feet below land surface)

FILL, SILT; some Clay; little Gravel  
Fine to Medium; trace Rock Fragments,  
Small to Medium; trace Root, Hard, dry  
brown.

Highly weathered rock fragments; Very weak; Gray.

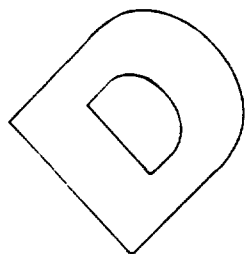
CLAY; some Silt; little Sand, Medium to  
Coarse; Very stiff to hard, dry, brown.

Top of bedrock inferred at 6.4 feet below land  
surface.

0 - 2.5

2.5 - 4.0

4.0 - 6.4



**Geologic Log of B-13A**  
**Tutu Service Station Investigation**  
**St. Thomas, U.S. Virgin Islands**

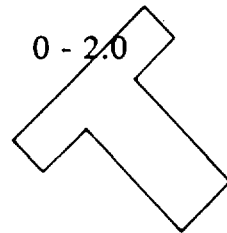
Description

Sampled Interval  
(feet below land surface)

FILL, SILT; some Clay; little Gravel  
Fine to Medium; trace Rock Fragments,  
Small to Medium; trace Root, Hard, dry  
brown to reddish brown.

Top of bedrock not encountered.

0 - 2.0



D  
R  
A  
F  
T

**Geologic Log of B-14**  
**Tutu Service Station Investigation**  
**St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

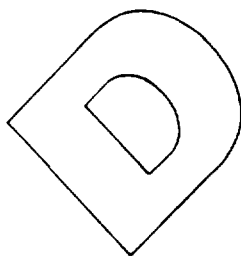
FILL, SILT; some Clay; some Sand,  
Fine to Medium; trace Rock Fragments,  
Small; trace Organic Material, Root  
Wood; Stiff, dry, light brown to light  
gray.

0 - 2.6

BEDROCK Highly weathered altered; very Weak;  
Hard, grayish green.

2.6 - 3.2

Top of weathered bedrock inferred at 3.2 feet  
below land surface.



**Geologic Log of B-15**  
**Tutu Service Station Investigation**  
**St. Thomas, U.S. Virgin Islands**

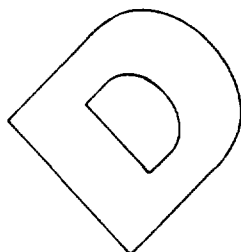
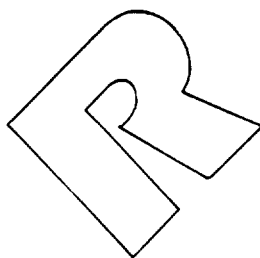
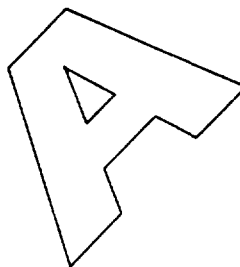
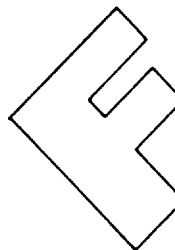
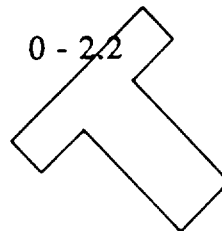
Description

SILT; some Clay; some Sand Fine to Medium,  
trace Rock Fragments, Small; trace of highly  
weathered Rock Fragments; trace Root, Medium  
stiff to hard, moist reddish brown to light brown.

Top of bedrock inferred at 2.2 feet below land  
surface.

Sampled Interval  
(feet below land surface)

0 - 2.2



**Geologic Log of B-16  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

SILT; some Clay; some Sand Fine to Medium,  
trace Rock Fragments, Small; trace Root,  
Very stiff, moist, reddish brown to light brown.

BEDROCK Highly weathered; Very weak;  
Hard, Grayish green.

Top of competent bedrock inferred at 3.7 feet  
below land surface.

0 - 2.7

2.7 - 3.7

D  
R  
A  
F  
T

**Geologic Log of MW-1  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

ASPHALT

CLAY; some Silt; little Sand, Fine to Coarse,  
trace Weathered rock fragments; Angular, hard,  
dry, brown, greenish gray.

Top of bedrock inferred at 1.8 feet below land  
surface.

(See also Geologic Log of MW-1D)

Sampled Interval  
(feet below land surface)

0 - 0.1

0.1 - 1.8

D

R

A

E

**Geologic Log of MW-1D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below surface)

**ASPHALT**

FILL consisting of Gravel, Medium to Fine;  
some Clay; trace Silt; trace Sand, Medium  
to Coarse; dry to moist, brown.

CLAY; some Silt; little to trace Sand,  
Medium to Coarse; little Rock Fragments,  
Medium to Large, angular; little to trace  
Gravel, Fine to Medium; trace pieces of wood;  
Very hard, dry to moist, light brown to brown.

VOLCANIC BRECCIA, greenish gray; strong to  
moderately strong; fine, medium, large grained,  
rectangular and irregular shape, moderately  
sorted, occasional clasts of 1 to 5 cm;  
plagioclase feldspar, pyroxenes, quartz,  
and chlorite minerals, dull to vitreous; calcite  
veins, iron stains; fresh to slightly altered.  
White minerals ranged from 10 to 25% of rock matrix.

Fracture zones observed from 2.34 to 15.09 feet,  
19.34 to 25.14 feet, 35.14 to 41.14 feet,  
and 69.84 to 75.14 feet.

0 - 0.3

0.3 - 2.5

2.5 - 2.8

2.8 - 89.0

**Geologic Log of MW-2  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

ASPHALT

SILT; some Clay, little Rock Fragments, small;  
trace Sand, Fine to Medium; trace Root; Hard,  
dry, brown to tan.

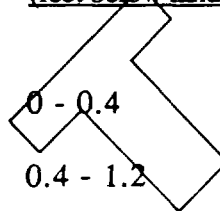
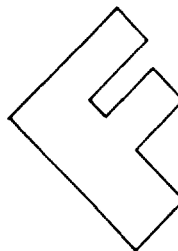
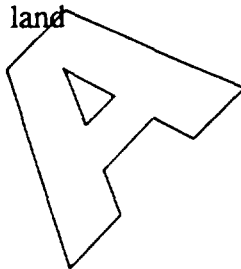
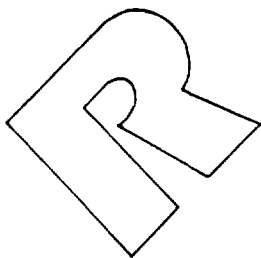
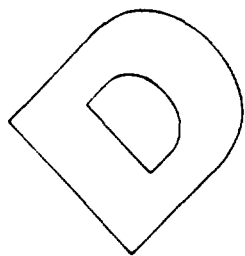
CLAY, some Silt; little Rock Fragments, Small;  
trace Gravel, Fine to Medium; Hard to very hard,  
dry, gray.

Top of bedrock inferred at 3.4 feet below land  
surface.

0 - 0.4

0.4 - 1.2

1.2 - 3.1





Geologic Log of MW-3  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands

Description

Sampled Interval  
(feet below land surface)

CONCRETE SLAB

FILL, CLAY, some Silt; trace Sand, Fine to Medium;  
trace Rock fragments, Small to medium; hard, dry,  
brown, reddish brown.

No Recovery

Top of bedrock inferred at 2.4 feet below land surface.

0 - 0.4

0.4 - 2.0

2.0 - 2.4

D  
R  
A  
F  
T

**Geologic Log of MW-4  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

**CONCRETE SLAB**

CLAY, some Silt; some Organic content (4.7 - 6.7')  
trace Sand, Fine to Coarse; trace Gravel;  
Subangular, very Stiff to Hard, reddish brown  
dark greenish gray, brown, dark brown, gray and  
dark gray.

No Recovery

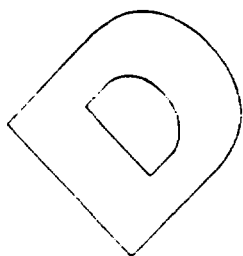
Top of bedrock inferred at 8.7 feet below land surface.

(See also Geologic Log for MW-4D)

0 - 0.7

0.7 - 7.1

8.7 - 9.8



**Geologic Log of MW-4D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sample Interval  
(feet below land surface)

CONCRETE PAVEMENT

0 - 0.7

CLAY, some Silt; little Sand, Fine to Coarse; little Gravel; Stiff to hard, moist, reddish brown to brown, bluish-gray dark gray, medium plasticity.

0.7 - 9.5

WEATHERED ROCK FRAGMENTS and CLAY;  
some Silt; some to little Sand

9.5 - 10.7

Top of weathered bedrock inferred at 10.7 feet.

WEATHERED ROCK FRAGMENTS AND CLAY;  
some Silt; Angular, Small to Large;  
Hard, wet, gray.

10.7 - 22.8

Angular, hard, moist to wet at 14.7 and 18.7 feet, gray, blue, green, brown, white, red, black stains, crumbled.

Top of competent bedrock inferred at 22.8 feet below land surface.

VOLCANIC SANDSTONE; gray; moderately strong to strong, very fine grained; pyroxene, plagioclase feldspars, some quartz, chlorite, and orthoclase minerals; calcite veins, iron stains; black minerals 60% of rock matrix, white minerals 35% of rock matrix; slightly altered.

22.8 - 33.0

**Geologic Log of MW-4D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

VOLCANIC SANDSTONE FRAGMENTS,  
in a brown silty clay matrix,  
trace sand, fine to coarse; semi-  
angular.

33.0 - 35.0

No Recovery.

35.0 - 37.1

VOLCANIC SANDSTONE; gray; strong;  
very fine grained; pyroxene, plagioclase  
feldspars, some quartz, chlorite, and orthoclase  
minerals; calcite veins; black minerals 60% of  
rock matrix; white minerals 35% of rock  
matrix; slightly altered.

37.1 - 40.0

DIORITE; gray; strong; very fine to  
coarse grained; pyroxene, plagioclase  
feldspar, quartz, chlorite, and orthoclase  
minerals; black minerals ranged from 35 to 60%  
of rock matrix; white minerals ranged  
from 35 to 40% of rock matrix; slightly  
altered.

40.0 - 71.0

Fracture zone observed from 9.0 to 23.4 feet and 33.6 to 38.2 feet.

Highly weathered fracture plane at 40.9, 55.0, 64.0, and 65.0 feet.

**Geologic Log of MW-5  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Fill, Silt; little Sand, Fine to Medium;  
little Gravel, Fine to Medium; trace Rock  
Fragments, Small; trace Clay; trace pieces  
of Wood; Hard, dry, brown.

Highly weathered bedrock; Very Weak;  
Grayish green.

Top of bedrock inferred at 4.8 feet below  
land surface.

Sampled Interval  
(feet below land surface)

0 - 4.0

4.0 - 4.8

D  
R  
A  
F  
T

**Geologic Log of MW-6D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

| <u>Description</u>                                                                                                                                                                                                                                                                                                                                                          | <u>Sampled Interval<br/>(feet below land surface)</u> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| ASPHALT                                                                                                                                                                                                                                                                                                                                                                     | 0 - 0.3                                               |
| CLAY; some Silt; trace Sand, Fine to Very Coarse; little Rock Fragments, Small to Medium; Hard, dry, brown to gray.                                                                                                                                                                                                                                                         | 0.3 - 2.0                                             |
| No Recovery.                                                                                                                                                                                                                                                                                                                                                                | 2.0 - 4.0                                             |
| VOLCANIC SANDSTONE; grayish green to dark green; moderately strong; fine to medium grained, rectangular to massive, moderately sorted; plagioclase feldspar, quartz, and pyroxenes minerals, dull, glassy, vitreous; white minerals ranged from 10 to 15% of rock matrix; slightly to highly altered. CLAY: little silt; trace sand, fine to coarse; light gray, soft, wet. | 2.5 - 20.0                                            |
| VOLCANIC BRECCIA; yellow to tan; medium to coarse grained; massed (?); weak; plagioclase feldspar, and orthoclase minerals, vitreous, glassy, dull, poorly sorted; moderately altered.                                                                                                                                                                                      | 20.0 - 31.8                                           |
| SILTSTONE; grayish green; fine grained; strong to moderately altered.                                                                                                                                                                                                                                                                                                       | 31.8 - 33.3                                           |
| VOLCANIC SANDSTONE; grayish green; moderately strong to weak; fine to medium grained, rectangular and irregular shape, moderately sorted; plagioclase feldspar, quartz, pyroxenes,                                                                                                                                                                                          | 33.3 - 55.0                                           |

**Geologic Log of MW-6D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below surface)

VOLCANIC SANDSTONE; grayish green; moderately strong to weak; fine to medium grained, rectangular and irregular shape, moderately sorted; plagioclase feldspar, quartz, pyroxenes, epidote and chlorite minerals, dull, glassy; calcite veins, iron stains; moderately to highly altered.

33.3 - 55.0

VOLCANIC BRECCIA; grayish green; strong to moderately strong; fine, medium to large grained, rectangular, cubic and irregular shape; plagioclase, chlorite, and epidote minerals, dull, glassy; calcite veins; fresh to slightly altered.

55.0 - 60.0

VOLCANIC SANDSTONE, greenish gray; moderately strong; fine grained, rectangular to irregular shape, well sorted; plagioclase, dull, glassy, slightly altered.

60.0 - 65.0

Fracture zones observed from 9.6 to 14.3 feet.

Note: This log is a combination of the geology observed at MW-6 (abandoned) and MW-6D.

**Geologic Log of MW-7  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

Fill, CLAY; some Silt; little Rock  
Fragments, Small to Medium; trace Sand,  
Medium to Very Coarse; trace Root; Hard,  
dry, brown.

0 - 4.0

Highly weathered Rock; SAND, Fine to  
Medium; some Silt; trace Sand, Coarse  
to very Coarse; trace Gravel, Fine; trace  
Clay; Hard, dry, gray.

4.0 - 6.0

Highly weathered bedrock; Weak; Grayish green.

6.0 - 15.0

D  
R  
A  
F  
T



**Geologic Log of MW-8  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

Fill, CLAY; some Silt; trace Sand  
very Fine to very Coarse; trace Rock,  
fragments, Small to Medium; Very Stiff,  
dry, brown.

0 - 0.35

Moderately weathered Rock; SILT; little  
to trace Sand, Very fine to fine; little  
trace Rock Fragments; very Stiff to hard,  
dry, brown to reddish brown.

3.3 - 8.3

Top of bedrock inferred at 8.3 feet below  
land surface.

D  
R  
A  
F  
T

**Geologic Log of MW-9  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

FILL consisting of CLAY; some Silt;  
little Rock Fragments, Small to Large;  
trace Sand, Fine to Very Coarse; Hard,  
dry, brown to reddish brown.

0 - 5.0

Top of bedrock inferred at 5.0 feet below  
land surface.

VOLCANIC BRECCIA; greenish gray;  
moderately strong; fine to large  
grained, rectangular to irregular shape,  
moderately sorted; plagioclase, and chlorite  
minerals, dull, vitreous; calcite veins;  
white minerals ranged from 10 to 25% of  
rock matrix; slightly altered. Clay;  
observed at 10.0 feet, little silt,  
trace sand, medium to coarse.

5.0 - 20.0

VOLCANIC SANDSTONE; bluish green to grayish  
green; weak to moderately strong; fine to  
medium grained, rectangular to irregular  
shape, Plagioclase, chlorite, orthoclase,  
pyroxenes, and quartz minerals; calcite veins,  
iron stains; slightly to highly altered.

20.0 - 31.0

VOLCANIC BRECCIA; grayish green; moderately  
strong; fine to large grained; moderately  
to poorly sorted; plagioclase, chlorite, and  
pyroxenes minerals; calcite veins; slightly altered.

31.0 - 34.3

**Geologic Log of MW-10  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

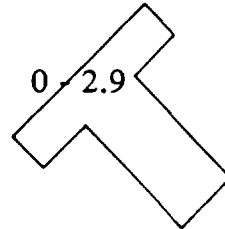
Description

Fill, CLAY; some Silt; little Sand  
Medium, little Rock Fragments, Small  
to Medium; trace Gravel, Fine to Medium;  
Hard, dry, gray to brown.

Top of bedrock inferred at 2.9 feet.

See also Geologic Log of MW-10D

Sampled Interval  
(feet below land surface)



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**Geologic Log of MW-10D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sample Interval  
(feet below land surface)

ASPHALT

CLAY; some Silt; trace Sand,  
Fine; trace Gravel, Fine to Medium;  
little Rock Fragments, Small to Medium;  
Hard, dry, gray to brown.

VOLCANIC BRECCIA; greenish gray;  
moderately strong; medium to large  
grained, rectangular to irregular shape,  
moderately sorted; plagioclase minerals,  
dull; manganese oxidation, iron stains;  
calcite stains; moderately altered.

VOLCANIC SANDSTONE; greenish gray;  
weak; fine to medium grained,  
rectangular to irregular shape, moderately  
sorted; plagioclase, pyroxenes, and quartz  
minerals, dull, glassy; manganese oxidation,  
iron stains, calcite veins; moderately to  
slightly altered.

VOLCANIC BRECCIA; greenish gray; strong  
medium to large grained, rectangular, irregular  
shape, large clasts; poorly sorted; plagioclase,  
quartz, pyroxenes, epidote and chlorite minerals;  
calcite veins; fresh to slightly altered.

Fracture zone observed from 22.0 to 26.5.

0 - 0.5

0.5 - 1.7

2.3 - 25.0

25.0 - 27.3

27.3 - 75.0

**Geologic Log of MW-11D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

FILL consisting of CLAY; some to little Silt; trace Sand, Fine to Coarse; trace Organics; Very stiff, dry to moist, light brown, brown to reddish brown.

0 - 4.0

SILT; little Sand, Fine; trace Clay; trace Sand, Coarse to Very Coarse; Hard, dry, brown.

4.0 - 10.2

VOLCANIC SANDSTONE; bluish green; strong to moderately strong; fine grained, rectangular, cubic and irregular shape, well sorted; plagioclase feldspar, epidote, quartz, and pyroxenes minerals, dull, glassy, bright to silky; calcite veins, iron stains; white minerals ranged from 10 to 25% or rock matrix; fresh, slightly to highly altered.

10.2 - 52.0

DIORITE; bluish green; strong to moderately strong; fine grained; well sorted; plagioclase feldspar, epidote, quartz, and pyroxenes minerals, glassy, silky dull; calcite veins, iron stains; fresh to slightly altered; white minerals ranged from 10 to 25% of rock matrix (white mineral content increase with depth).

52.0 - 75.0

Fracture zone observed from 11.3 to 21.1 feet.

**Geologic Log of MW-12D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

| <u>Description</u>                                                                                                                                                                                                                                                                                                                                           | <u>Sampled Interval<br/>(feet below land surface)</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| FILL consisting of SILT; some Clay; trace Sand, Very Fine to Very Coarse; trace Gravel, Medium; trace Rock Fragments; trace Organics; Hard dry, brown.                                                                                                                                                                                                       | 0 - 2.0                                               |
| CLAY, some Silt; trace Sand, Very Fine to Very Coarse; trace Rock Fragments, Medium to Large; trace Organics; Very stiff.                                                                                                                                                                                                                                    | 2.0 - 4.0                                             |
| No Recovery.                                                                                                                                                                                                                                                                                                                                                 | 5.9 - 10.0                                            |
| SILT; some Clay; little to trace Rock Fragments, Small to Medium; trace Sand, Very Fine to Coarse; Stiff to very stiff, dry, brown to yellow, light brown.                                                                                                                                                                                                   | 10.0 - 15.0                                           |
| Top of weathered bedrock inferred at 15.0 feet below land surface.                                                                                                                                                                                                                                                                                           |                                                       |
| VOLCANIC SANDSTONE; brown to tan, light gray to reddish gray; weak to very weak; calcite veins, iron stains; highly altered.                                                                                                                                                                                                                                 | 15.0 - 30.0                                           |
| VOLCANIC SANDSTONE; bluish green and gray; strong to weak to moderately strong; fine to medium grained, rectangular to irregular shape, moderately sorted; plagioclase feldspar, pyroxenes, quartz and pyrite minerals, dull, vitreous, metallic; calcite veins, iron stains; white minerals range from 5 to 10% of rock matrix; slightly to highly altered. | 30.0 - 66.0                                           |
| No Recovery.                                                                                                                                                                                                                                                                                                                                                 | 66.0 - 75.0                                           |

**Geologic Log of MW-13D  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

| <u>Description</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <u>Sampled Interval<br/>(feet below land surface)</u> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| CLAY; some Silt; little Sand, Very Fine; trace Gravel, Small to Medium; trace Organics; Very hard, dry, light brown.                                                                                                                                                                                                                                                                                                                                                                           | 0 - 2.0                                               |
| CLAY, some Silt; little Sand, Very Fine to Medium; little Gravel, Fine; trace Sand, Very Coarse to Coarse; trace Rock Fragments, Large to Medium; Hard, dry, light brown.                                                                                                                                                                                                                                                                                                                      | 2.0 - 5.0                                             |
| VOLCANIC SANDSTONE; greenish gray to dusky yellow green to pale reddish; moderately strong to very weak at 20.0 feet; fine, medium grained, irregular shape, moderately sorted; plagioclase feldspar, quartz and epidote minerals, dull; calcite veins; slightly to moderately altered at 5.3 feet, highly altered with iron stains at 20.0 feet; white minerals ranged from 10 to 35% of rock matrix.                                                                                         | 5.0 - 40.0                                            |
| VOLCANIC BRECCIA, grayish green, dusky yellow green to grayish blue green; moderately strong to weak; fine, medium, large grained, occasional clast of 1 to 3 cm (40-55 feet interval), rectangular, cubic, and irregular shape, moderately to well sorted; plagioclase feldspar, epidote, chlorite, and pyroxenes minerals, glassy, dull; calcite veins, iron stains; slightly to highly altered (55-85 feet interval); white minerals ranged from 10 to 35% of rock matrix (40-55 interval). | 40 - 120                                              |

Fracture zones observed from 5.2 to 36.0 feet, 40.7 to 65.3 feet, and 85.6 to 118.7 feet.

**Geologic Log of MW-14  
Tutu Service Station Investigation  
St. Thomas, U.S. Virgin Islands**

Description

Sampled Interval  
(feet below land surface)

Asphalt

0 - 0.1

CLAY; some Silt; some Sand; trace gravel  
trace to some Weathered Rock Fragments,  
Angular; very Hard, greenish gray, brown  
gray.

0.1 - 3.0

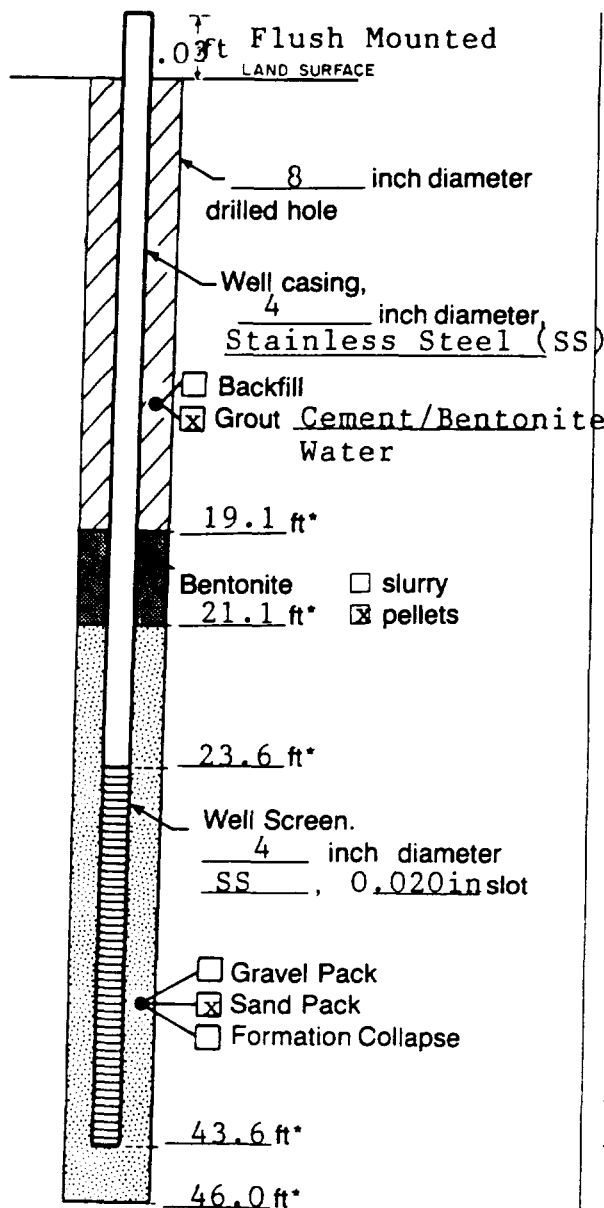
Top of bedrock inferred at 3.0 feet below  
land surface.

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**APPENDIX B**  
**WELL CONSTRUCTION LOGS**

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-1

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 195.05 feet msl  
and Datum 195.08 feet ☒ Surveyed  
☐ Estimated

Installation Date(s) June 30, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid Water

Development Technique(s) and Date(s)

Submersible pump; 8/29/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 60 (approximately) gallons

Static Depth to Water 29.5 before develop. feet below M.P.

Pumping Depth to Water 40.0 feet below M.P.

Pumping Duration 0.42 hours

Yield NA gpm Date 8/29/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring

Remarks 6-inch hollow stem auger from land surface to 1.7 feet.

7.5-inch air hammer from land surface to 46.0 feet.

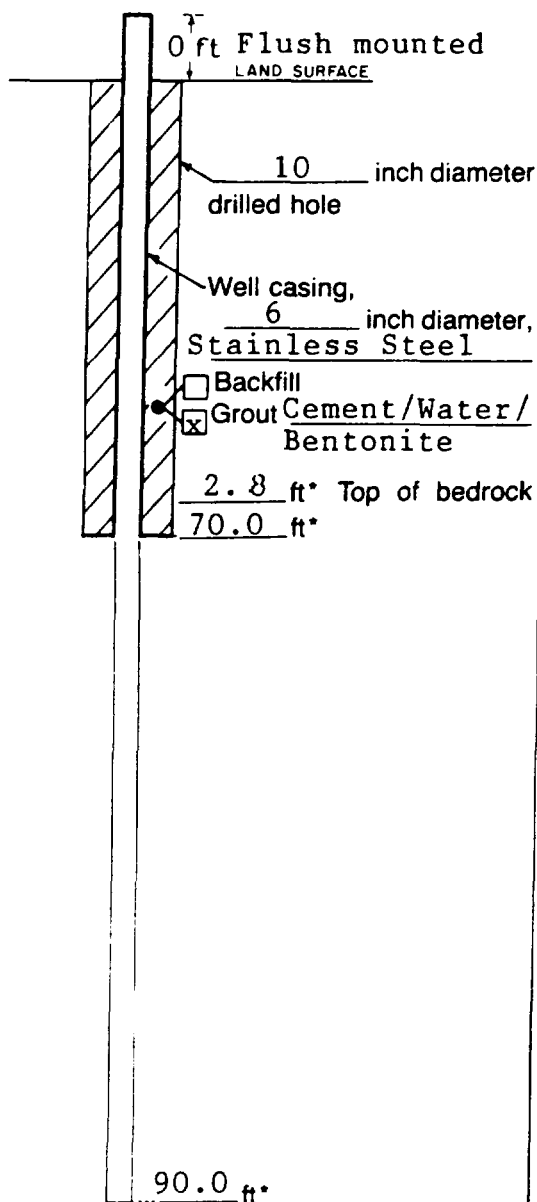
Borehole cave in up to 43.6 feet.

Top of bedrock at 1.8 feet.

Prepared by Wanda I. Morales

# WELL CONSTRUCTION LOG

## (BEDROCK)



**Measuring Point is Top of Well Casing Unless Otherwise Noted.**

\*Depth Below Land Surface

Project TEIC/PR01301 Well MW-1D

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 195.14 feet msl

and Datum 195.14 feet msl ☒ Surveyed

☐ **Estimated**

Installation Date(s) July 7 & 8, 1992

Drilling Method Hollow Stem Auger & Air HammerDrilling Contractor Soil Tech

Drilling Fluid Water when diamond coring was performed

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water  
to facilitate development; 8/28/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 250 (approx.) gallons

Static Depth to Water 70.6 before develop. feet below M.P.

Pumping Depth to Water 89.0 feet below M.P.

Pumping Duration 0.5 hours

Yield NA gpm

Date 8/28/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

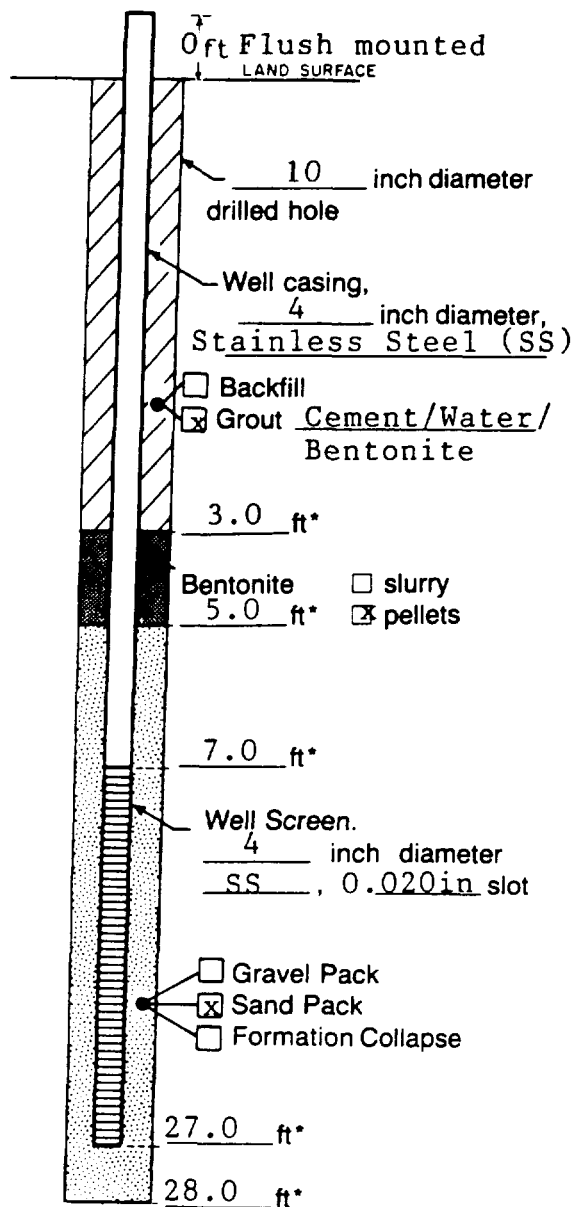
## Fracture Zones

Remarks 6-inch hollow stem auger from land  
surface to 2.5 feet. Top of bedrock at 2.8 feet  
3-inch diamond coring from 2.5 to 89.0 feet.  
10-inch air hammer from land surface to 71.0 fe  
Borehole cave in up to 70.0 feet.  
6-inch casing installed to 70.0 feet.

5.5-inch air hammer from 70.0 to 90.0 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-2

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 178.31 feet msl

and Datum 178.15 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 25, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water  
to facilitate development; 9/2/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 72 (approximately) gallons

Static Depth to Water 13.6 before develop. feet below M.P.

Pumping Depth to Water 26.0 feet below M.P.

Pumping Duration 0.41 hours

Yield NA gpm

Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land  
surface to 2.0 feet.

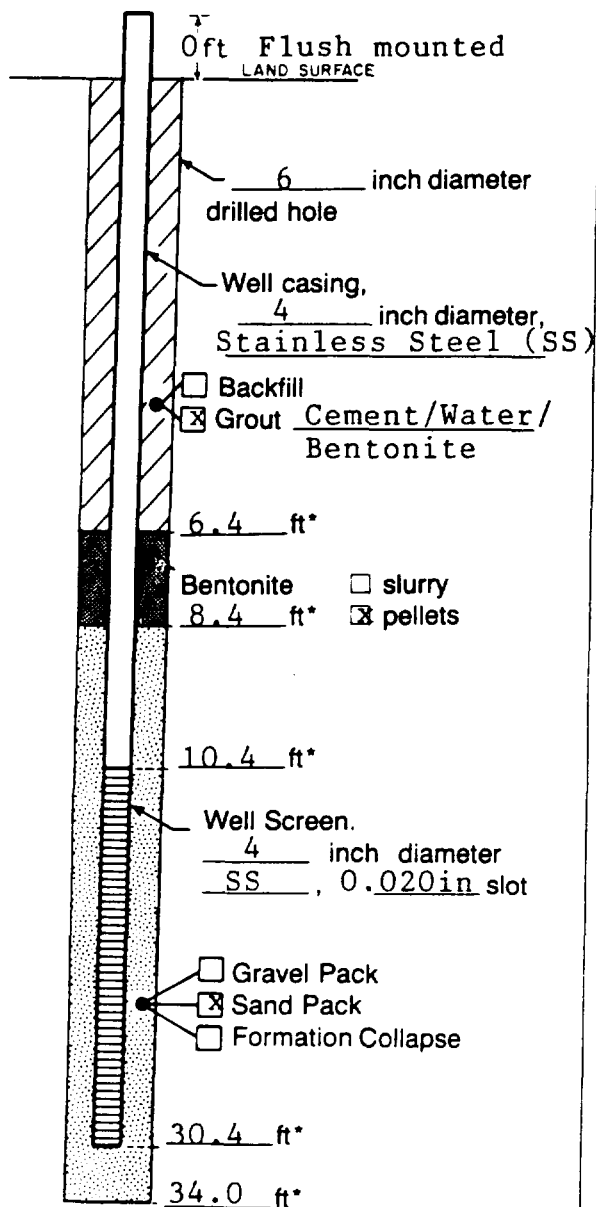
10-inch air hammer from land surface to  
29.0 feet.

Borehole cave in up to 28.0 feet.

Top of bedrock at 3.91 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-3

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 181.85 feet msl

and Datum 181.84 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) June 9 & 11, 1992

Drilling Method Hollow Stem Auger/Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)

Submersible pump, August 25, 1992

Fluid Loss During Drilling NA gallons

Water Removed During Development 130 gallons

Static Depth to Water 17.35ft before develop feet below M.P.

Pumping Depth to Water 28.40 feet below M.P.

Pumping Duration 0.5 hours

Yield 4.3 gpm Date 8/25/92

Specific Capacity 0.4 gpm/ft

Well Purpose Monitoring Well

Remarks 6-inch hollow stem auger from land  
surface to 2.4 feet. (Bedrock).

5.5-inch air hammer from 2.4 to 34.0 feet.

Borehole cave in up to 33.3 feet.

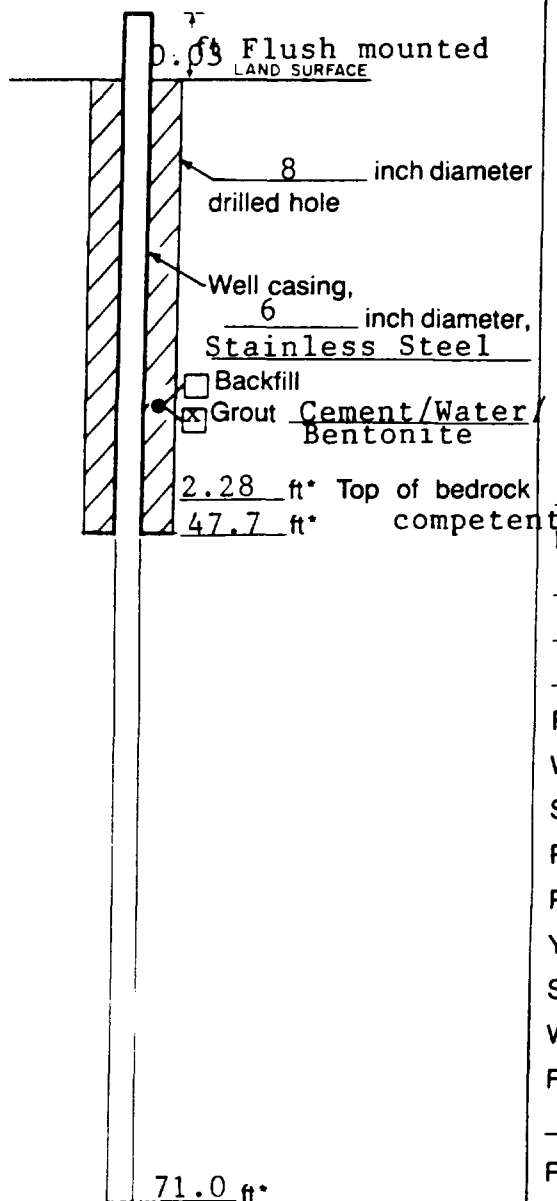
Prepared by Rubén Ponciano





## WELL CONSTRUCTION LOG

(BEDROCK)

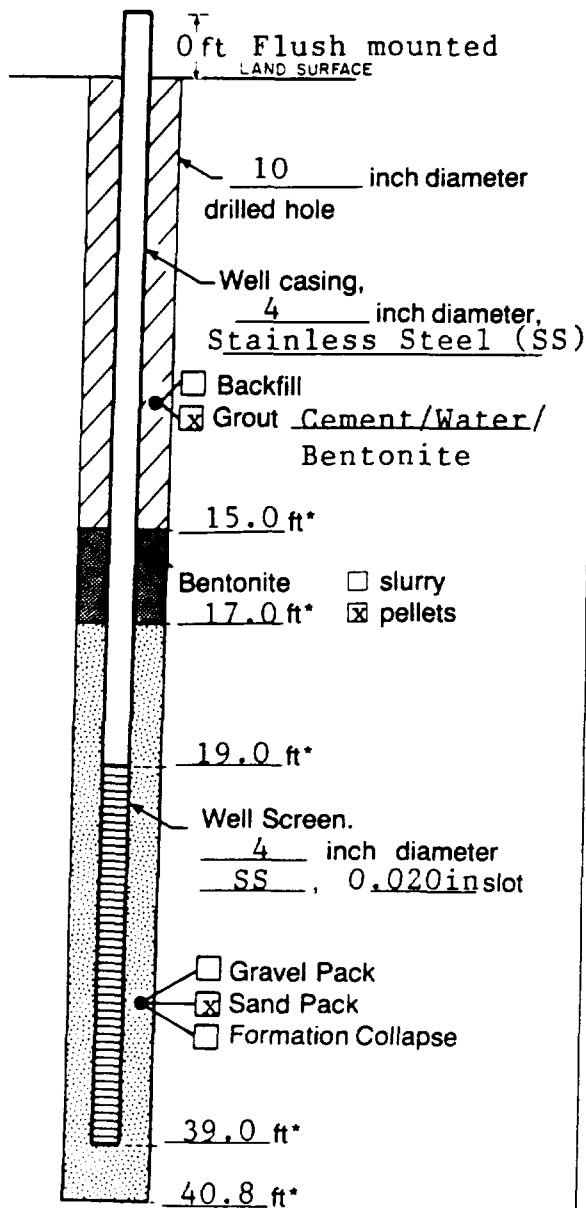


Measuring Point is Top of  
Well Casing Unless Otherwise  
Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-4D  
 Town/City Anna's Retreat/Tutu  
 County St. Thomas State USVI  
 Permit No. \_\_\_\_\_  
 Land-Surface Elevation 175.99 feet msl  
 and Datum 176.02 feet msl ☒ Surveyed  
☐ Estimated  
 Installation Date(s) June 17, 1992  
 Drilling Method Hollow Stem Auger & Air Hammer  
 Drilling Contractor Soil Tech  
 Drilling Fluid Water when diamond coring was performed  
 Development Technique(s) and Date(s)  
Submersible pump; 8/24/92.  
 Fluid Loss During Drilling NA gallons  
 Water Removed During Development 360 gallons  
 Static Depth to Water 12.20ft before develop feet below M.P.  
 Pumping Depth to Water 68.0 feet below M.P.  
 Pumping Duration 0.8 hours  
 Yield 7.2 gpm Date 8/24/92  
 Specific Capacity 0.13 gpm/ft  
 Well Purpose Monitoring well  
 Fracture Zones \_\_\_\_\_  
 Remarks 6-inch hollow stem auger from land  
surface to 24.7 feet.  
3-inch diamond coring from 24.0 to 67.25 feet.  
7.5-inch air hammer from land surface to  
48.0 feet. Top of weathered bedrock at 10.7 feet.  
6-inch casing installed at 47.7 feet.  
5.5-inch air hammer from 47.7 to 71.0 feet.  
 Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-5

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 187.24 feet msl

and Datum 187.09 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 25, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

### Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water  
to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 66 gallons

Static Depth to Water 22.8 ft before develop feet below M.P.

Pumping Depth to Water 37.5 feet below M.P.

Pumping Duration 0.43 hours

Yield NA gpm Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land  
surface to 4.0 feet.

10-inch air hammer from land surface to

45.0 feet. Top of bedrock at 4.8 feet.

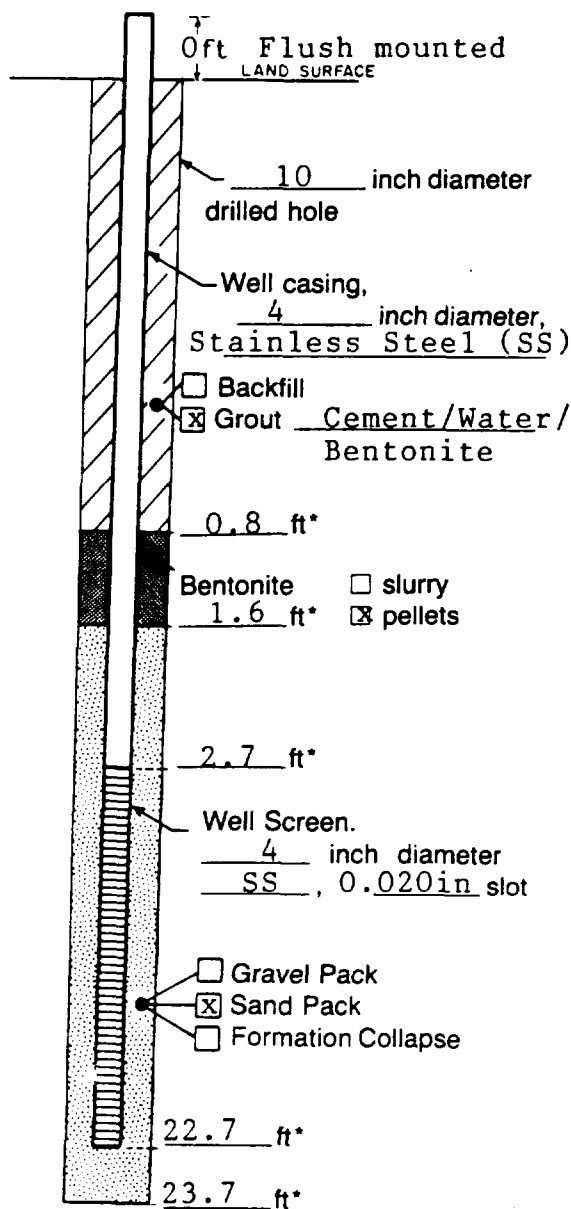
Grout seal from 44.8 up to 40.8 feet.

Prepared by Wanda I. Morales





## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PR01301 Well MW-6R

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 171.44 feet msl

and Datum 171.17 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) September 2, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)

Submersible pump; 9/9/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 486 gallons

Static Depth to Water 8.2ft before develop feet below M.P.

Pumping Depth to Water 20.6 feet below M.P.

Pumping Duration 0.9 hours

Yield 9 gpm Date 9/9/92

Specific Capacity 0.72 gpm/ft

Well Purpose Monitoring Well

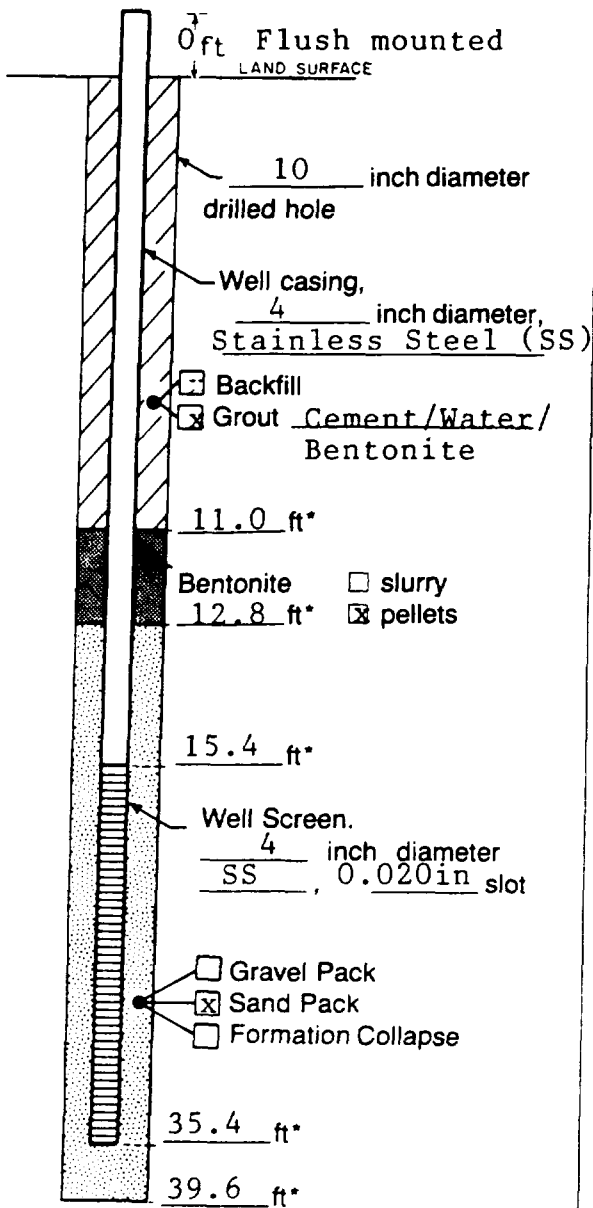
Remarks 10-inch air hammer from land surface to 26.0 feet.

Borehole cave in up to 23.7 feet.

Bedrock at approximately 4.92 feet bls (see MW-6D).

Prepared by Derrick Stepanof/Rubén Ponciano

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-7

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 180.3 feet msl

and Datum 180.13 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 29, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water  
to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 84 gallons

Static Depth to Water 17.14 ft before development feet below M.P.

Pumping Depth to Water 34.0 feet below M.P.

Pumping Duration \_\_\_\_\_ hours

Yield NA gpm

Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land  
surface to 15.0 feet.

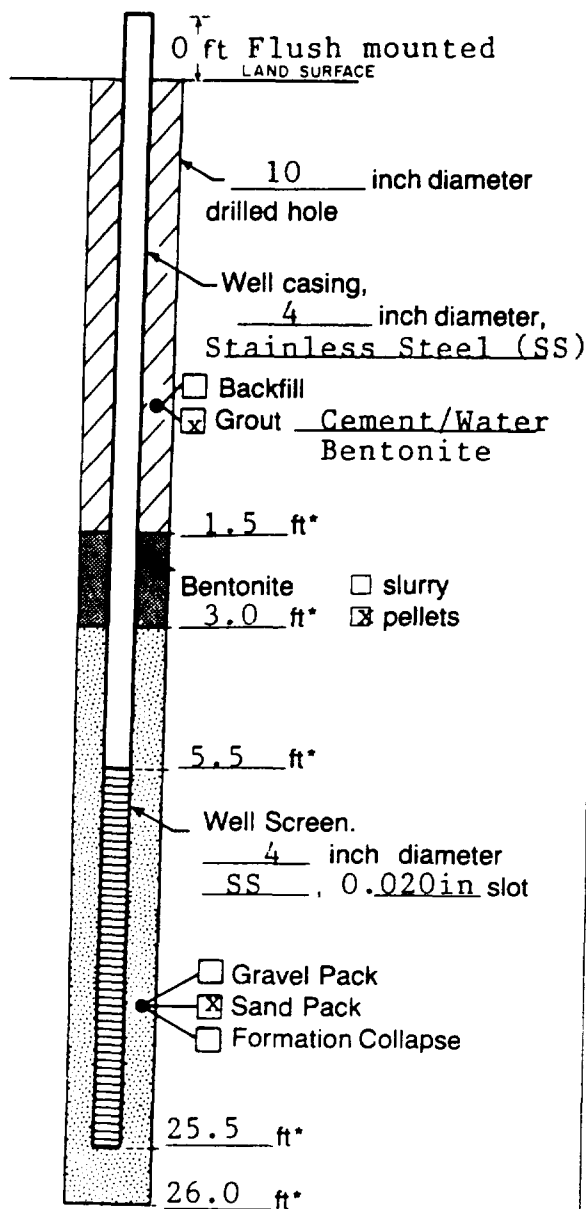
10-inch air hammer from land surface to  
40.0 feet.

Borehole cave in up to 39.6 feet.

Competent bedrock approximately at 15.0 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PR01301 Well MW-8

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 167.61 feet msl  
and Datum 167.54 feet msl ☒ Surveyed  
☐ Estimated

Installation Date(s) July 23, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water  
to facilitate development; 8/31/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 110 gallons

Static Depth to Water 17.70ft before develop feet below M.P.

Pumping Depth to Water 25.0 feet below M.P.

Pumping Duration 0.76 hours

Yield NA gpm Date 8/31/92

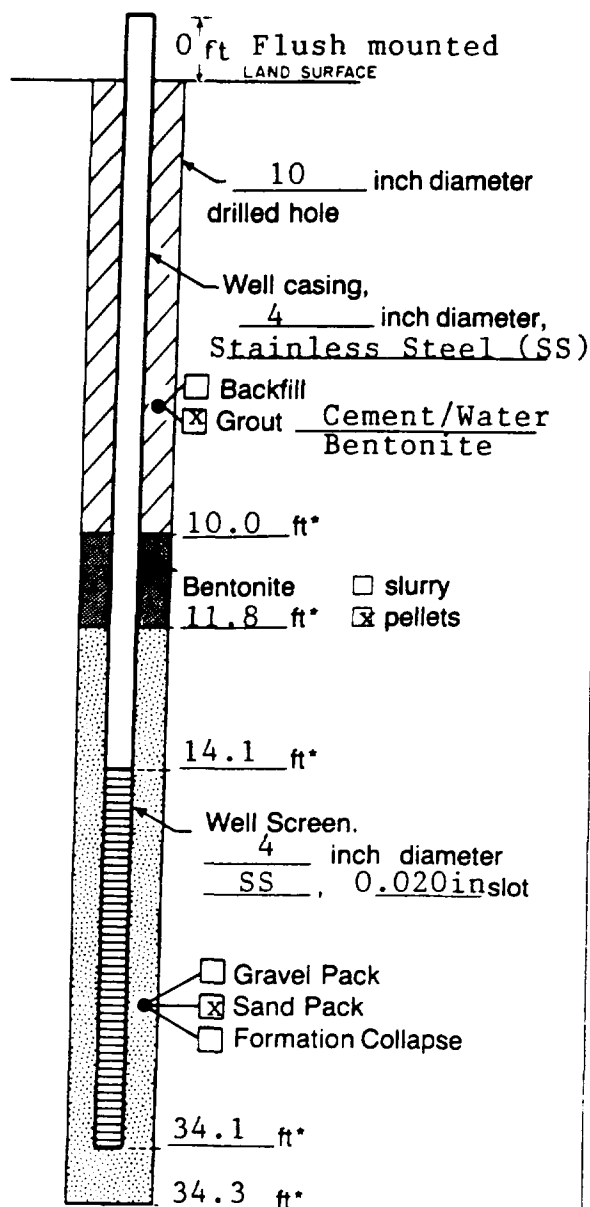
Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land  
surface to 8.3 feet. (bedrock).  
10-inch air hammer from land surface to  
27.0 feet.  
Borehole cave in up to 26.0 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-9

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 162.32 feet msl

and Datum 162.26 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 30, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid Water when diamond coring was performed.

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 70 gallons

Static Depth to Water 13.14 ft before develop Feet below M.P.

Pumping Depth to Water 33.0 feet below M.P.

Pumping Duration 0.33 hours

Yield NA gpm Date 9/2/92

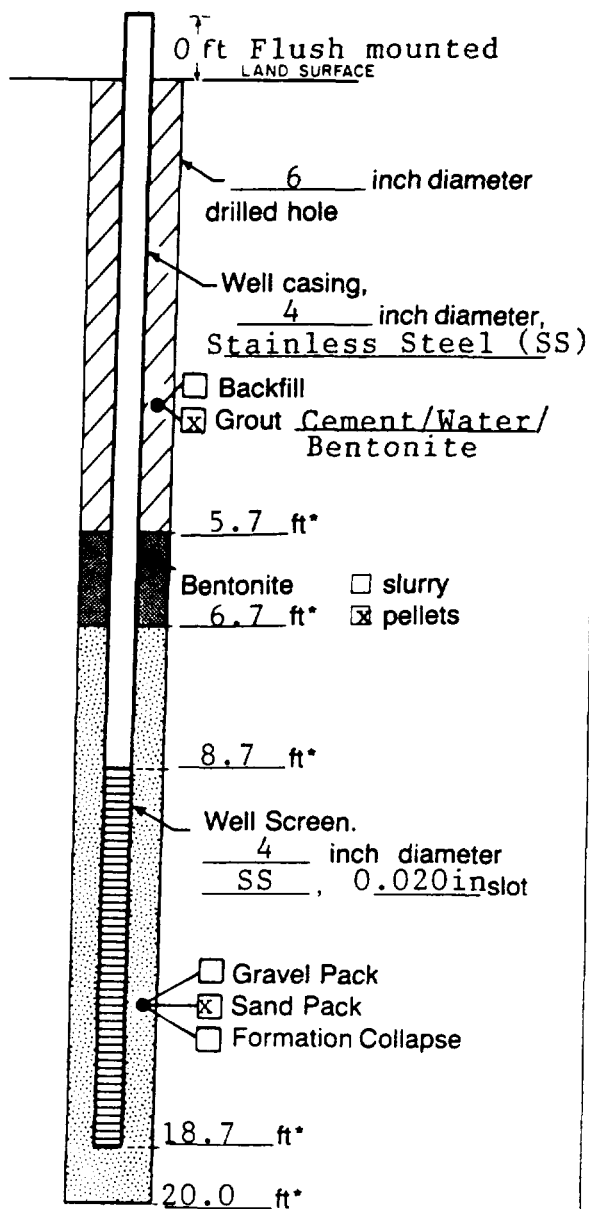
Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land surface to 5.5 feet. Bedrock at 5.0 feet.  
3-inch diamond coring from 5.5 to 35.0 feet.  
10-inch air hammer from 3.7 to 37.0 feet.  
Borehole cave in up to 34.3 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-9S

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 162.47 feet msl  
and Datum 162.37 feet msl ☒ Surveyed  
☐ Estimated

Installation Date(s) September 14, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water  
to facilitate development; 9/15/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 20 gallons

Static Depth to Water 13.34ft before develop feet below M.P.

Pumping Depth to Water 18.0 feet below M.P.

Pumping Duration 0.20 hours

Yield NA gpm Date 9/15/92

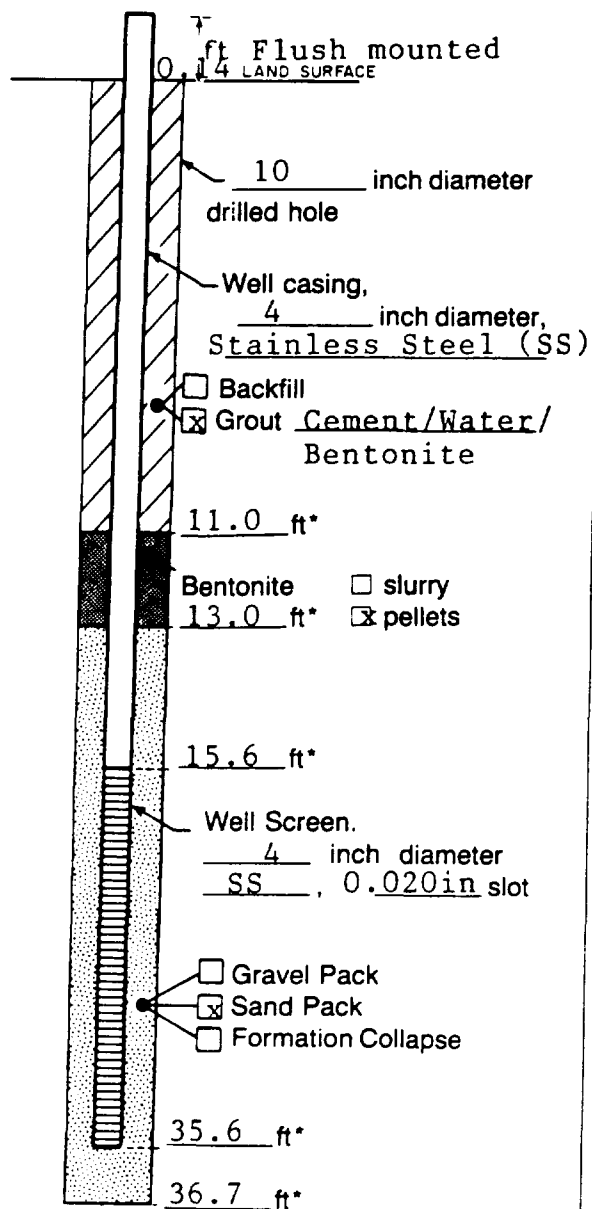
Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 10-inch air hammer from land surface  
to 20.0 feet.  
Borehole cave in from 20.0 up to  
18.7 feet. Bedrock located approximatel  
at 5.0 feet.

Prepared by Rubén Ponciano

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-10

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 161.36 feet msl

and Datum 161.50 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 20, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water  
to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 40.0 gallons

Static Depth to Water 20.80ft before develop feet below M.P.

Pumping Depth to Water 34.0 feet below M.P.

Pumping Duration 0.3 hours

Yield NA gpm

Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

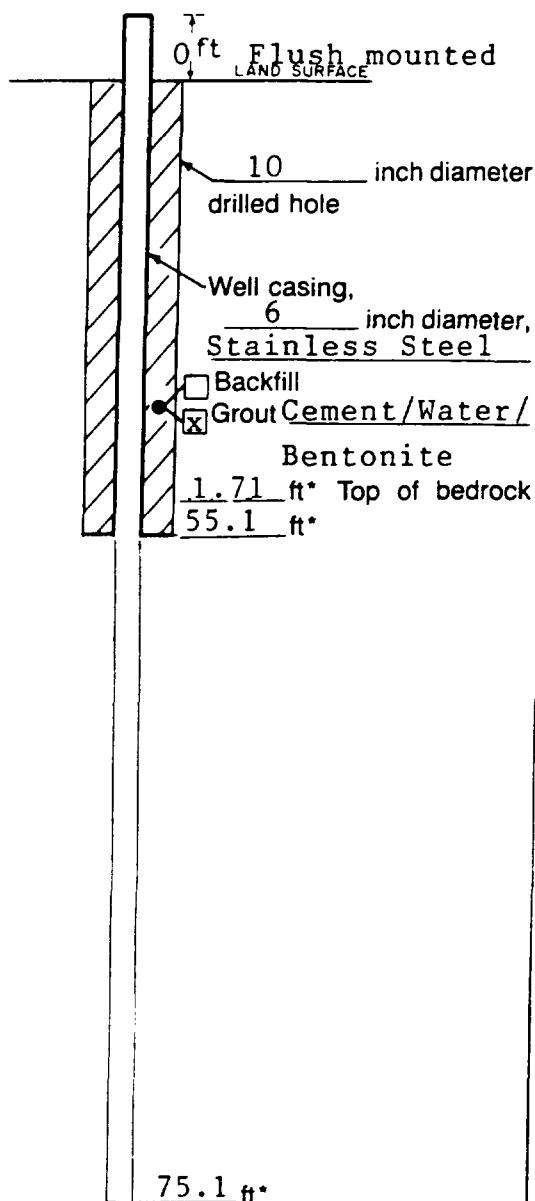
Remarks 6-inch hollow stem auger from land  
surface to 3.0 feet. (Bedrock at 2.9 feet).  
10-inch air hammer from land surface to  
36.7 feet.

Prepared by Wanda I. Morales



## WELL CONSTRUCTION LOG

(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

\*Depth Below Land Surface

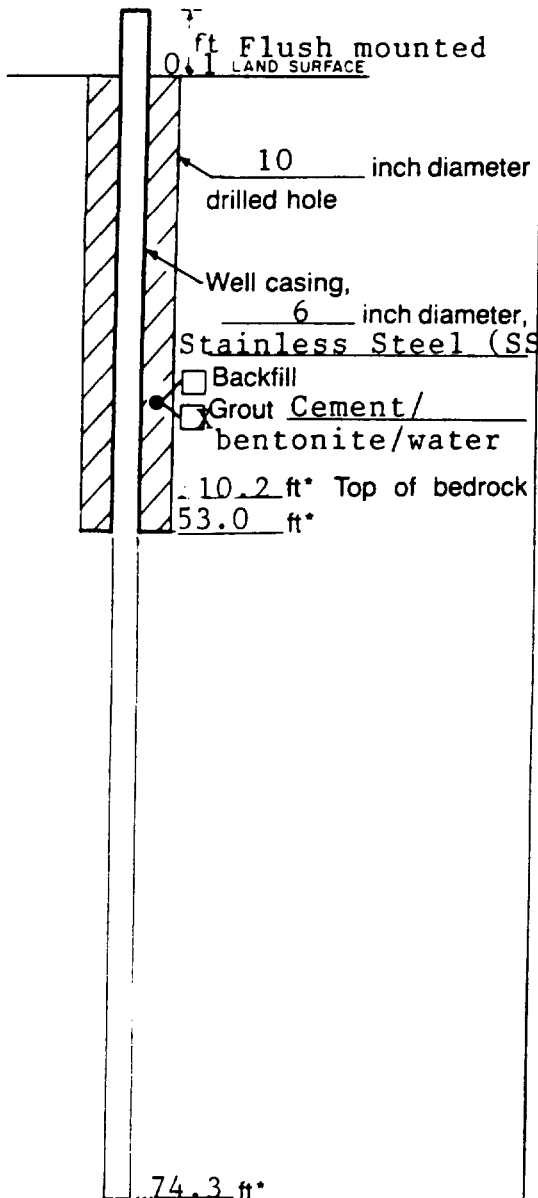
Project TEIC/PR01301 Well MW-10D  
 Town/City Anna's Retreat/Tutu  
 County St. Thomas State USVI  
 Permit No. \_\_\_\_\_  
 Land-Surface Elevation 161.52 feet msl  
 and Datum 161.38 feet msl ☒ Surveyed  
☐ Estimated  
 Installation Date(s) August 17, 18 & 19, 1992  
 Drilling Method Hollow Stem Auger & Air Hammer  
 Drilling Contractor Soil Tech  
 Drilling Fluid Water when diamond coring was performed.  
 Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.  
 Fluid Loss During Drilling NA gallons  
 Water Removed During Development 240 gallons  
 Static Depth to Water 20.20ft before develop feet below M.P.  
 Pumping Depth to Water 74.0 feet below M.P.  
 Pumping Duration 0.33 hours  
 Yield NA gpm Date 9/2/92  
 Specific Capacity NA gpm/ft  
 Well Purpose Monitoring well  
 Fracture Zones \_\_\_\_\_  
 Remarks 6-inch hollow stem auger from land surface to 1.7 feet. (Top of bedrock)  
3-inch diamond coring from 1.71 to 75.0 feet.  
10-inch air hammer from 2.0 to 56.0 feet.  
6-inch casing installed at 55.1 feet.  
5.5-inch air hammer from 55.1 to 75.1 feet.  
 Prepared by Wanda I. Morales





## WELL CONSTRUCTION LOG

(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/Tutu PR01301 Well MW-11D  
 Town/City Anna's Retreat /Tutu  
 County St. Thomas State USVI  
 Permit No. \_\_\_\_\_  
 Land-Surface Elevation 153.11 feet ms1  
 and Datum 153.22 feet ms1 ☒ Surveyed  
☐ Estimated  
 Installation Date(s) July 16, 17, 20, 1992  
 Drilling Method Hollow Stem Auger & Air Hammer  
 Drilling Contractor Soil Tech  
 Drilling Fluid Water when diamond coring was performed.

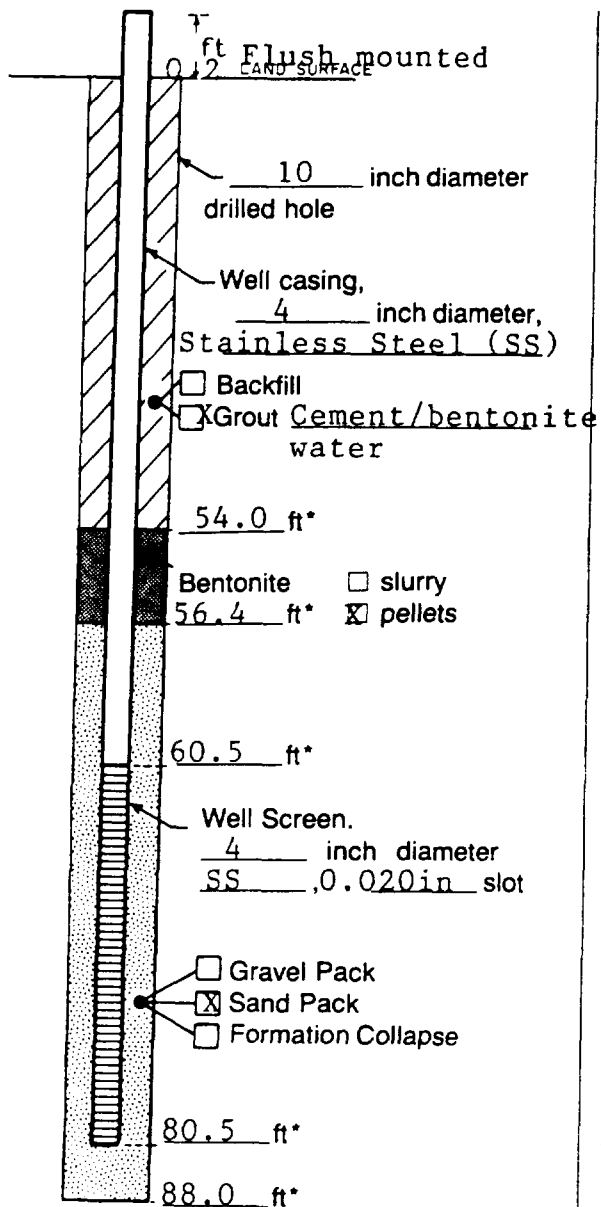
Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons  
 Water Removed During Development 84 gallons  
 Static Depth to Water 17.20 before develop feet below M.P.  
 Pumping Depth to Water 73.0 feet below M.P.  
 Pumping Duration 0.43 hours  
 Yield NA gpm Date 9/2/92  
 Specific Capacity NA gpm/ft  
 Well Purpose Monitoring  
 Fracture Zones \_\_\_\_\_

Remarks 6-inch hollow stem auger from land surface to 11.0 feet. (Top of bedrock approx. 10.2 feet)  
3-inch diamond coring from 10.2 to 75.0 feet.  
10-inch air hammer from 5.0 to 53.5 feet.  
6-inch casing installed at 53.0 feet.  
5.5-inch air hammer from 53.0 to 74.3 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Measuring Point is  
Top of Well Casing  
Unless Otherwise Noted.

\*Depth Below Land Surface

Project TEIC/Tutu PRO1301 Well MW-12D  
Town/City Anna's Retreat/Tutu  
County St. Thomas State USVI  
Permit No. \_\_\_\_\_  
Land-Surface Elevation 161.58 feet msl  
and Datum 161.81 feet msl ☒ Surveyed  
☐ Estimated  
Installation Date(s) July 23, 1992  
Drilling Method Hollow Stem Auger & Air Hammer  
Drilling Contractor Soil Tech  
Drilling Fluid Water when diamond coring was performed

Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water to facilitate development; 9/1/92.

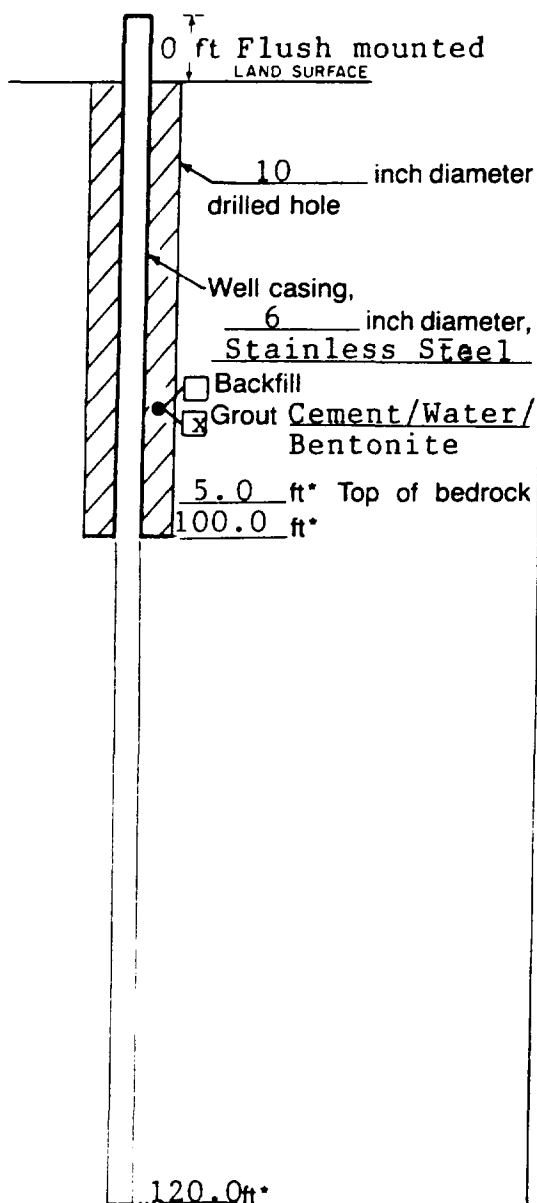
Fluid Loss During Drilling NA gallons  
Water Removed During Development 76 gallons  
Static Depth to Water 26.0 before develop. feet below M.P.  
Pumping Depth to Water 79.0 feet below M.P.  
Pumping Duration 1.1 hours  
Yield NA gpm Date 9/1/92  
Specific Capacity NA gpm/ft  
Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land surface to 5.9 feet. (top of bedrock).  
3-inch diamond coring from 5.9 to 75.0 feet.  
10-inch air hammer from 3.9 to 88.0 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG

(BEDROCK)



Measuring Point is Top of  
Well Casing Unless Otherwise  
Noted.

\*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-13D  
Town/City Anna's Retreat/Tutu  
County St. Thomas State USVI  
Permit No. \_\_\_\_\_  
Land-Surface Elevation 236.67 feet msl  
and Datum 236.60 feet msl ☒ Surveyed  
☐ Estimated  
Installation Date(s) July 9, 13, & 15, 1992  
Drilling Method Hollow Stem Auger & Air Hammer  
Drilling Contractor Soil Tech  
Drilling Fluid Water when diamond coring was performed

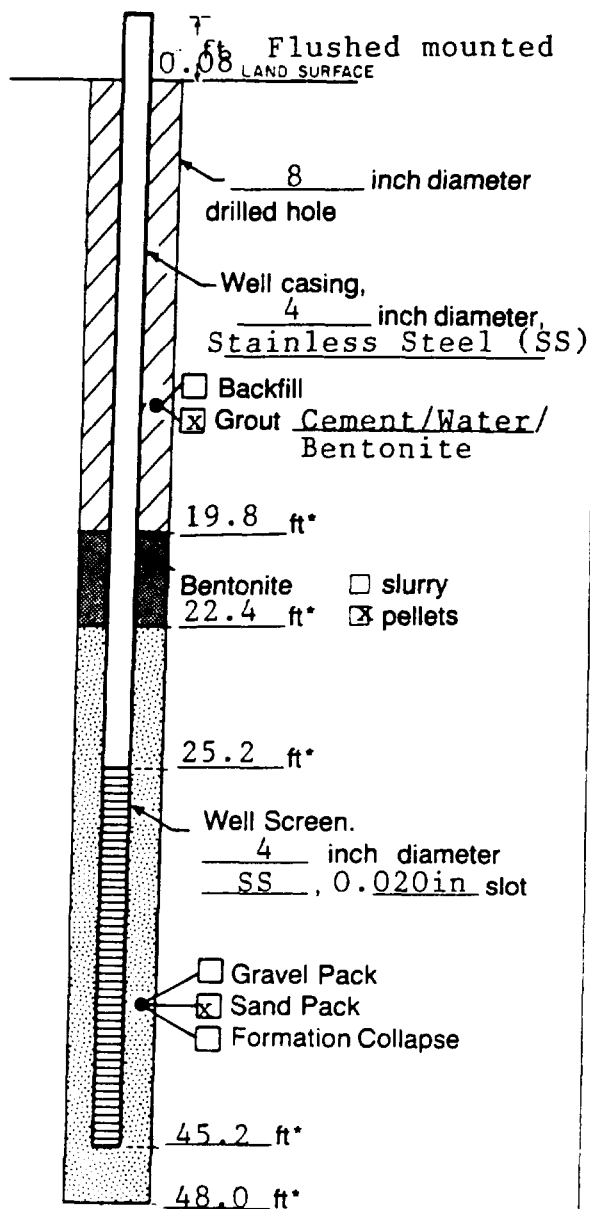
Development Technique(s) and Date(s)  
Submersible pump. Flushed well with water  
to facilitate development; 9/3/92.

Fluid Loss During Drilling NA gallons  
Water Removed During Development 150 gallons  
Static Depth to Water 57.60ft before develop feet below M.P.  
Pumping Depth to Water 106 feet below M.P.  
Pumping Duration 0.42 hours  
Yield NA gpm Date 9/3/92  
Specific Capacity NA gpm/ft  
Well Purpose Monitoring well  
Fracture Zones \_\_\_\_\_

Remarks 6-inch hollow stem auger from land  
surface to 5.3 feet. (Bedrock at 5.0 feet).  
3-inch diamond coring from 4.6 to 120 feet.  
10-inch air hammer from land surface to  
100.5 feet.  
5.5-inch air hammer from 100 to 120.3 feet.

Prepared by Wanda I. Morales

## WELL CONSTRUCTION LOG



Project TEIC/PRO1301 Well MW-14

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. \_\_\_\_\_

Land-Surface Elevation 196.04 feet msl  
and Datum 196.12 feet msl ☒ Surveyed  
☐ Estimated

Installation Date(s) July 2, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid \_\_\_\_\_

Development Technique(s) and Date(s)  
Centrifugal pump. Flushed well with water  
to facilitate development; 8/31/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 108 gallons

Static Depth to Water 28.40ft before develop feet below M.P.

Pumping Depth to Water 43.0 feet below M.P.

Pumping Duration 0.55 hours

Yield NA gpm Date 8/31/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land  
surface to 3.0 feet. (top of bedrock).  
7.5-inch air hammer from land surface to  
48.0 feet.

Prepared by Wanda I. Morales

**APPENDIX C**  
**WATER SAMPLING LOGS**

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                 |                            |                 |
|---------------|----------------------------------------|-------------------------|-----------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                            |                 |
| Site/Well No. | <u>Esso Tap</u>                        | Coded/<br>Replicate No. | <u>None</u>     | Date                       | <u>10/07/92</u> |
| Weather       | <u>Partly Cloudy</u>                   | Time Sampling<br>Began  | <u>10:40 am</u> | Time Sampling<br>Completed | <u>12:00 pm</u> |

## EVACUATION DATA

|                                      |                        |                                                           |           |
|--------------------------------------|------------------------|-----------------------------------------------------------|-----------|
| Description of Measuring Point (MP)  | <u>Faucet at Esso.</u> |                                                           |           |
| Height of MP Above Land Surface      | <u>NA</u>              | MP Elevation                                              | <u>NA</u> |
| Total Sounded Depth of Well Below MP | <u>NA</u>              | Water-Level Elevation                                     | <u>NA</u> |
| Depth to Water Below MP              | <u>NA</u>              | Diameter of Casing                                        | <u>NA</u> |
| Water Column in Well                 | <u>NA</u>              | Gallons Pumped<br>Prior to Sampling                       | <u>NA</u> |
| Gallons per Foot                     | <u>NA</u>              | Sampling Pump Intake Setting<br>(feet below land surface) | <u>NA</u> |
| Gallons in Well                      | <u>NA</u>              |                                                           |           |

Evacuation Method Not applicable; Faucet valve was opened for 10 minutes before sampling.

## SAMPLING DATA/FIELD PARAMETERS

|              |             |                              |          |          |  |  |  |  |  |
|--------------|-------------|------------------------------|----------|----------|--|--|--|--|--|
|              |             |                              |          |          |  |  |  |  |  |
| Color        | Odor        | TIME (ET from Start Pumping) |          |          |  |  |  |  |  |
| <u>Clear</u> | <u>None</u> | Field<br>Parameters          | 10:42 am | 12:05 pm |  |  |  |  |  |
|              |             | pH                           | 7.56     | 7.55     |  |  |  |  |  |
|              |             | Temp. (°C)                   | 29.2     | 29.3     |  |  |  |  |  |
|              |             | Spec. Cond. (umhos)          | 664      | 626      |  |  |  |  |  |
|              |             | PID (ppm)                    | 0        | 0        |  |  |  |  |  |

Sampling Method and Material NA

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH~1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |               |                     |               |           |  |
|----------|---------------|---------------------|---------------|-----------|--|
|          |               | WELL CASING VOLUMES |               |           |  |
| GAL./FT. | 1-1/4" = 0.06 | 2" = 0.16           | 3" = 0.37     | 4" = 0.65 |  |
|          | 1-1/2" = 0.09 | 2-1/2" = 0.26       | 3-1/2" = 0.50 | 6" = 1.47 |  |

Tutu was J&M Tap well

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                |                            |                 |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |                 |
| Site/Well No. | <u>MW-1*</u>                           | Coded/<br>Replicate No. | <u>None</u>    | Date                       | <u>10/6/92</u>  |
| Weather       | <u>Clear, 85° F</u>                    | Time Sampling<br>Began  | <u>8:54 am</u> | Time Sampling<br>Completed | <u>10:15 am</u> |

## EVACUATION DATA

|                                      |                                                                           |                                                                          |
|--------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                |                                                                          |
| Height of MP Above Land Surface      | <u>0.04 ft</u>                                                            | MP Elevation <u>195.08 ft</u>                                            |
| Total Sounded Depth of Well Below MP | <u>43.00 ft</u>                                                           | Water-Level Elevation <u>166.29 ft</u>                                   |
| Depth to Water Below MP              | <u>28.79 ft</u>                                                           | Diameter of Casing <u>4-inch</u>                                         |
| Water Column in Well                 | <u>14.21 ft</u>                                                           | Gallons Pumped<br>Prior to Sampling <u>28</u>                            |
| Gallons per Foot                     | <u>0.65</u>                                                               | Sampling Pump Intake Setting<br>(feet below land surface) <u>41.0 ft</u> |
| Gallons in Well                      | <u>9.24</u>                                                               |                                                                          |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 8:54 am      Pump off - 9:25 am</u> |                                                                          |

## SAMPLING DATA/FIELD PARAMETERS

|       |      | TIME (ET from Start Pumping) |                  |                   |                   |
|-------|------|------------------------------|------------------|-------------------|-------------------|
| Color | Odor | Field Parameters             | 9:02am (10 gal.) | 9:12 am (10 gal.) | 9:22 am (10 gal.) |
| Clear | None | pH                           | 7.03             | 7.00              | 7.02              |
|       |      | Temp. (°C)                   | 31.1             | 31.3              | 32.1              |
|       |      | Spec. Cond. (umhos)          | 1330             | 1335              | 1333              |
|       |      | PID (ppm)                    | 0                | 0                 | 0                 |
|       |      | After sampling               | 7.00             | 29.5              | 133               |

Sampling Method and Material Teflon Bailer

| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
|----------------------------|---------------------------------------------------------|--------------|
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks Well went dry. \* Well was resampled due to lost sample containers during shipment on 10/2/92.  
Ground-water sample was collected according to the procedure specified in Appendix G, Section 1.6.2. of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

| WELL CASING VOLUMES |               |               |               |           |           |
|---------------------|---------------|---------------|---------------|-----------|-----------|
| GAL./FT.            | 1-1/4" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 | 6" = 1.47 |
|                     | 1-1/2" = 0.09 | 2-1/2" = 0.26 | 3-1/2" = 0.50 |           |           |

Tutu next dist/MW-1Rmk3

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                |                                   |
|---------------|----------------------------------------|-------------------------|----------------|-----------------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                                   |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                                   |
| Site/Well No. | <u>MW-1D</u>                           | Coded/<br>Replicate No. | <u>None</u>    | Date<br>Time Sampling             |
| Weather       | <u>Clear, 88° F</u>                    | Time Sampling<br>Began  | <u>8:37 am</u> | <u>10/2/92</u><br><u>10:00 am</u> |

## EVACUATION DATA

|                                      |                                                                           |                                                           |                  |
|--------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.003 ft</u>                                                           | MP Elevation                                              | <u>195.14 ft</u> |
| Total Sounded Depth of Well Below MP | <u>90.0 ft</u>                                                            | Water-Level Elevation                                     | <u>165.52 ft</u> |
| Depth to Water Below MP              | <u>29.62 ft</u>                                                           | Diameter of Casing                                        | <u>6-inch</u>    |
| Water Column in Well                 | <u>60.38 ft</u>                                                           | Gallons Pumped<br>Prior to Sampling                       | <u>120</u>       |
| Gallons per Foot                     | <u>1.47</u>                                                               | Sampling Pump Intake Setting<br>(feet below land surface) | <u>85.0 ft</u>   |
| Gallons in Well                      | <u>88.76</u>                                                              |                                                           |                  |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 8:37 am      Pump off - 8:52 am</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

|       |      |                              |                                        |
|-------|------|------------------------------|----------------------------------------|
|       |      | TIME (ET from Start Pumping) |                                        |
| Color | Odor | Field                        |                                        |
| Clear | None | Parameters                   | 8:49 am (120 gal.)      After Sampling |
|       |      | pH                           | 10.56      8.06                        |
|       |      | Temp. (°C)                   | 29.5      29.3                         |
|       |      | Spec. Cond. (umhos)          | 2780      741                          |
|       |      | PID (ppm)                    | 0      0                               |

Sampling Method and Material      Teflon Bailor

|                            |                                                   |                 |
|----------------------------|---------------------------------------------------|-----------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M | Preservative    |
| VOCs                       | <u>5-40ml vials</u>                               | <u>HCL pH-1</u> |
| TCL BNAs                   | <u>2-500 ml amber glass</u>                       | <u>None</u>     |
| TAL Total/Dissolved Metals | <u>1-500 ml plastic</u>                           | <u>HNO3</u>     |
| TAL Cyanide                | <u>1-500 ml plastic</u>                           | <u>NaOH</u>     |
| TPH                        | <u>2-500 ml amber glass</u>                       | <u>HCL</u>      |

Remarks      Well went dry. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel      C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|                     |               |               |               |           |
|---------------------|---------------|---------------|---------------|-----------|
| WELL CASING VOLUMES |               |               |               |           |
| GAL./FT.            | 1-1/4" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|                     | 1-1/2" = 0.09 | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu water distribution - 1D sub 3



# WATER SAMPLING LOG

Page 1 of 1

|               |                                 |                            |          |
|---------------|---------------------------------|----------------------------|----------|
| Project/No.   | Tutu/PR01301                    |                            |          |
| Site Location | St. Thomas, U.S. Virgin Islands |                            |          |
| Site/Well No. | MW-2                            | Coded/<br>Replicate No.    | None     |
| Weather       | Partly cloudy, 90° F            | Time Sampling<br>Began     | 8:28 am  |
|               |                                 | Date                       | 9/30/92  |
|               |                                 | Time Sampling<br>Completed | 10:15 am |

## EVACUATION DATA

|                                      |                     |                                                           |           |
|--------------------------------------|---------------------|-----------------------------------------------------------|-----------|
| Description of Measuring Point (MP)  | Top of well casing. |                                                           |           |
| Height of MP Below Land Surface      | 0.16 ft             | MP Elevation                                              | 178.15 ft |
| Total Sounded Depth of Well Below MP | 26.9 ft             | Water-Level Elevation                                     | 165.51 ft |
| Depth to Water Below MP              | 12.64 ft            | Diameter of Casing                                        | 4-inch    |
| Water Column in Well                 | 14.26 ft            | Gallons Pumped                                            |           |
| Gallons per Foot                     | 0.65                | Prior to Sampling                                         | 37        |
| Gallons in Well                      | 9.27                | Sampling Pump Intake Setting<br>(feet below land surface) | 14.0 ft   |

Evacuation Method Centrifugal Pump      Pump start - 8:28 am      Pump off - 8:51 am

## SAMPLING DATA/FIELD PARAMETERS

|       |      |       |                              |                   |                     |                   |                |
|-------|------|-------|------------------------------|-------------------|---------------------|-------------------|----------------|
|       |      |       | TIME (ET from Start Pumping) |                   |                     |                   |                |
| Color | Odor | Field | Parameters                   | 8:37 am (12 gal.) | 8:39 am (10.5 gal.) | 8:49 am (15 gal.) | After Sampling |
| Clear | None |       | pH                           | 6.86              | 6.98                | 6.96              | 6.85           |
|       |      |       | Temp. (°C)                   | 30.1              | 24.8                | 30.0              | 30.7           |
|       |      |       | Spec. Cond. (umhos)          | 1321              | 1317                | 1314              | 1293           |
|       |      |       | PID (ppm)                    | 0                 | 0                   | 0                 | 0              |

Sampling Method and Material Teflon Bailer

|                            |                                                   |              |
|----------------------------|---------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M | Preservative |
| VOCs                       | 5-40ml vials                                      | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                              | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                  | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                  | NaOH         |
| TPH                        | 2-500 ml amber glass                              | HCL          |

Remarks

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                     |               |               |           |
|----------|---------------------|---------------|---------------|-----------|
|          | WELL CASING VOLUMES |               |               |           |
| GAL./FT. | 1-1/4" = 0.06       | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|          | 1-1/2" = 0.09       | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu work sheet MW - 2.xls

## Page 1 of 1

### EVACUATION DATA

|                          |                         |                             |                           |
|--------------------------|-------------------------|-----------------------------|---------------------------|
| <b>Evacuation Method</b> | <b>Centrifugal Pump</b> | <b>Pump start – 1:14 pm</b> | <b>Pump off – 1:32 pm</b> |
|--------------------------|-------------------------|-----------------------------|---------------------------|

## TIME (ET from Start Pumping)

### Sampling Method and Material

Preservative

|         |                      |
|---------|----------------------|
| Remarks | Slight product odor. |
|---------|----------------------|

**Sampling Personnel** C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

There were 4 different W-1 sets.

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                            |                 |
|---------------|----------------------------------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                            |                 |
| Site/Well No. | <u>MW-4</u>                            | Coded/<br>Replicate No.    | <u>None</u>     |
| Weather       | <u>Partly cloudy, 90° F</u>            | Time Sampling<br>Began     | <u>11:31 am</u> |
|               |                                        | Date                       | <u>9/30/92</u>  |
|               |                                        | Time Sampling<br>Completed | <u>1:00 pm</u>  |

## EVACUATION DATA

|                                      |                            |                                                           |                            |
|--------------------------------------|----------------------------|-----------------------------------------------------------|----------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u> |                                                           |                            |
| Height of MP Below Land Surface      | <u>0.03 ft</u>             | MP Elevation                                              | <u>175.66 ft</u>           |
| Total Sounded Depth of Well Below MP | <u>27.00 ft</u>            | Water-Level Elevation                                     | <u>165.04 ft</u>           |
| Depth to Water Below MP              | <u>10.62 ft</u>            | Diameter of Casing                                        | <u>4-inch</u>              |
| Water Column in Well                 | <u>16.38 ft</u>            | Gallons Pumped<br>Prior to Sampling                       | <u>38</u>                  |
| Gallons per Foot                     | <u>0.65</u>                | Sampling Pump Intake Setting<br>(feet below land surface) | <u>16.0 ft</u>             |
| Gallons in Well                      | <u>10.65</u>               |                                                           |                            |
| Evacuation Method                    | <u>Centrifugal Pump</u>    | <u>Pump start - 11:31 am</u>                              | <u>Pump off - 11:58 am</u> |

## SAMPLING DATA/FIELD PARAMETERS

|       |      |       |                              |                    |                    |                    |                |
|-------|------|-------|------------------------------|--------------------|--------------------|--------------------|----------------|
|       |      |       | TIME (ET from Start Pumping) |                    |                    |                    |                |
| Color | Odor | Field | Parameters                   | 11:36 am (10 gal.) | 11:46 am (10 gal.) | 11:56 am (18 gal.) | After Sampling |
| Clear | None |       | pH                           | 6.94               | 7.01               | 7.03               | 7.09           |
|       |      |       | Temp. (°C)                   | 33.1               | 32.8               | 32.7               | 31.9           |
|       |      |       | Spec. Cond. (umhos)          | 1371               | 1340               | 1358               | 1456           |
|       |      |       | PID (ppm)                    | 2.76               | 1.0                | 2.40               | 0              |

Sampling Method and Material Teflon Bailor

|                            |                                                     |              |
|----------------------------|-----------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab __X__ or G&M ____ | Preservative |
| VOCs                       | 5-40ml vials                                        | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                    | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                    | NaOH         |
| TPH                        | 2-500 ml amber glass                                | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                     |               |               |           |
|----------|---------------------|---------------|---------------|-----------|
|          | WELL CASING VOLUMES |               |               |           |
| GAL./FT. | 1-1/2" = 0.06       | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|          | 1-1/2" = 0.09       | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

This work sheet is for use with the T-4000

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                 |                            |
|---------------|----------------------------------------|-------------------------|-----------------|----------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                            |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                            |
| Site/Well No. | <u>MW-4D</u>                           | Coded/<br>Replicate No. | <u>None</u>     | Date                       |
| Weather       | <u>Partly cloudy</u>                   | Time Sampling<br>Began  | <u>12:11 pm</u> | Time Sampling<br>Completed |
|               |                                        |                         |                 | <u>10/5/92</u>             |
|               |                                        |                         |                 | <u>2:00 pm</u>             |

## EVACUATION DATA

|                                      |                                                                        |                                                           |                  |
|--------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                             |                                                           |                  |
| Height of MP Above Land Surface      | <u>0.3 ft</u>                                                          | MP Elevation                                              | <u>176.02 ft</u> |
| Total Sounded Depth of Well Below MP | <u>71.0 ft</u>                                                         | Water-Level Elevation                                     | <u>164.92 ft</u> |
| Depth to Water Below MP              | <u>11.10 ft</u>                                                        | Diameter of Casing                                        | <u>6-inch</u>    |
| Water Column in Well                 | <u>59.90 ft</u>                                                        | Gallons Pumped<br>Prior to Sampling                       | <u>264</u>       |
| Gallons per Foot                     | <u>1.47</u>                                                            | Sampling Pump Intake Setting<br>(feet below land surface) | <u>20.0 ft</u>   |
| Gallons in Well                      | <u>88.05</u>                                                           |                                                           |                  |
| Evacuation Method                    | <u>Centrifugal Pump    Pump start - 12:11 pm    Pump off - 1:47 pm</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

|       |        | TIME (ET from Start Pumping) |                    |                   |                   |                |
|-------|--------|------------------------------|--------------------|-------------------|-------------------|----------------|
|       |        | Field                        |                    |                   |                   |                |
|       |        | Parameters                   | 12:41 pm (90 gal.) | 1:15 pm (78 gal.) | 1:47 pm (96 gal.) | After Sampling |
| Color | Odor   | pH                           | 7.00               | 7.00              | 7.00              | 7.01           |
| Clear | Slight | Temp. (°C)                   | 30.8               | 30.0              | 30.5              | 30.5           |
|       |        | Spec. Cond. (umhos)          | 1471               | 1472              | 1476              | 1473           |
|       |        | PID (ppm)                    | 0                  | 90.7              | 52                | 68             |

Sampling Method and Material      Teflon Bailor

| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative    |
|----------------------------|---------------------------------------------------------|-----------------|
| VOCs                       | <u>5-40ml vials</u>                                     | <u>HCL pH-1</u> |
| TCL BNAs                   | <u>2-500 ml amber glass</u>                             | <u>None</u>     |
| TAL Total/Dissolved Metals | <u>1-500 ml plastic</u>                                 | <u>HNO3</u>     |
| TAL Cyanide                | <u>1-500 ml plastic</u>                                 | <u>NaOH</u>     |
| TPH                        | <u>2-500 ml amber glass</u>                             | <u>HCL</u>      |

Remarks      Trace of product observed in this well. Slight petroleum odor.

Sampling Personnel      C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |               | WELL CASING VOLUMES |               |           |  |
|----------|---------------|---------------------|---------------|-----------|--|
| GAL./FT. | 1-1/4" = 0.06 | 2" = 0.16           | 3" = 0.37     | 4" = 0.65 |  |
|          | 1-1/2" = 0.09 | 2-1/2" = 0.26       | 3-1/2" = 0.50 | 6" = 1.47 |  |

Tutu work done MW-4D.mh3

# WATER SAMPLING LOG

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|               |                                        |                         |                |                            |                |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |                |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |                |
| Site/Well No. | <u>MW-4D*</u>                          | Coded/<br>Replicate No. | <u>None</u>    | Date                       | <u>10/7/92</u> |
| Weather       | <u>Clear, 82° F</u>                    | Time Sampling<br>Began  | <u>7:55 am</u> | Time Sampling<br>Completed | <u>9:30 am</u> |

## EVACUATION DATA

|                                      |                                                                           |                                                                          |
|--------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                |                                                                          |
| Height of MP Above Land Surface      | <u>0.24 ft</u>                                                            | MP Elevation <u>176.23 ft</u>                                            |
| Total Sounded Depth of Well Below MP | <u>71.0 ft</u>                                                            | Water-Level Elevation <u>165.15 ft</u>                                   |
| Depth to Water Below MP              | <u>11.08 ft</u>                                                           | Diameter of Casing <u>6-inch</u>                                         |
| Water Column in Well                 | <u>59.92 ft</u>                                                           | Gallons Pumped<br>Prior to Sampling <u>280</u>                           |
| Gallons per Foot                     | <u>1.47</u>                                                               | Sampling Pump Intake Setting<br>(feet below land surface) <u>66.0 ft</u> |
| Gallons in Well                      | <u>88.08</u>                                                              |                                                                          |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 7:55 am      Pump off - 8:30 am</u> |                                                                          |

## SAMPLING DATA/FIELD PARAMETERS

|       |        | TIME (ET from Start Pumping) |                   |                   |                    |
|-------|--------|------------------------------|-------------------|-------------------|--------------------|
| Color | Odor   | Field Parameters             | 8:06 am (88 gal.) | 8:17 am (88 gal.) | 8:28 am (104 gal.) |
| Clear | Slight | pH                           | 7.15              | 7.17              | 7.16               |
|       |        | Temp. (°C)                   | 28.6              | 28.6              | 28.8               |
|       |        | Spec. Cond. (umhos)          | 1477              | 1474              | 1474               |
|       |        | PID (ppm)                    | 0                 | 0                 | 0                  |

Sampling Method and Material Teflon Bailor

|                      |                                                         |                 |
|----------------------|---------------------------------------------------------|-----------------|
| Constituents Sampled | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative    |
| <u>VOCs</u>          | <u>5-40ml vials</u>                                     | <u>HCL pH-1</u> |

Remarks \* Well was resampled for VOCs due to air bubbles in original sample container.  
Trace of product observed in this well.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

| WELL CASING VOLUMES |               |               |               |           |
|---------------------|---------------|---------------|---------------|-----------|
| GAL./FT.            | 1-1/4" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|                     | 1-1/2" = 0.09 | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu work data/MW-4DRLab3

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                |                            |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |
| Site/Well No. | <u>MW-5</u>                            | Coded/<br>Replicate No. | <u>None</u>    | Date                       |
| Weather       | <u>Clear, 85° F</u>                    | Time Sampling<br>Began  | <u>8:59 am</u> | Time Sampling<br>Completed |
|               |                                        |                         |                | <u>10/1/92</u>             |
|               |                                        |                         |                | <u>9:25 am</u>             |

## EVACUATION DATA

|                                      |                                                                           |                                                           |                  |
|--------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.16 ft</u>                                                            | MP Elevation                                              | <u>187.09 ft</u> |
| Total Sounded Depth of Well Below MP | <u>39.0 ft</u>                                                            | Water-Level Elevation                                     | <u>164.49 ft</u> |
| Depth to Water Below MP              | <u>22.60 ft</u>                                                           | Diameter of Casing                                        | <u>4-inch</u>    |
| Water Column in Well                 | <u>16.40 ft</u>                                                           | Gallons Pumped<br>Prior to Sampling                       | <u>33</u>        |
| Gallons per Foot                     | <u>0.65</u>                                                               | Sampling Pump Intake Setting<br>(feet below land surface) | <u>33.0 ft</u>   |
| Gallons in Well                      | <u>10.66</u>                                                              |                                                           |                  |
| Evacuation Method                    | <u>Centrifugal Pump      Pump start - 8:59 am      Pump off - 9:25 am</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

|       |             |                     |                              |                   |                     |                   |                |
|-------|-------------|---------------------|------------------------------|-------------------|---------------------|-------------------|----------------|
|       |             |                     | TIME (ET from Start Pumping) |                   |                     |                   |                |
| Color | Odor        | Field               | Parameters                   | 9:07 am (10 gal.) | 9:14 am (10.5 gal.) | 9:22 am (12 gal.) | After Sampling |
| Clear | Strong odor | pH                  |                              | 6.80              | 7.00                | 7.00              | 7.00           |
|       |             | Temp. (°C)          |                              | 29.6              | 29.6                | 30.02             | 29.2           |
|       |             | Spec. Cond. (umhos) |                              | 1294              | 1284                | 1262              | 1149           |
|       |             | PID (ppm)           |                              | 9.999             | <2000               | <2000             | 2000           |

Sampling Method and Material      Teflon Bailor

|                            |                       |              |
|----------------------------|-----------------------|--------------|
| Constituents Sampled       | Container Description | Preservative |
| VOCs                       | 5-40ml vials          | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass  | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic      | HNO3         |
| TAL Cyanide                | 1-500 ml plastic      | NaOH         |
| TPH                        | 2-500 ml amber glass  | HCL          |

Remarks      Trace of product observed in this well. Strong gasoline odor.

Sampling Personnel      C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                     |               |               |           |
|----------|---------------------|---------------|---------------|-----------|
|          | WELL CASING VOLUMES |               |               |           |
| GAL./FT. | 1-1/4" = 0.06       | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|          | 1-1/2" = 0.09       | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu note dtd/MW - 5 mb 3

# WATER SAMPLING LOG

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Project/No. Tutu/PR01301

Site Location St. Thomas, U.S. Virgin Islands

Site/Well No. MW-6R Coded/Replicate No. None Date 9/29/92

Weather Partly cloudy, 90° F. Time Sampling Began 11:15 am Time Sampling Completed 1:15 pm

## EVACUATION DATA

Description of Measuring Point (MP) Top of well casing.

Height of MP Below Land Surface 0.3 ft MP Elevation 171.17 ft

Total Sounded Depth of Well Below MP 22.95 ft Water-Level Elevation 163.67 ft

Depth to Water Below MP 7.50 ft Diameter of Casing 4-inch

Water Column in Well 15.45 ft Gallons Pumped Prior to Sampling 37

Gallons per Foot 0.65 Sampling Pump Intake Setting (feet below land surface) 11.0 ft

Gallons in Well 10.04

Evacuation Method Centrifugal Pump Pump start - 11:15 am Pump off - 11:28 am

## SAMPLING DATA/FIELD PARAMETERS

TIME (ET from Start Pumping)

| Field Parameters    | 11:18 am (9 gal.) | 11:21 am (9 gal.) | 11:24 am (11 gal.) |
|---------------------|-------------------|-------------------|--------------------|
| pH                  | 6.88              | 6.83              | 6.79               |
| Temp. (°C)          | 31.2              | 30.2              | 29.7               |
| Spec. Cond. (umhos) | 1283              | 1309              | 1316               |
| PID (ppm)           | 94                | 0                 | 0                  |

Color Clear Odor None

Sampling Method and Material Teflon Bailor

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

| WELL CASING VOLUMES |               |               |               |           |
|---------------------|---------------|---------------|---------------|-----------|
| GAL./FT.            | 1-1/4" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|                     | 1-1/2" = 0.09 | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu-0018 JAM/MW - 6R-011

# WATER SAMPLING LOG

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|               |                                        |                         |                 |                              |
|---------------|----------------------------------------|-------------------------|-----------------|------------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                              |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                              |
| Site/Well No. | <u>MW-6D</u>                           | Coded/<br>Replicate No. | <u>None</u>     | Date<br>Time Sampling        |
| Weather       | <u>Partly cloudy, 90° F.</u>           | Time Sampling<br>Began  | <u>10:12 am</u> | Completed<br><u>11:20 am</u> |

## EVACUATION DATA

|                                      |                            |                                                           |                  |
|--------------------------------------|----------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u> |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.25 ft</u>             | MP Elevation                                              | <u>171.01 ft</u> |
| Total Sounded Depth of Well Below MP | <u>62.6 ft</u>             | Water - Level Elevation                                   | <u>163.71 ft</u> |
| Depth to Water Below MP              | <u>7.30 ft</u>             | Diameter of Casing                                        | <u>6-inch</u>    |
| Water Column in Well                 | <u>55.30 ft</u>            | Gallons Pumped<br>Prior to Sampling                       | <u>270</u>       |
| Gallons per Foot                     | <u>1.47</u>                | Sampling Pump Intake Setting<br>(feet below land surface) | <u>10.0 ft</u>   |
| Gallons in Well                      | <u>81.29</u>               |                                                           |                  |

Evacuation Method Centrifugal Pump      Pump start - 10:12 am      Pump off - 11:11 am

## SAMPLING DATA/FIELD PARAMETERS

|       |      | TIME (ET from Start Pumping) |                    |                    |                     |
|-------|------|------------------------------|--------------------|--------------------|---------------------|
| Color | Odor | Field Parameters             | 10:29 am (77 gal.) | 10:49 am (90 gal.) | 11:09 am (103 gal.) |
| Clear | None | After Sampling               |                    |                    |                     |
|       |      | pH                           | <u>6.50</u>        | <u>6.70</u>        | <u>6.78</u>         |
|       |      | Temp. (°C)                   | <u>29.4</u>        | <u>29.8</u>        | <u>29.9</u>         |
|       |      | Spec. Cond. (umhos)          | <u>1450</u>        | <u>1465</u>        | <u>1465</u>         |
|       |      | PID (ppm)                    | <u>0</u>           | <u>0</u>           | <u>0</u>            |

Sampling Method and Material Teflon Bailor

| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M | Preservative    |
|----------------------------|---------------------------------------------------|-----------------|
| VOCs                       | <u>5-40ml vials</u>                               | <u>HCL pH-1</u> |
| TCL BNAs                   | <u>2-500 ml amber glass</u>                       | <u>None</u>     |
| TAL Total/Dissolved Metals | <u>1-500 ml plastic</u>                           | <u>HNO3</u>     |
| TAL Cyanide                | <u>1-500 ml plastic</u>                           | <u>NaOH</u>     |
| TPH                        | <u>2-500 ml amber glass</u>                       | <u>HCL</u>      |

Remarks

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                 | WELL CASING VOLUMES |                 |           |  |
|----------|-----------------|---------------------|-----------------|-----------|--|
| GAL./FT. | 1 - 1/4" = 0.06 | 2" = 0.16           | 3" = 0.37       | 4" = 0.65 |  |
|          | 1 - 1/2" = 0.09 | 2 - 1/2" = 0.26     | 3 - 1/2" = 0.50 | 6" = 1.47 |  |

Tutu-PR01301MW-6D.wj



# WATER SAMPLING LOG

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|               |                                        |                         |                 |                            |                 |
|---------------|----------------------------------------|-------------------------|-----------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                            |                 |
| Site/Well No. | <u>MW-7</u>                            | Coded/<br>Replicate No. | <u>None</u>     | Date                       | <u>10/05/92</u> |
| Weather       |                                        | Time Sampling<br>Began  | <u>11:32 am</u> | Time Sampling<br>Completed | <u>12:30 pm</u> |

## EVACUATION DATA

|                                      |                                                                   |                                                           |                  |
|--------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing</u>                                         |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.16 ft</u>                                                    | MP Elevation                                              | <u>180.13 ft</u> |
| Total Sounded Depth of Well Below MP | <u>35.0 ft</u>                                                    | Water-Level Elevation                                     | <u>163.37 ft</u> |
| Depth to Water Below MP              | <u>16.76 ft</u>                                                   | Diameter of Casing                                        | <u>4-inch</u>    |
| Water Column in Well                 | <u>18.24 ft</u>                                                   | Gallons Pumped<br>Prior to Sampling                       | <u>46</u>        |
| Gallons per Foot                     | <u>0.65</u>                                                       | Sampling Pump Intake Setting<br>(feet below land surface) | <u>20.0 ft</u>   |
| Gallons in Well                      | <u>11.86</u>                                                      |                                                           |                  |
| Evacuation Method                    | <u>Centrifugal Pump Pump start - 11:32 am Pump off - 11:50 am</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

|       |      |                     |                              |                    |                    |                    |                |
|-------|------|---------------------|------------------------------|--------------------|--------------------|--------------------|----------------|
|       |      |                     | TIME (ET from Start Pumping) |                    |                    |                    |                |
| Color | Odor | Field               | Parameters                   | 11:38 am (10 gal.) | 11:43 am (15 gal.) | 11:48 am (21 gal.) | After Sampling |
| Clear | None | pH                  |                              | 7.05               | 7.05               | 7.12               | 7.05           |
|       |      | Temp. (°C)          |                              | 30.3               | 29.5               | 29.5               | Not measured   |
|       |      | Spec. Cond. (umhos) |                              | 1294               | 1288               | 1292               | 1289           |
|       |      | PID (ppm)           |                              | 0                  | 0                  | 0                  | 0              |

Sampling Method and Material Teflon Bailor

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

| WELL CASING VOLUMES    |               |               |           |
|------------------------|---------------|---------------|-----------|
| GAL./FT. 1-1/4" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
| 1-1/2" = 0.09          | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu north disk (MW-7.xls)

# WATER SAMPLING LOG

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|               |                                        |                            |                 |
|---------------|----------------------------------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                            |                 |
| Site/Well No. | <u>MW-8</u>                            | Coded/<br>Replicate No.    | <u>None</u>     |
| Weather       | <u>Partly cloudy; 90° F.</u>           | Time Sampling<br>Began     | <u>8:39 am</u>  |
|               |                                        | Date                       | <u>9/29/92</u>  |
|               |                                        | Time Sampling<br>Completed | <u>11:30 am</u> |

## EVACUATION DATA

|                                      |                                                                           |                                                           |                  |
|--------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.08 ft</u>                                                            | MP Elevation                                              | <u>167.54 ft</u> |
| Total Sounded Depth of Well Below MP | <u>25.56 ft</u>                                                           | Water-Level Elevation                                     | <u>150.51 ft</u> |
| Depth to Water Below MP              | <u>17.03 ft</u>                                                           | Diameter of Casing                                        | <u>4-inch</u>    |
| Water Column in Well                 | <u>8.53 ft</u>                                                            | Gallons Pumped<br>Prior to Sampling                       | <u>12</u>        |
| Gallons per Foot                     | <u>0.65</u>                                                               | Sampling Pump Intake Setting<br>(feet below land surface) | <u>21.0 ft</u>   |
| Gallons in Well                      | <u>5.54</u>                                                               |                                                           |                  |
| Evacuation Method                    | <u>Centrifugal Pump      Pump start - 8:39 am      Pump off - 8:51 am</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

|                              |                      |                              |
|------------------------------|----------------------|------------------------------|
|                              |                      | TIME (ET from Start Pumping) |
| Color                        | Odor                 | Field                        |
| <u>Clear</u>                 | <u>None</u>          | Parameters                   |
|                              |                      | 8:41 am                      |
|                              |                      | 8:48 am                      |
|                              |                      | 6.78                         |
|                              |                      | 6.88                         |
|                              |                      | Temp. (°C)                   |
|                              |                      | 32.8                         |
|                              |                      | 32.2                         |
|                              |                      | Spec. Cond. (umbos)          |
|                              |                      | 1252                         |
|                              |                      | 1370                         |
|                              |                      | PID (ppm)                    |
|                              |                      | 0                            |
|                              |                      | 0                            |
| Sampling Method and Material | <u>Teflon Bailer</u> |                              |

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks Well went dry. Ground-water sample was collected according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                                                                    |
|----------|--------------------------------------------------------------------|
|          | WELL CASING VOLUMES                                                |
| GAL./FT. | 2" = 0.16      3" = 0.37      4" = 0.65                            |
|          | 1-1/2" = 0.09      2-1/2" = 0.26      3-1/2" = 0.50      6" = 1.47 |

Tutu was used (MW - 1.00)

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                |                            |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |
| Site/Well No. | <u>MW-9</u>                            | Coded/<br>Replicate No. | <u>None</u>    | Date                       |
| Weather       | <u>Partly cloudy; 85° F.</u>           | Time Sampling<br>Began  | <u>9:05 am</u> | Time Sampling<br>Completed |
|               |                                        |                         |                | <u>10/07/92</u>            |
|               |                                        |                         |                | <u>10:30 am</u>            |

## EVACUATION DATA

|                                      |                            |                                                           |                           |
|--------------------------------------|----------------------------|-----------------------------------------------------------|---------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u> |                                                           |                           |
| Height of MP Below Land Surface      | <u>0.06 ft</u>             | MP Elevation                                              | <u>162.26 ft</u>          |
| Total Sounded Depth of Well Below MP | <u>34.10 ft</u>            | Water - Level Elevation                                   | <u>149.86 ft</u>          |
| Depth to Water Below MP              | <u>12.40 ft</u>            | Diameter of Casing                                        | <u>4 - inch</u>           |
| Water Column in Well                 | <u>21.70 ft</u>            | Gallons Pumped<br>Prior to Sampling                       | <u>46</u>                 |
| Gallons per Foot                     | <u>0.65</u>                | Sampling Pump Intake Setting<br>(feet below land surface) | <u>32.0 ft</u>            |
| Gallons in Well                      | <u>14.11</u>               |                                                           |                           |
| Evacuation Method                    | <u>Submersible Pump</u>    | <u>Pump start - 9:05 am</u>                               | <u>Pump off - 9:38 am</u> |

## SAMPLING DATA/FIELD PARAMETERS

|                              |                      |                              |                          |                          |                          |
|------------------------------|----------------------|------------------------------|--------------------------|--------------------------|--------------------------|
|                              |                      | TIME (ET from Start Pumping) |                          |                          |                          |
| Color                        | Odor                 | Field                        |                          |                          |                          |
| Grayish                      | Strong Odor          | Parameters                   | <u>9:12 am (14 gal.)</u> | <u>9:19 am (14 gal.)</u> | <u>9:30 am (16 gal.)</u> |
|                              |                      | pH                           | <u>7.15</u>              | <u>7.12</u>              | <u>7.14</u>              |
|                              |                      | Temp. (°C)                   | <u>33.2</u>              | <u>28.88</u>             | <u>32.2</u>              |
|                              |                      | Spec. Cond. (umhos)          | <u>1386</u>              | <u>1490</u>              | <u>1486</u>              |
|                              |                      | PID (ppm)                    | <u>&lt;2000</u>          | <u>800</u>               | <u>780</u>               |
| Sampling Method and Material | <u>Teflon Bailor</u> |                              |                          |                          |                          |

|                            |                                |                 |
|----------------------------|--------------------------------|-----------------|
| Constituents Sampled       | Container Description          | Preservative    |
| VOCs                       | From Lab <u>X</u> or G&M _____ |                 |
| TCL BNAs                   | 5 - 40ml vials                 | <u>HCL pH-1</u> |
| TAL Total/Dissolved Metals | 2 - 500 ml amber glass         | <u>None</u>     |
| TAL Cyanide                | 1 - 500 ml plastic             | <u>HNO3</u>     |
| TPH                        | 1 - 500 ml plastic             | <u>NaOH</u>     |
|                            | 2 - 500 ml amber glass         | <u>HCL</u>      |

Remarks Strong petroleum odor (oil).

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|         |                                                                                                                                                                                                                                                                                                                                                       |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | WELL CASING VOLUMES                                                                                                                                                                                                                                                                                                                                   |
| GAL/FT. | <div style="display: flex; justify-content: space-around;"> <span>1 - 1/2" = 0.06</span> <span>2" = 0.16</span> <span>3" = 0.37</span> <span>4" = 0.65</span> </div> <div style="display: flex; justify-content: space-around;"> <span>1 - 3/4" = 0.09</span> <span>2 - 1/2" = 0.26</span> <span>3 - 1/2" = 0.50</span> <span>6" = 1.47</span> </div> |

Tutu wells data MW - 9 well

# WATER SAMPLING LOG

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|               |                                        |                         |                |                            |                 |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |                 |
| Site/Well No. | <u>MW-9S</u>                           | Coded/<br>Replicate No. | <u>None</u>    | Date                       | <u>10/07/92</u> |
| Weather       | <u>Partly cloudy; 85° F.</u>           | Time Sampling<br>Began  | <u>9:40 am</u> | Time Sampling<br>Completed | <u>11:15 am</u> |

## EVACUATION DATA

|                                      |                            |                                                           |
|--------------------------------------|----------------------------|-----------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u> |                                                           |
| Height of MP Below Land Surface      | <u>0.10 ft</u>             | MP Elevation                                              |
|                                      |                            | <u>162.37 ft</u>                                          |
| Total Sounded Depth of Well Below MP | <u>18.67 ft</u>            | Water-Level Elevation                                     |
|                                      |                            | <u>149.53 ft</u>                                          |
| Depth to Water Below MP              | <u>12.84 ft</u>            | Diameter of Casing                                        |
|                                      |                            | <u>4-inch</u>                                             |
| Water Column in Well                 | <u>5.83 ft</u>             | Gallons Pumped<br>Prior to Sampling                       |
|                                      |                            | <u>22</u>                                                 |
| Gallons per Foot                     | <u>0.65</u>                | Sampling Pump Intake Setting<br>(feet below land surface) |
|                                      |                            | <u>NA</u>                                                 |
| Gallons in Well                      | <u>3.79</u>                |                                                           |

Evacuation Method Centrifugal Pump      Pump start - 9:43 am      Pump off - 9:56 am

## SAMPLING DATA/FIELD PARAMETERS

|          |             |                     |                              |                  |                  |                   |                |
|----------|-------------|---------------------|------------------------------|------------------|------------------|-------------------|----------------|
|          |             |                     | TIME (ET from Start Pumping) |                  |                  |                   |                |
| Color    | Odor        | Field               | Parameters                   | 9:47 am (4 gal.) | 9:51 am (6 gal.) | 9:56 am (12 gal.) | After Sampling |
| Brownish | Strong Odor | pH                  |                              | 7.13             | 7.15             | 7.11              | 7.17           |
|          |             | Temp. (°C)          |                              | 32.6             | 32.4             | 32.0              | 31.8           |
|          |             | Spec. Cond. (umhos) |                              | 1250             | 1325             | 1322              | 1320           |
|          |             | PID (ppm)           |                              | 600              | 696              | 520               | 1200           |

Sampling Method and Material Teflon Bailor

|                            |                                                   |              |
|----------------------------|---------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M | Preservative |
| VOCs                       | 5-40ml vials                                      | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                              | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                  | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                  | NaOH         |
| TPH                        | 2-500 ml amber glass                              | HCL          |

Remarks Trace of product observed in this well. Well went dry. Ground-water sample collected following the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|         |                                                                                                                                                    |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|         | WELL CASING VOLUMES                                                                                                                                |
| GAL/FT. | $1-\frac{1}{4}" = 0.06$ $2" = 0.16$ $3" = 0.37$ $4" = 0.65$<br>$1-\frac{1}{2}" = 0.09$ $2-\frac{1}{2}" = 0.26$ $3-\frac{1}{2}" = 0.50$ $6" = 1.47$ |

Tutu well den(MW)-9S.wk1

# WATER SAMPLING LOG

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|               |                                        |                         |                |                            |
|---------------|----------------------------------------|-------------------------|----------------|----------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                |                            |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                |                            |
| Site/Well No. | <u>MW-10</u>                           | Coded/<br>Replicate No. | <u>None</u>    | Date                       |
| Weather       | <u>Clear, Cool</u>                     | Time Sampling<br>Began  | <u>6:30 am</u> | Time Sampling<br>Completed |
|               |                                        |                         |                | <u>10/6/92</u>             |
|               |                                        |                         |                | <u>9:00 am</u>             |

## EVACUATION DATA

|                                      |                            |                                                           |                  |
|--------------------------------------|----------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u> | MP Elevation                                              | <u>161.50 ft</u> |
| Height of MP Above Land Surface      | <u>0.14 ft</u>             | Water-Level Elevation                                     | <u>140.98 ft</u> |
| Total Sounded Depth of Well Below MP | <u>35.60 ft</u>            | Diameter of Casing                                        | <u>4-inch</u>    |
| Depth to Water Below MP              | <u>20.52 ft</u>            | Gallons Pumped<br>Prior to Sampling                       | <u>30</u>        |
| Water Column in Well                 | <u>15.08 ft</u>            | Sampling Pump Intake Setting<br>(feet below land surface) | <u>33.0 ft</u>   |
| Gallons per Foot                     | <u>0.65</u>                |                                                           |                  |
| Gallons in Well                      | <u>9.80</u>                |                                                           |                  |

Evacuation Method Submersible Pump    Pump start - 6:30 am    Pump off - 6:42 am

## SAMPLING DATA/FIELD PARAMETERS

|              |             |                     |         |         |         |                |
|--------------|-------------|---------------------|---------|---------|---------|----------------|
| Color        | Odor        | Field               |         |         |         |                |
| <u>Clear</u> | <u>None</u> | Parameters          | 6:30 am | 7:54 am | 7:55 am | After Sampling |
|              |             | pH                  | 7.23    | 7.18    | 7.15    | 7.05           |
|              |             | Temp. (°C)          | 31.0    | 31.4    | 31.5    | 31.1           |
|              |             | Spec. Cond. (umhos) | 469     | 1225    | 1229    | 1229           |
|              |             | PID (ppm)           | 0       | 0       | 0       | 0              |

Sampling Method and Material Teflon Bailer

|                                   |                                                         |                 |
|-----------------------------------|---------------------------------------------------------|-----------------|
| Constituents Sampled              | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative    |
| <u>VOCs</u>                       | <u>5-40ml vials</u>                                     | <u>HCL pH-1</u> |
| <u>TCL BNAs</u>                   | <u>2-500 ml amber glass</u>                             | <u>None</u>     |
| <u>TAL Total/Dissolved Metals</u> | <u>1-500 ml plastic</u>                                 | <u>HNO3</u>     |
| <u>TAL Cyanide</u>                | <u>1-500 ml plastic</u>                                 | <u>NaOH</u>     |
| <u>TPH</u>                        | <u>2-500 ml amber glass</u>                             | <u>HCL</u>      |

Remarks Well went dry. Well was pumped until specific conductivity stabilized.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller) / A. Barrera, G. González (Soil Tech).

|          |               | WELL CASING VOLUMES |               |           |  |
|----------|---------------|---------------------|---------------|-----------|--|
| GAL./FT. | 1-1/4" = 0.06 | 2" = 0.16           | 3" = 0.37     | 4" = 0.65 |  |
|          | 1-1/2" = 0.09 | 2-1/2" = 0.26       | 3-1/2" = 0.50 | 6" = 1.47 |  |

Tutu work sheet MW-10.m3

# WATER SAMPLING LOG

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|               |                                        |                            |                |
|---------------|----------------------------------------|----------------------------|----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                            |                |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                            |                |
| Site/Well No. | <u>MW-10D</u>                          | Coded/<br>Replicate No.    | <u>None</u>    |
| Weather       | <u>Partly cloudy, 85°</u>              | Time Sampling<br>Began     | <u>5:14 am</u> |
|               |                                        | Date                       | <u>10/6/92</u> |
|               |                                        | Time Sampling<br>Completed | <u>7:30 am</u> |

## EVACUATION DATA

|                                      |                           |                                                           |
|--------------------------------------|---------------------------|-----------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing</u> |                                                           |
| Height of MP Below Land Surface      | <u>0.14 ft</u>            | MP Elevation                                              |
| Total Sounded Depth of Well Below MP | <u>75.0 ft</u>            | Water-Level Elevation                                     |
| Depth to Water Below MP              | <u>20.66 ft</u>           | Diameter of Casing                                        |
| Water Column in Well                 | <u>54.34 ft</u>           | Galloons Pumped<br>Prior to Sampling                      |
| Galloons per Foot                    | <u>1.47</u>               | Sampling Pump Intake Setting<br>(feet below land surface) |
| Galloons in Well                     | <u>79.88</u>              | <u>70.0 ft</u>                                            |
| Evacuation Method                    | <u>Submersible Pump</u>   | Pump start - <u>5:14 am</u> Pump off - <u>6:04 am</u>     |

## SAMPLING DATA/FIELD PARAMETERS

|       |      |                              |
|-------|------|------------------------------|
|       |      | TIME (ET from Start Pumping) |
| Color | Odor | Field                        |
| Clear | None | Parameters                   |
|       |      | 5:24 am (80 gal.)            |
|       |      | 5:34 am (80 gal.)            |
|       |      | 5:55 am                      |
|       |      | 6:04 am                      |
|       |      | After Sampling               |
|       |      | pH                           |
|       |      | Temp. (°C)                   |
|       |      | Spec. Cond. (umhos)          |
|       |      | PID (ppm)                    |

Sampling Method and Material Teflon Bailor

|                            |                          |              |
|----------------------------|--------------------------|--------------|
| Constituents Sampled       | Container Description    | Preservative |
| VOCs                       | From Lab <u>X</u> or G&M |              |
| TCL BNAs                   | 5-40ml vials             | HCL pH-1     |
| TAL Total/Dissolved Metals | 2-500 ml amber glass     | None         |
| TAL Cyanide                | 1-500 ml plastic         | HNO3         |
| TPH                        | 1-500 ml plastic         | NaOH         |
|                            | 2-500 ml amber glass     | HCL          |

Remarks Well went dry. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/A. Barrera, G. González (Soil Tech).

|          |               |               |               |           |
|----------|---------------|---------------|---------------|-----------|
| GAL./FT. | 1-1/2" = 0.06 | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|          | 1-1/2" = 0.09 | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

This work sheet MW-10D-04.1

# WATER SAMPLING LOG

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|               |                                        |                         |                 |                              |
|---------------|----------------------------------------|-------------------------|-----------------|------------------------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                              |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                              |
| Site/Well No. | <u>MW-11D</u>                          | Coded/<br>Replicate No. | <u>MS/MSD</u>   | Date<br>Time Sampling        |
| Weather       | <u>Partly cloudy, 90°</u>              | Time Sampling<br>Began  | <u>10:12 am</u> | Completed<br><u>11:30 am</u> |

## EVACUATION DATA

|                                      |                                                                             |                                                           |                  |
|--------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                  |                                                           |                  |
| Height of MP Below Land Surface      | <u>0.12 ft</u>                                                              | MP Elevation                                              | <u>153.22 ft</u> |
| Total Sounded Depth of Well Below MP | <u>74.3 ft</u>                                                              | Water-Level Elevation                                     | <u>133.22 ft</u> |
| Depth to Water Below MP              | <u>20.0 ft</u>                                                              | Diameter of Casing                                        | <u>6-inch</u>    |
| Water Column in Well                 | <u>54.3 ft</u>                                                              | Gallons Pumped<br>Prior to Sampling                       | <u>280</u>       |
| Gallons per Foot                     | <u>1.47</u>                                                                 | Sampling Pump Intake Setting<br>(feet below land surface) | <u>NA</u>        |
| Gallons in Well                      | <u>79.82</u>                                                                |                                                           |                  |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 10:12 am      Pump off - 10:47 am</u> |                                                           |                  |

## SAMPLING DATA/FIELD PARAMETERS

| Color<br>Clear      | Odor<br>None       | Field<br>Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |
|---------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|---------------------|----------------|----|------|------|------|------|------------|------|------|------|------|---------------------|------|------|------|-----|-----------|---|---|---|---|
|                     |                    | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 15%;">10:12 am (88 gal.)</th> <th style="width: 15%;">10:34 am (88 gal.)</th> <th style="width: 15%;">10:45 am (104 gal.)</th> <th style="width: 15%;">After Sampling</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td style="text-align: center;">6.78</td> <td style="text-align: center;">7.00</td> <td style="text-align: center;">7.00</td> <td style="text-align: center;">9.38</td> </tr> <tr> <td>Temp. (°C)</td> <td style="text-align: center;">29.2</td> <td style="text-align: center;">29.4</td> <td style="text-align: center;">29.3</td> <td style="text-align: center;">29.9</td> </tr> <tr> <td>Spec. Cond. (umhos)</td> <td style="text-align: center;">1438</td> <td style="text-align: center;">1556</td> <td style="text-align: center;">1589</td> <td style="text-align: center;">192</td> </tr> <tr> <td>PID (ppm)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> |                     | 10:12 am (88 gal.) | 10:34 am (88 gal.) | 10:45 am (104 gal.) | After Sampling | pH | 6.78 | 7.00 | 7.00 | 9.38 | Temp. (°C) | 29.2 | 29.4 | 29.3 | 29.9 | Spec. Cond. (umhos) | 1438 | 1556 | 1589 | 192 | PID (ppm) | 0 | 0 | 0 | 0 |
|                     | 10:12 am (88 gal.) | 10:34 am (88 gal.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10:45 am (104 gal.) | After Sampling     |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |
| pH                  | 6.78               | 7.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7.00                | 9.38               |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |
| Temp. (°C)          | 29.2               | 29.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 29.3                | 29.9               |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |
| Spec. Cond. (umhos) | 1438               | 1556                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1589                | 192                |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |
| PID (ppm)           | 0                  | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                   | 0                  |                    |                     |                |    |      |      |      |      |            |      |      |      |      |                     |      |      |      |     |           |   |   |   |   |

Sampling Method and Material      Teflon Bailor

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel      C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                     |               |               |           |
|----------|---------------------|---------------|---------------|-----------|
|          | WELL CASING VOLUMES |               |               |           |
| GAL./FT. | 1-1/4" = 0.06       | 2" = 0.16     | 3" = 0.37     | 4" = 0.65 |
|          | 1-1/2" = 0.09       | 2-1/2" = 0.26 | 3-1/2" = 0.50 | 6" = 1.47 |

Tutu well data MW-11D.xls

# WATER SAMPLING LOG

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|               |                                 |                                    |                     |
|---------------|---------------------------------|------------------------------------|---------------------|
| Project/No.   | Tutu/PR01301                    |                                    |                     |
| Site Location | St. Thomas, U.S. Virgin Islands |                                    |                     |
| Site/Well No. | MW-12D                          | Coded/<br>Replicate No.            | None                |
| Weather       | Partly cloudy, 85°              | Time Sampling<br>Began             | 10:13 am            |
|               |                                 | Date<br>Time Sampling<br>Completed | 10/5/92<br>11:30 am |

## EVACUATION DATA

|                                      |                                                                      |                                                           |           |
|--------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------|-----------|
| Description of Measuring Point (MP)  | Top of well casing.                                                  |                                                           |           |
| Height of MP Above Land Surface      | 0.23 ft                                                              | MP Elevation                                              | 161.81 ft |
| Total Sounded Depth of Well Below MP | 80.65 ft                                                             | Water - Level Elevation                                   | 133.99 ft |
| Depth to Water Below MP              | 27.82 ft                                                             | Diameter of Casing                                        | 4-inch    |
| Water Column in Well                 | 52.83 ft                                                             | Gallons Pumped<br>Prior to Sampling                       | 123       |
| Gallons per Foot                     | 0.65                                                                 | Sampling Pump Intake Setting<br>(feet below land surface) | 75 ft     |
| Gallons in Well                      | 34.34                                                                |                                                           |           |
| Evacuation Method                    | Submersible Pump      Pump start - 10:13 am      Pump off - 10:44 am |                                                           |           |

## SAMPLING DATA/FIELD PARAMETERS

|       |      |       |                              |                    |                       |                    |                |
|-------|------|-------|------------------------------|--------------------|-----------------------|--------------------|----------------|
|       |      |       | TIME (ET from Start Pumping) |                    |                       |                    |                |
| Color | Odor | Field | Parameters                   | 10:23 am (34 gal.) | 10:32 am (38.75 gal.) | 10:44 am (51 gal.) | After Sampling |
| Clear | None |       | pH                           | 7.23               | 7.50                  | 7.07               | 7.28           |
|       |      |       | Temp. (°C)                   | 31.1               | 31.7                  | 31.1               | 32.1           |
|       |      |       | Spec. Cond. (umhos)          | 1459               | 1453                  | 1455               | 1607           |
|       |      |       | PID (ppm)                    | 0                  | 0                     | 0                  | 0              |

Sampling Method and Material      Teflon Bailor

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks

Sampling Personnel      C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|         |               |                     |               |           |           |           |
|---------|---------------|---------------------|---------------|-----------|-----------|-----------|
| GAL/FT. | 1-1/4" = 0.06 | WELL CASING VOLUMES |               | 2" = 0.16 | 3" = 0.37 | 4" = 0.65 |
|         | 1-1/2" = 0.09 | 2-1/2" = 0.26       | 3-1/2" = 0.50 | 6" = 1.47 |           |           |

Tutu work data 10/5/92 - 12/23/92



# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                 |                            |                |
|---------------|----------------------------------------|-------------------------|-----------------|----------------------------|----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                            |                |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                            |                |
| Site/Well No. | <u>MW - 13D</u>                        | Coded/<br>Replicate No. | <u>None</u>     | Date                       | <u>10/6/92</u> |
| Weather       | <u>Partly cloudy</u>                   | Time Sampling<br>Began  | <u>11:04 am</u> | Time Sampling<br>Completed | <u>1:15 pm</u> |

## EVACUATION DATA

|                                      |                                                                             |                                                                           |
|--------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                  |                                                                           |
| Height of MP Below Land Surface      | <u>0.08 ft</u>                                                              | MP Elevation <u>238.60 ft</u>                                             |
| Total Sounded Depth of Well Below MP | <u>119.0 ft</u>                                                             | Water-Level Elevation <u>153.40 ft</u>                                    |
| Depth to Water Below MP              | <u>83.20 ft</u>                                                             | Diameter of Casing <u>6-inch</u>                                          |
| Water Column in Well                 | <u>35.80 ft</u>                                                             | Gallons Pumped<br>Prior to Sampling <u>66</u>                             |
| Gallons per Foot                     | <u>1.47</u>                                                                 | Sampling Pump Intake Setting<br>(feet below land surface) <u>115.0 ft</u> |
| Gallons in Well                      | <u>52.63</u>                                                                |                                                                           |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 11:04 am      Pump off - 11:15 am</u> |                                                                           |

## SAMPLING DATA/FIELD PARAMETERS

|                              |                      |                                 |
|------------------------------|----------------------|---------------------------------|
|                              |                      | TIME (ET from Start Pumping)    |
| Color                        | Odor                 | Field                           |
| <u>Clear</u>                 | <u>None</u>          | Parameters      After Sampling  |
|                              |                      | pH <u>7.05</u>                  |
|                              |                      | Temp. (°C) <u>28.0</u>          |
|                              |                      | Spec. Cond. (umhos) <u>2370</u> |
|                              |                      | PID (ppm) <u>0</u>              |
| Sampling Method and Material | <u>Teflon Bailer</u> |                                 |

|                            |                                                         |                 |
|----------------------------|---------------------------------------------------------|-----------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative    |
| VOCs                       | <u>5-40ml vials</u>                                     | <u>HCL pH-1</u> |
| TCL BNAs                   | <u>2-500 ml amber glass</u>                             | <u>None</u>     |
| TAL Total/Dissolved Metals | <u>1-500 ml plastic</u>                                 | <u>HNO3</u>     |
| TAL Cyanide                | <u>1-500 ml plastic</u>                                 | <u>NaOH</u>     |
| TPH                        | <u>2-500 ml amber glass</u>                             | <u>HCL</u>      |

Remarks Well went dry after 11 minutes of pumping at a rate of 6 gpm. Field parameters were not measured. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                      |                      |                      |                  |
|----------|----------------------|----------------------|----------------------|------------------|
|          | WELL CASING VOLUMES  |                      |                      |                  |
| GAL./FT. | <u>1-1/2" = 0.06</u> | <u>2" = 0.16</u>     | <u>3" = 0.37</u>     | <u>4" = 0.65</u> |
|          | <u>1-1/2" = 0.09</u> | <u>2-1/2" = 0.26</u> | <u>3-1/2" = 0.50</u> | <u>6" = 1.47</u> |

This work sheet MW - 13D.mcd

# WATER SAMPLING LOG

Page 1 of 1

|               |                                        |                         |                 |                            |                 |
|---------------|----------------------------------------|-------------------------|-----------------|----------------------------|-----------------|
| Project/No.   | <u>Tutu/PR01301</u>                    |                         |                 |                            |                 |
| Site Location | <u>St. Thomas, U.S. Virgin Islands</u> |                         |                 |                            |                 |
| Site/Well No. | <u>MW-14</u>                           | Coded/<br>Replicate No. | <u>None</u>     | Date                       | <u>10/1/92</u>  |
| Weather       | <u>Partly cloudy, 88°</u>              | Time Sampling<br>Began  | <u>12:02 am</u> | Time Sampling<br>Completed | <u>12:35 pm</u> |

## EVACUATION DATA

|                                      |                                                                             |                                                                          |
|--------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Description of Measuring Point (MP)  | <u>Top of well casing.</u>                                                  |                                                                          |
| Height of MP Above Land Surface      | <u>0.08 ft</u>                                                              | MP Elevation <u>196.12 ft</u>                                            |
| Total Sounded Depth of Well Below MP | <u>45.5 ft</u>                                                              | Water-Level Elevation <u>173.32 ft</u>                                   |
| Depth to Water Below MP              | <u>22.80 ft</u>                                                             | Diameter of Casing <u>4-inch</u>                                         |
| Water Column in Well                 | <u>22.70 ft</u>                                                             | Gallons Pumped<br>Prior to Sampling <u>45</u>                            |
| Gallons per Foot                     | <u>0.65</u>                                                                 | Sampling Pump Intake Setting<br>(feet below land surface) <u>40.0 ft</u> |
| Gallons in Well                      | <u>14.76</u>                                                                |                                                                          |
| Evacuation Method                    | <u>Submersible Pump      Pump start - 12:02 am      Pump off - 12:35 am</u> |                                                                          |

## SAMPLING DATA/FIELD PARAMETERS

|       |        |                              |                   |                    |                |
|-------|--------|------------------------------|-------------------|--------------------|----------------|
|       |        | TIME (ET from Start Pumping) |                   |                    |                |
| Color | Odor   | Field Parameters             | 12:10 (11.5 gal.) | 12:20 (13.75 gal.) | 12:30          |
| Clear | Slight | pH                           | 7.34              | 7.14               | 7.00           |
|       |        | Temp. (°C)                   | 31.1              | 30.8               | 30.7           |
|       |        | Spec. Cond. (umhos)          | 1096              | 1084               | 1086           |
|       |        | PID (ppm)                    | <2000             |                    | 0              |
|       |        |                              |                   |                    | After Sampling |
|       |        |                              |                   |                    | 6.54           |
|       |        |                              |                   |                    | 30.0           |
|       |        |                              |                   |                    | 1084           |
|       |        |                              |                   |                    | 0              |

Sampling Method and Material Teflon Bailor

|                            |                                                         |              |
|----------------------------|---------------------------------------------------------|--------------|
| Constituents Sampled       | Container Description<br>From Lab <u>X</u> or G&M _____ | Preservative |
| VOCs                       | 5-40ml vials                                            | HCL pH-1     |
| TCL BNAs                   | 2-500 ml amber glass                                    | None         |
| TAL Total/Dissolved Metals | 1-500 ml plastic                                        | HNO3         |
| TAL Cyanide                | 1-500 ml plastic                                        | NaOH         |
| TPH                        | 2-500 ml amber glass                                    | HCL          |

Remarks \_\_\_\_\_

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

|          |                                                                    |  |
|----------|--------------------------------------------------------------------|--|
|          | WELL CASING VOLUMES                                                |  |
| GAL./FT. | 1-1/4" = 0.06      2" = 0.16      3" = 0.37      4" = 0.65         |  |
|          | 1-1/2" = 0.09      2-1/2" = 0.26      3-1/2" = 0.50      6" = 1.47 |  |

Tutu work 4/24/92 MW-14.m3

**APPENDIX D**

**DATA VALIDATION REPORT**

**(Under Separate Cover)**

**APPENDIX D**

**FIRST SAMPLING ROUND DATA VALIDATION REPORT**

## **APPENDIX D**

### **FIRST SAMPLING ROUND DATA VALIDATION REPORT**

Appendix D includes the data validation summary and the supporting documentation generated during the analytical data review of first round ground-water samples collected in September and October 1992 for the Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands and analyzed by Enseco East (Enseco) of Somerset, New Jersey.

## **APPENDIX FORMAT**

The data validation report appendix is divided in the following sections:

- Introduction.
- Attachment D1 - The U.S. Environmental Protection Agency (USEPA) Standard Operating Procedure (SOP) Number (No.) HW-6 (Revision No. 8) Contract Laboratory Program (CLP) organics data review and preliminary review checklist, and the data assessment narrative.
- Attachment D2 - The USEPA SOP No. HW-2 (Revision 11) "Evaluation of Metals Data for the CLP" total review inorganics checklist and the data assessment narrative for the target analyte list (TAL).
- Attachment D3 - Tables associated with the validation checklists and narratives.

The introduction summarizes (1) the field investigation sampling effort, (2) the analytical parameters and methods employed in support of the field investigation, (3) the data validation requirements and validation protocols used for the data assessment, and (4) an overall assessment.

Attachment D1 is comprised of the USEPA Region II SOP No. HW-6 (Revision No. 8) CLP organics preliminary data review checklist and the data assessment narrative (USEPA 1992a). The data review checklist guides the data reviewer in evaluating pertinent field and laboratory sample documentation and analytical procedures. By evaluating critical quality control (QC) criteria, the data reviewer determines the validity of the analytical data and places limitations on data use. In the data assessment narrative, the data reviewer summarizes the validation, discusses sample anomalies and QC outliers, and provides an overall assessment of the analytical data generated in support of the field investigation.

Attachment D2 is comprised of the USEPA Region II SOP No. HW-2 (Revision 11) data review checklist and associated narrative for the evaluation of CLP inorganics (USEPA 1992b).

In Attachment D3, tables are provided that summarize sample identification/delivery groups; holding time non-compliance; associated trip blank, field blank, and method blank contamination; calibration outliers; and matrix spike outliers.

### INTRODUCTION

This report represents the data validation and narrative summary for 23 ground-water samples (including three field replicates [FR]), six field blanks, seven trip blanks, one field-decontamination water blank, one matrix spike (MS), and one matrix spike duplicate (MSD) sample collected in September and October 1992 for the Tutu Service Station Investigation.

### **SAMPLING**

The samples were collected on seven days during the period of September 29, 1992 through October 7, 1992. They were delivered to the laboratory in seven sample delivery groups (SDGs). An SDG and sample identification (ID) summary is provided below in Table D3-1 of this appendix.

Three replicate ground-water samples were collected and provided to the laboratory with blind field identifications. The field replicates were collected at a frequency of 10 percent of the total field sample number. The sample/field replicate pairs were as follows:

| <u>Sample ID</u> | <u>Replicate Field ID</u> | <u>Report ID</u> |
|------------------|---------------------------|------------------|
| MW-5             | MW-104                    | MW-5 FR          |
| MW-7             | MW-105                    | MW-7 FR          |
| MW-9             | MW-106                    | MW-9 FR          |

A field blank and trip blank were prepared daily and accompanied each SDG shipment. The field blank collected on October 2, 1992 was cancelled at the laboratory due to an internal error.

Sample MW-1 was initially collected on October 2, 1992 in SDG 25009. However, the shipping cooler was lost in transit by the overnight carrier. Since the sample cooler was not delivered to the laboratory during the required time period and the sample preservation requirements were exceeded, MW-1 was resampled on October 6, 1992 and delivered to the laboratory with SDG 25071.

The volatile analysis vials for samples MW-4D and MW-7 collected on October 5, 1992 were received at the laboratory with headspace. Sample MW-4D was resampled for volatiles on October 7, 1992 and delivered to the laboratory with SDG 25091. Sample MW-7 was not resampled since a field replicate of sample MW-7 designated MW-105 was collected on October 5, 1992 and sent to the laboratory for analysis. Geraghty & Miller instructed the laboratory to cancel the volatile organic compound (VOC) analyses on the volatile sample vials delivered for MW-7. To satisfy the 10 percent frequency required for the evaluation of sampling precision and homogeneity of the sample matrix, an additional sample (MW-9) was collected in duplicate in the field. The field replicate of MW-9 was designated MW-106 for analysis of volatile organics only.

A sample of the water used as the source for field decontamination was collected for analysis on October 7, 1992 and designated "ESSO-TAP." The sample was analyzed for the total suite of analytical parameters.

## ANALYSIS

Samples collected during the field investigation were analyzed for the target compound list (TCL) VOCs, 1,2,-dibromoethane (EDB), n-propylbenzene, methyl tert-butyl ether (MTBE), TCL semivolatiles (i.e., base neutral and acid [BNA] extractable compounds), TAL metals, cyanide, and total petroleum hydrocarbons (TPH).

All VOC and BNA analyses were performed in accordance with the USEPA March 1990 CLP organic routine analytical services (RAS) SOW (USEPA 1990a). The SOW was modified during the VOC analysis in order to analyze and quantitate EDB, MTBE, and n-propylbenzene.

For TAL metal and cyanide analyses, the USEPA March 1990 inorganic SOW protocols were used for the quantitation of TAL analytes (USEPA 1990b).

For the analysis of TPH in water samples, preparation and instrumental analysis was performed in accordance with USEPA Method 418.1 in *Methods of Chemical Analysis of Water and Wastes* (USEPA 1983).

## DATA VALIDATION

All VOC, BNA, metals, and cyanide data were validated in accordance with the USEPA Region II data validation guidelines for organic and inorganic analyses performed in accordance with CLP RAS protocols. The guidelines for organics and inorganics are provided in the regional Standard Operating Procedures (SOP) No. HW-6, Revision 8, and No. HW-2, Revision 11, respectively (USEPA 1992a; 1992b).



Data validation of TPH data was performed according to criteria specified in USEPA Method 418.1 (USEPA 1983) and in accordance with the following guidelines:

- Method and/or reagent blanks - Reported concentration should be less than the quantitation limit. Blanks, including field blanks, associated with field samples were reviewed for contamination. Sample results were evaluated using a five times (5x) multiplier of the highest concentration associated TPH blank.
- Precision of duplicates - Acceptable precision was demonstrated by calculation of relative percent difference (RPD) with a limit of 20 percent. For calculated RPD between 20 to 40 percent, all associated sample data for the analytical batch was estimated and qualified with a "J" flag.
- Accuracy of matrix spikes - Acceptable accuracy was demonstrated by percent recovery (%R) of MS and MSD in the acceptance window range of 80 to 120 percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data was qualified as estimated.
- Accuracy of laboratory control spikes - Acceptable %R of blank spikes was within the window of 80 to 120 percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data in the SDG were qualified as estimated concentrations.

## OVERALL ASSESSMENT

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness.

Some data generated for the VOC and BNA organic analyses have been negated for blank contamination and estimated for holding time, calibration criteria, surrogate and MS/MSD

recoveries, and for sample disposition issues. The acid-extractable compounds reported as non-detects in samples MW-6D and MW-11D were rejected due to surrogate outliers.

In the data review of TAL inorganics, some data were estimated for the following criteria: holding times and sample preservation, calibration, furnace precision and accuracy outliers, serial dilution, and for greater than a 10 percent difference between sample results for total and dissolved constituents. The following data were determined unusable because of QC outliers:

- The cyanide data for samples MW-6R and MW-8 due to holding time and sample preservation requirements.
- The cyanide data for MW-11D due to the matrix precision and accuracy data (MS/MSD analyses).
- Total aluminum and iron data in sample ESSO-TAP due to field blank contamination.
- Total chromium in samples MW-9, MW-9S, and MW-1 due to field blank contamination.
- Total and dissolved arsenic in sample MW-9S due to a greater than 50 percent difference between the arsenic sample results.

## **REFERENCES**

- U.S. Environmental Protection Agency (USEPA). 1983. Methods of Chemical Analysis of Water and Wastes, EPA-600/4-7-90-020, United States Environmental Protection Agency, Cincinnati, Ohio, March 1983.
- U.S. Environmental Protection Agency (USEPA). 1990a. USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90 including Rev. 12/90 and 2/91, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1990b. USEPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1992a. Evaluation of Organic Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-6, Revision No. 8, United States Environmental Protection Agency, January 1992.
- U.S. Environmental Protection Agency (USEPA). 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-2, Revision No. 11, United States Environmental Protection Agency, January 1992.

tuturi-wp DV/appx.d

**ATTACHMENT D1**  
**ORGANIC DATA VALIDATION REPORT**

SOP NO. HW-6  
Revision #8

CLP ORGANICS DATA REVIEW  
AND PRELIMINARY REVIEW

BY: Leon Lazarus  
Leon Lazarus, Environmental Scientist  
Toxic and Hazardous Waste Section

Date: Jan 21

BY: George Karras  
George Karras, Chemist  
Toxic and Hazardous Waste Section

Date: January

BY: Stelios Gerazounis  
Stelios Gerazounis, Chemist  
Toxic and Hazardous Waste Section

Date: 1/3/92

CONCURRED BY: Kevin W. Kubik  
Kevin Kubik, Chief  
Toxic and Hazardous Waste Section

Date: 1/3/92

APPROVED BY: Robert Runyon  
Robert Runyon, Chief  
Monitoring Management Branch

Date: 1/7/92

STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

PACKAGE COMPLETENESS AND DELIVERABLES

CASE NUMBER: \_\_\_\_\_

LAB: Enseco East

SITE: Tutu Service Station Investigation

1.0 Data Completeness and Deliverables

- 1.1 Have any missing deliverables been received and added to the data package? ☒ \_\_\_\_\_

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-Compliance" section of reviewer narrative.

- 1.2 Was SMO CCS checklist included with package? ☐ \_\_\_\_\_ ☒

2.0 Cover Letter SDG Narrative

- 2.1 Is the Narrative or Cover Letter Present? ☒ \_\_\_\_\_

- 2.2 Are Case Number and/or SAS number contained in the Narrative or Cover letter? ☒ \_\_\_\_\_

3.0 Data Validation Checklist

The following checklist is divided into three parts. Part A is filled out if the data package contains any VOA analyses, Part B for any BNA analyses and Part C for Pesticide/PCBs.

Does this package contain:

VOA Data? ☒ \_\_\_\_\_

BNA Data? ☒ \_\_\_\_\_

Pesticide/PCB data? \_\_\_\_\_ ☒

Action: Complete corresponding parts of checklist.

STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

PART A: VOA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are the Traffic Report Forms present for all samples? ☒ ☐ ☐

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data? ☒ ☐ ☐

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated (J). If a soil sample other than TCLP contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all Non-Detects "UJ".

ACTION: If both VOA vials for a sample have air bubbles or the VOA vial analyzed had air bubbles, flag all positive results "J" and all non-detects "R".

# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

## 2.0 Holding Times

2.1 Have any VOA technical holding times, determined from date of collection to date of analysis, been exceeded? ✓      

If unpreserved, aqueous samples maintained at 4°C which are to be analyzed for aromatic hydrocarbons must be analyzed within 7 days of collection. If preserved with HCl (pH<2) and stored at 4°C, then aqueous samples must be analyzed within 14 days of collection. If uncertain about preservation, contact sampler to determine whether or not samples were preserved.

The holding time for soils is 10 days.

### Table of Holding Time Violations

*Refer to Table  
D3-2 in the appendix.*

| Sample ID | Sample Matrix | Preserved? | (See Traffic Report) |                   |               |
|-----------|---------------|------------|----------------------|-------------------|---------------|
|           |               |            | Date Sampled         | Date Lab Received | Date Analyzed |
| _____     | _____         | _____      | _____                | _____             | _____         |
| _____     | _____         | _____      | _____                | _____             | _____         |
| _____     | _____         | _____      | _____                | _____             | _____         |
| _____     | _____         | _____      | _____                | _____             | _____         |

**ACTION:** If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results must be qualified "J", but the reviewer may determine that non-detect data are unusable (R). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).



# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

## 3.0 System Monitoring Compound (SMC) Recovery (Form II)

3.1 Are the VOA SMC Recovery Summaries (Form II) present for each of the following matrices:

- |              |                                     |     |                                     |
|--------------|-------------------------------------|-----|-------------------------------------|
| a. Low Water | <input checked="" type="checkbox"/> | ___ | ___                                 |
| b. Low Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |
| c. Med Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |

3.2 Are all the VOA samples listed on the appropriate System Monitoring Compound Recovery Summary for each of the following matrices:

- |              |                                     |     |                                     |
|--------------|-------------------------------------|-----|-------------------------------------|
| a. Low Water | <input checked="" type="checkbox"/> | ___ | ___                                 |
| b. Low Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |
| c. Med Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |

ACTION: Call lab for explanation/  
resubmittals. If missing  
deliverables are unavailable,  
document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk?

☒ \_\_\_ \_\_\_

ACTION: Circle all outliers in red.

3.4 Was one or more VOA system monitoring compound recovery outside of contract specifications for any sample or method blank?

☒ ☐ \_\_\_

If yes, were samples re-analyzed?

☒ \_\_\_ \_\_\_

Were method blanks re-analyzed?

☐ \_\_\_ ☒

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

ACTION: If recoveries are > 10% but 1 or more compounds fail to meet SOW specifications:

1. All positive results are qualified as estimated (J).
2. Flag all non-detects as estimated detection limits ("UJ") where recovery is less than the lower acceptance limit.
3. If SMC recoveries are above allowable levels, do not qualify non-detects.

If any system monitoring compound recovery is <10% :

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as unusable ("R").

Professional judgement should be used to qualify data that only have method blank SMC recoveries out of specification in both original and re-analyses. Check the internal standard areas.

- 3.5 Are there any transcription/calculation errors between raw data and Form II? ☒ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and note errors in the data assessment.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☒ ☐ ☐

# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:

- |              |                                     |     |                                     |
|--------------|-------------------------------------|-----|-------------------------------------|
| a. Low Water | <input checked="" type="checkbox"/> | ___ | ___                                 |
| b. Low Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |
| c. Med Soil  | <input type="checkbox"/>            | ___ | <input checked="" type="checkbox"/> |

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

4.3 How many VOA spike recoveries are outside QC limits?

|                    |                     |
|--------------------|---------------------|
| <u>Water</u>       | <u>Soils</u>        |
| <u>3</u> out of 10 | <u>NA</u> out of 10 |

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

|                   |                    |
|-------------------|--------------------|
| <u>Water</u>      | <u>Soils</u>       |
| <u>0</u> out of 5 | <u>NA</u> out of 5 |

ACTION: No action is taken based on MS/MSD data alone. However, using informed professional judgement, the MS/MSD results may be used in conjunction with other QC criteria to determine the need for qualification of the data.

## 5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present?

☒ \_\_\_

5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix (low water, low soil, medium soil), whichever is more frequent?

☒ \_\_\_

# STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- 5.3 Has a VOA method/instrument blank been analyzed at least once every twelve hours for each concentration level and GC/MS system used? ☒ ☐ ☐

ACTION: If any method blank data are missing, call lab for explanation/ resubmittal. If method blank data are not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank or trip blank data for missing method blank data.

- 5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs? ☒ ☐ ☐

ACTION: Use professional judgement to determine the effect on the data.

## 6.0 Contamination

NOTE: "Water blanks", "drill blanks", and distilled water blanks" are validated like any other sample, and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture when necessary. ☒ ☐ ☐

- 6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)? ☒ ☐ ☐

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

## STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

NOTE: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped and are not required for non-aqueous matrices. Blanks may not be qualified because of contamination in another blank. Field Blanks & Trip Blanks must be qualified for system monitoring compound, instrument performance criteria, spectral or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If any blanks are grossly contaminated, all associated data should be qualified as unusable (R).

|                                                           | Sample conc > CRQL<br>but < 10x blank<br>value | Sample conc < CRQL<br>& < 10x blank value | Sample conc > CRQL<br>& > 10x blank value |
|-----------------------------------------------------------|------------------------------------------------|-------------------------------------------|-------------------------------------------|
| Methylene<br>Chloride<br>Acetone<br>Toluene<br>2-Butanone | Flag sample result<br>with a "U";              | Report CRQL &<br>qualify "U"              | No qualification<br>is needed             |

|                            | Sample conc > CRQL<br>but < 5x blank | Sample conc < CRQL &<br>is < 5x blank value | Sample conc > CRQL<br>value & > 5x blank<br>value |
|----------------------------|--------------------------------------|---------------------------------------------|---------------------------------------------------|
| Other<br>Contam-<br>inants | Flag sample result<br>with a "U"     | Report CRQL &<br>qualify "U"                | No qualification<br>is needed                     |

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample?

☐ ☒ ☐

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

## 7.0 GC/MS Instrument Performance Check (Form V)

7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Bromofluorobenzene (BFB)?

☒ ☐ ☐

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the BFB provided for each twelve hour shift?

☒ ☐ ☐

7.3 Has an instrument performance compound been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

ACTION: List date, time, instrument ID, and sample analysis for which no associated GC/MS tuning data are available.

| DATE  | TIME  | INSTRUMENT | SAMPLE NUMBERS |
|-------|-------|------------|----------------|
| _____ | _____ | _____      | _____          |
| _____ | _____ | _____      | _____          |
| _____ | _____ | _____      | _____          |

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

7.4 Have the ion abundances been normalized to m/z 95? ☒ \_\_\_\_\_

ACTION: If mass assignment is in error, qualify all associated data as unusable (R).

7.5 Have the ion abundance criteria been met for each instrument used? ☒ \_\_\_\_\_

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

7.6 Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ☒ \_\_\_\_\_

## STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- 7.7 Have the appropriate number of significant figures (two) been reported? ☐ ☒ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

- 7.8 Are the spectra of the mass calibration compound acceptable? ☒ ☐ ☐

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

- 8.1 Are the Organic Analysis Data Sheets (Form I VOA) present with required header information on each page, for each of the following:

- a. Samples and/or fractions as appropriate ☒ ☐ ☐  
b. Matrix spikes and matrix spike duplicates ☒ ☐ ☐  
c. Blanks ☒ ☐ ☐

- 8.2 Are the VOA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?

- a. Samples and/or fractions as appropriate ☒ ☐ ☐  
b. Matrix spikes and matrix spike duplicates (Mass spectra not required) ☒ ☐ ☐  
c. Blanks ☒ ☐ ☐

ACTION: If any data are missing, take action specified in 3.2 above.



## STANDARD OPERATING PROCEDURE

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|                                                                                                                                                                                    | YES                                 | NO                                  | N/A                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 8.3 Are the response factors shown in the Quant Report?                                                                                                                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 8.4 Is chromatographic performance acceptable with respect to:                                                                                                                     |                                     |                                     |                                     |
| Baseline stability?                                                                                                                                                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Resolution?                                                                                                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Peak shape?                                                                                                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Full-scale graph (attenuation)?                                                                                                                                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Other: _____                                                                                                                                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| ACTION: Use professional judgement to determine the acceptability of the data.                                                                                                     |                                     |                                     |                                     |
| 8.5 Are the lab-generated standard mass spectra of the identified VOA compounds present for each sample?                                                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance". |                                     |                                     |                                     |
| 8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?                                                                  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- 8.8 Do sample and standard relative ion intensities agree within 20%? ☒ ☐ ☐

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.6, 8.7, and 8.8.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

- 9.1 Are all Tentatively Identified Compound Forms (Form I Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? ☐ ☒ ☐

- 9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

- a. Samples and/or fractions as appropriate ☒ ☐ ☐  
b. Blanks ☒ ☐ ☐

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- 9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene- a VOA TCL analyte - and should not be reported as a TIC)? YES ☒ NO ☐ N/A ☐

ACTION: Flag with "R" any TCL compound listed as a TIC.

- 9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum? YES ☒ NO ☐ N/A ☐

- 9.5 Do TIC and "best match" standard relative ion intensities agree within 20%? YES ☒ NO ☐ N/A ☐

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.

Also, when a compound is not found in any blank, but is detected in a sample and is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R). (i.e. Common Lab Contaminants: CO<sub>2</sub> (M/E 44), Siloxanes (M/E 73) Hexane, Aldol Condensation Products, Solvent Preservatives, and related by products - see Functional Guidelines for more guidance).

STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?

— ☒ —

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?

☒ — —

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and its associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial and continuing calibration?

☒ — —

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

- 12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction at concentrations of 10, 20, 50, 100, 200 ug/l? Are there separate calibrations for low water/med soils and low soil samples? ☒ ☐ ☐

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

- 12.2 Were all low level soil standards, blanks and samples analyzed by heated purge? ☐ ☐ ☒

ACTION: If low level soil samples were not heated during purge, qualify positive hits "J" and non-detects "R".

- 12.3 Are response factors stable for VOA's over the concentration range of the calibration (%Relative Standard Deviation (%RSD) <30.0% )? ☐ ☒ ☐

ACTION: Circle all outliers in red.

NOTE: Although 11 VOA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If %RSD > 30.0%, qualify associated positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detects for that analyte R (unusable).

NOTE: Analytes previously qualified "U" for blank contamination are still considered as "hits" when qualifying for initial calibration criteria.

- 12.4 Are the RRFs above 0.05? ☒ ☐ ☐

Action: Circle all outliers in red.

Action: If any RRF are < 0.05, qualify associated non-detects (R) and flag associated positive data as estimated (J).

STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

- 12.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %RSD? (Check at least 2 values, but if errors are found, check more.)

☒ ☐ ☐

13.0 GC/MS Continuing Calibration (Form VII)

- 13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction?

☒ ☐ ☐

- 13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

- 13.3 Do any volatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the  $\pm 25\%$  criteria?

☒ ☐ ☐

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated. When % D is above 90%, reject all non-detects for that analyte (R) unusable.

# STANDARD OPERATING PROCEDURE

Date: January 1992  
Revision: 8

YES NO N/A

13.4 Do any volatile compounds have a RRF <0.05? ☐ ☒ ☐

ACTION: Circle all outliers in red.

ACTION: If the RRF <0.05, qualify associated non-detects as unusable (R) and "J" associated positive values.

13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) ☐ ☒ ☐

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

## 14.0 Internal Standard (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration? ☒ ☐ ☐

ACTION: List all the outliers below.

| Sample # | Internal Std | Area  | Lower Limit | Upper Limit |
|----------|--------------|-------|-------------|-------------|
| _____    | _____        | _____ | _____       | _____       |
| _____    | _____        | _____ | _____       | _____       |
| _____    | _____        | _____ | _____       | _____       |
| _____    | _____        | _____ | _____       | _____       |
| _____    | _____        | _____ | _____       | _____       |

(Attach additional sheets if necessary.)

## STANDARD OPERATING PROCEDURE

Date: January 1992

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YES NO N/A

- ACTION: 1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results quantitated with this internal standard.
2. Non-detects associated with IS area counts > 100% should not be qualified.
3. If IS area is below the lower limit (< 50%), qualify all associated non-detects (U values) "J". If extremely low area counts are reported, (< 25%) or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

- 14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard?

☒ ☐ ☐

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

### 15.0 Field Duplicates

- 15.1 Were any field duplicates submitted for VOA analysis?

☒ ☐ ☐

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.



YES NO N/A

PART B: BNA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are the Traffic Report Forms present for all samples? 1 1 1

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? 1 1 1

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated ("J"). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

- 2.1 Have any BNA technical holding times, determined from date of collection to date of extraction, been exceeded? 1 1 1

Continuous extraction of water samples for BNA analysis must be started within seven days of the date of collection. Soil/sediment samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of the date of extraction.

YES NO N/A

Table of Holding Time Violations

Refer to Table D3-2  
in the appendix.

| Sample | Sample Matrix | Date Sampled | (See Traffic Report) |                | Date Analyzed |
|--------|---------------|--------------|----------------------|----------------|---------------|
|        |               |              | Date Lab Received    | Date Extracted |               |
| _____  | _____         | _____        | _____                | _____          | _____         |
| _____  | _____         | _____        | _____                | _____          | _____         |
| _____  | _____         | _____        | _____                | _____          | _____         |
| _____  | _____         | _____        | _____                | _____          | _____         |
| _____  | _____         | _____        | _____                | _____          | _____         |
| _____  | _____         | _____        | _____                | _____          | _____         |

**ACTION:** If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results should be qualified "J", but the reviewer may determine that non-detect data are unusable ("R"). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices:

- a. Low Water
- b. Low Soil
- c. Med Soil

☒ \_\_\_\_\_  
☐ \_\_\_\_\_ ☒  
☐ \_\_\_\_\_ ☒

## STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- 3.2 Are all the BNA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:

a. Low Water

☒ ☐ ☐

b. Low Soil

☐ ☐ ☒

c. Low Soil

☐ ☐ ☒

ACTION: Call lab for explanation/resubmittals.  
If missing deliverables are unavailable,  
document effect in data assessments.

- 3.3 Were outliers marked correctly with an asterisk?

☒ ☐ ☐

ACTION: Circle all outliers in red.

- 3.4 Were two or more base-neutral OR acid surrogate recoveries out of specification for any sample or method blank?

☒ ☐ ☐

If yes, were samples reanalyzed?

☒ ☐ ☐

Were method blanks reanalyzed?

☐ ☐ ☒

ACTION: If all BNA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, for the affected fraction only (i.e. base-neutral or acid compounds):

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ") when recoveries are less than the lower acceptance limit.
3. If recoveries are greater than the upper acceptance limit, do not qualify non-detects.

YES NO N/A

If any base-neutral or acid surrogate has a recovery of <10%:

1. Positive results for the fraction with <10% surrogate recovery are qualified with "J".
2. Non-detects for that fraction should be qualified as unusable (R) .

Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.

- 3.5 Are there any transcription/calculation errors between raw data and Form II? ☒

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

#### 4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☒
- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:
- |              |                                     |                          |                                     |
|--------------|-------------------------------------|--------------------------|-------------------------------------|
| a. Low Water | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| b. Low Soil  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| c. Med Soil  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

- 4.3 How many BNA spike recoveries are outside QC limits?

WaterSoils12 out of 22NA out of 22

- 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

WaterSoils0 out of 11NA out of 11

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present? ☒ 1

- 5.2 Frequency of Analysis:

Has a reagent/method blank analysis been reported per 20 samples of similar matrix, or concentration level, and for each extraction batch? ☒ 1          

- 5.3 Has a BNA method blank been analyzed for each GC/MS system used? ☒ 1            
(See SOW p. D - 59/SV, Section 8.7)

ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, use professional judgement to determine if the associated sample data should be qualified.

YES NO N/A

- 5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for BNAs?

☒ ☐ ☐

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

Note: "Water blanks", "drill blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture where necessary.

☒ ☐ ☐

- 6.2 Do any field/rinse/ blanks have positive BNA results (TCL and/or TIC)?

☒ ☐ ☐

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

Note: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field Blanks must be qualified for surrogate, spectral, instrument performance or calibration QC problems.

YES NO N/A

**ACTION:** Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If gross contamination exists, all data in the associated samples should be qualified as unusable (R).

| Sample conc > CRQL<br>but < 10x blank | Sample conc < CRQL &<br>is < 10x blank value | Sample conc > CRQL<br>value & > 10x blank |
|---------------------------------------|----------------------------------------------|-------------------------------------------|
|---------------------------------------|----------------------------------------------|-------------------------------------------|

**Common Phthalate Esters**

|                                   |                              |                               |
|-----------------------------------|------------------------------|-------------------------------|
| Flag sample result<br>with a "U"; | Report CRQL &<br>qualify "U" | No qualification<br>is needed |
|-----------------------------------|------------------------------|-------------------------------|

| Sample conc > CRQL<br>but < 5x blank | Sample conc < CRQL &<br>is < 5x blank value | Sample conc > CRQL<br>value & > 5 blank value |
|--------------------------------------|---------------------------------------------|-----------------------------------------------|
|--------------------------------------|---------------------------------------------|-----------------------------------------------|

**Other Contaminants**

|                                   |                              |                                |
|-----------------------------------|------------------------------|--------------------------------|
| Flag sample result<br>with a "U"; | Report CRQL &<br>qualify "U" | No qualification<br>is needed. |
|-----------------------------------|------------------------------|--------------------------------|

**NOTE:** Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

**ACTION:** For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample?

☐ ☒ ☐

**ACTION:** For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

YES NO N/A

7.0 GC/MS Instrument Performance Check

7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)? ☒          

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift? ☒          

7.3 Has an instrument performance check solution been analyzed for every twelve hours of sample analysis per instrument? ☒          

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

| DATE              | TIME              | INSTRUMENT        | SAMPLE NUMBERS    |
|-------------------|-------------------|-------------------|-------------------|
| <u>          </u> | <u>          </u> | <u>          </u> | <u>          </u> |
| <u>          </u> | <u>          </u> | <u>          </u> | <u>          </u> |
| <u>          </u> | <u>          </u> | <u>          </u> | <u>          </u> |

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

ACTION: If mass assignment is in error, flag all associated sample data as unusable (R).

7.4 Have the ion abundances been normalized to m/z 198? ☒



YES NO N/A

- 7.5 Have the ion abundance criteria been met for each instrument used? ☒ ☐ ☐

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

- 7.6 Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ☐ ☒ ☐
- 7.7 Have the appropriate number of significant figures (two) been reported? ☐ ☒ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

- 7.8 Are the spectra of the mass calibration compound acceptable? ☒ ☐ ☐

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

- 8.1 Are the Organic Analysis Data Sheets (Form I BNA) present with required header information on each page, for each of the following:

- a. Samples and/or fractions as appropriate ☒ ☐ ☐
- b. Matrix spikes and matrix spike duplicates ☒ ☐ ☐
- c. Blanks ☒ ☐ ☐

YES NO N/A

- 8.2 Has GPC cleanup been performed on all soil/  
sediment sample extracts?

☐ ☐ ☒

ACTION: If data suggests that GPC was not  
performed, use professional judgement.  
Make note in "Contract  
Problems/Non-Compliance".

- 8.3 Are the BNA Reconstructed Ion Chromatograms,  
the mass spectra for the identified compounds,  
and the data system printouts (Quant Reports)  
included in the sample package for each of the  
following?

- a. Samples and/or fractions as appropriate  
b. Matrix spikes and matrix spike duplicates  
(Mass spectra not required)  
c. Blanks

☒ ☐ ☐  
☒ ☐ ☐  
☒ ☐ ☐

ACTION: If any data are missing, take action  
specified in 3.2 above.

- 8.4 Are the response factors shown in the Quant  
Report?

☐ ☒ ☐

- 8.5 Is chromatographic performance acceptable with  
respect to:

Baseline stability?

☒ ☐ ☐

Resolution?

☒ ☐ ☐

Peak shape?

☒ ☐ ☐

Full-scale graph (attenuation)?

☒ ☐ ☐

Other: \_\_\_\_\_

☐ ☐ ☒

ACTION: Use professional judgement to determine  
the acceptability of the data.

YES NO N/A

- 8.6 Are the lab-generated standard mass spectra of identified BNA compounds present for each sample? ☒ 1

ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance". If spectra are missing, reject all positive data.

- 8.7 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration? ☒ 1

- 8.8 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum? ☒ 1

- 8.9 Do sample and standard relative ion intensities agree within 20%? ☒ 1

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (Presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.7, 8.8, and 8.9.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

- 9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? ☒ 1

YES NO N/A

9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

a. Samples and/or fractions as appropriate

☒ ☐ ☐

b. Blanks

☒ ☐ ☐

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene a VOA TCL - and should not be reported as a TIC)?

☒ ☐ ☐

ACTION: Flag with "R" any TCL compound listed as a TIC.

9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?

☒ ☐ ☐

9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?

☒ ☐ ☐

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate. Also, when a compound is not found in any blank, but is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R).

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?    ☒   

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture? ☒      

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and it's associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant, Reports) present for initial and continuing calibration? ☒      

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

- 12.1 Are the Initial Calibration Forms (Form VI) present and complete for the BNA fraction? ☒ 1

ACTION: If any calibration standard forms are missing, take action specified in 3.2. above.

- 12.2 Are response factors stable for BNAs over the concentration range of the calibration? (% Relative standard deviation (%RSD) < 30.0%) ☒ 1

ACTION: Circle all outliers in red.

NOTE: Although 20 BNA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If the % RSD is > 30.0%, qualify positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detect results for that analyte R (unusable).

NOTE: Analytes previously qualified "U" due to blank contamination are still considered as "hits" when qualifying for calibration criteria.

- 12.3 Are all BNA compound RRFs > 0.05? ☒ 1

ACTION: Circle all outliers in red.

ACTION: If any RRF < 0.05  
1. "R" all non-detects.  
2. "J" all positive results.

- 12.4 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % RSD? (Check at least two values but if errors are found, check more.)    ☒ 1

ACTION: Circle Errors in red.

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YES NO N/A

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors in data assessments.

13.0 GC/MS Continuing Calibration (Form VII)

13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction? ☒ 1 1 1

13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument? ☒ 1 1 1

ACTION: List below all sample analyses that were not within twelve hours of a continuing calibration analysis for each instrument used.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

13.3 Do any semivolatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the + 25.0% criteria? ☒ 1 1 1

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated (J). When %D is above 90%, reject all non-detects for that analyte (R) unusable.

YES NO N/A

13.4 Do any semivolatile compounds have a RRF  $< 0.05$ ? ☒

ACTION: Circle all outliers in red.

ACTION: If RRF  $< 0.05$ , qualify as unusable (R) associated non-detects and "J" associated positive values.13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more). ☒

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

14.0 Internal Standards (Form VIII)14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits ( $-50\%$  to  $+100\%$ ) for each continuing calibration? ☒

ACTION: List all the outliers below.

| Sample #   | Internal Std | Area  | Lower Limit | Upper Limit |
|------------|--------------|-------|-------------|-------------|
| MW-11D MSD | Chrysene-d12 | 95467 | 8108        | 32430       |
| MW-11D MSD | Perylene-d12 | 35775 | 8835        | 35340       |
| _____      | _____        | _____ | _____       | _____       |
| _____      | _____        | _____ | _____       | _____       |

(Attach additional sheets if necessary.)

ACTION: 1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard.



YES NO N/A

2. Non-detects associated with IS areas  
> 100% should not be qualified.

3. If the IS area is below the lower limit  
(<50%), qualify all associated non-detects  
(U-values) "J". If extremely low area counts  
are reported (<25%) or if performance  
exhibits a major abrupt drop off, flag all  
associated non-detects as unusable (R).

14.2 Are the retention times of the internal standards  
within 30 seconds of the associated calibration  
standard? ☒ — —

ACTION: Professional judgement should be  
used to qualify data if the  
retention times differ by more than  
30 seconds.

15.0 Field Duplicates

15.1 Were any field duplicates submitted for BNA  
analysis? ☒ — —

ACTION: Compare the reported results for  
field duplicates and calculate  
the relative percent difference.

ACTION: Any gross variation between field  
duplicate results must be addressed  
in the reviewer narrative. However,  
if large differences exist,  
identification of field duplicates  
should be confirmed by contacting the  
sampler.

YES NO N/A

PART C: PESTICIDE/PCB ANALYSIS

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are Traffic Report Forms present for all samples?   1

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or SDG Narrative indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?        1

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be qualified as estimated (J). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

- 2.1 Have any PEST/PCB technical holding times, determined from date of collection to date of extraction, been exceeded?        1

Water and soil samples for PEST/PCB analysis must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date extraction.

YES NO N/A

**ACTION:** If technical holding times are exceeded, flag all positive results as estimated (J) and sample quantitation limits (UJ) and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all the data should at least be qualified "J", but the reviewer may determine that non-detects are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the PEST/PCB Surrogate Recovery Summaries (Form II) present for each of the following matrices?

|              |                          |     |     |
|--------------|--------------------------|-----|-----|
| a. Low Water | <input type="checkbox"/> | ___ | ___ |
| b. Soil      | <input type="checkbox"/> | ___ | ___ |

3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summary for each of the following matrices?

|              |                          |     |     |
|--------------|--------------------------|-----|-----|
| a. Low Water | <input type="checkbox"/> | ___ | ___ |
| b. Soil      | <input type="checkbox"/> | ___ | ___ |

**ACTION:** Call lab for explanation/resubmittals.  
If missing deliverables are unavailable, document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk? ☐ \_\_\_

**ACTION:** Circle all outliers in red.

3.4 Were surrogate recoveries of TCX or DCB outside of the contract specification for any sample or blank? (60-150%) \_\_\_ ☐ \_\_\_

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YES NO N/A

ACTION: No qualification is done if surrogates are diluted out. If recovery for both surrogates is below the contract limit, but above 10%, flag all results for that sample "J". If recovery is < 10% for either surrogate, qualify positive results "J" and flag non-detects "R". If recovery is above the contract advisory limits for both surrogates qualify positive values "J".

- 3.5 Were surrogate retention times (RT) within the windows established during the initial 3-point analysis of Individual Standard Mixture A? ☐ ☐ ☐

ACTION: If the RT limits are not met, the analysis may be qualified unusable (R) for that sample on the basis of professional judgement.

- 3.6 Are there any transcription/calculation errors between raw data and Form II? ☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal. Make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☐ ☐ ☐

- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices? (1 MS/MSD must be performed for every 20 samples of similar matrix or concentration level)

a. Low Water ☐ ☐ ☐

b. Soil ☐ ☐ ☐

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

- 4.3 How many PEST/PCB spike recoveries are outside QC limits?

Water

\_\_\_\_\_ out of 12

Soil

\_\_\_\_\_ out of 12

- 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water

\_\_\_\_\_ out of 6

Soil

\_\_\_\_\_ out of 6

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present? 1 \_\_\_\_\_

- 5.2 Frequency of Analysis: For the analysis of Pesticide/PCB TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix or concentration or each extraction batch, whichever is more frequent? 1 \_\_\_\_\_

ACTION: If any blank data are missing, take the action specified above in 3.2. If blank data is not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank data for missing method blank data.

- 5.3 Has a PEST/PCB instrument blank been analyzed at the beginning of every 12 hr. period following the initial calibration sequence? (minimum contract requirement)

YES NO N/A

ACTION: If any blank data are missing, call lab for explanation/resubmittals. If missing deliverables are unavailable, document the effect in data assessments.

- 5.4 Chromatography: review the blank raw data - chromatograms, quant reports or data system printouts.

Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs?

1 1 1

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks", "distilled water blanks" and "drilling water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent/cleanup blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor and corrected for % moisture when necessary.

1 1 1

- 6.2 Do any field/rinse blanks have positive PEST/PCB results?

1 1 1

ACTION: Prepare a list of the samples associated with each of the contaminated blanks.  
(Attach a separate sheet)

NOTE: All field blank results associated to a particular group of samples (may exceed one per case or one per day) may be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field blanks must be qualified for surrogate, or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below  
to qualify TCL results due to contamination.  
Use the largest value from all the associated blanks..

| Sample conc > CRQL<br>but < 5x blank | Sample conc < CRQL &<br>is < 5x blank value | Sample conc > CRQL<br>& > 5x blank value |
|--------------------------------------|---------------------------------------------|------------------------------------------|
| Flag sample result<br>with a "U";    | Report CRQL &<br>qualify "U"                | No qualification<br>is needed            |

NOTE: If gross blank contamination exists, all data  
in the associated samples should be  
qualified as unusable (R).

- 6.3 Are there field/rinse/equipment blanks associated  
with every sample? ☐ ☐ ☐

ACTION: For low level samples, note in data assessment  
that there is no associated field/rinse/equipment blank.  
Exception: samples taken from a drinking water tap  
do not have associated field blanks.

#### 7.0 Calibration and GC Performance

- 7.1 Are the following Gas Chromatograms and Data  
Systems Printouts for both columns present  
for all samples, blanks, MS/MSD?

- |                                          |                          |                          |                          |
|------------------------------------------|--------------------------|--------------------------|--------------------------|
| a. peak resolution check                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. performance evaluation mixtures       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. aroclor 1016/1260                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. aroclors 1221, 1232, 1242, 1248, 1254 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. toxaphene                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. low points individual mixtures A & B  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. med points individual mixtures A & B  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h. high points individual mixtures A & B | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

YES NO N/A

i. instrument blanks ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

7.2 Are Forms VI - PEST 1-4 present and complete  
for each column and each analytical sequence? ☐ ☐ ☐ACTION: If no, take action specified in 3.2  
above.7.3 Are there any transcription/calculation errors  
between raw data and Forms VI? ☐ ☐ ☐ACTION: If large errors exist, call lab for  
explanation/resubmittal, make  
necessary corrections and  
document effect in data assessments.7.4 Do all standard retention times, including each  
pesticide in each level of Individual Mixtures  
A & B, fall within the windows established  
during the initial calibration analytical  
sequence? (For Initial Calibration Standards,  
Form VI - PEST - 1). ☐ ☐ ☐ACTION: If no, all samples in the entire  
analytical sequence are potentially  
affected. Check to see if the  
chromatograms contain peaks within an  
expanded window surrounding the expected  
retention times. If no peaks are found  
and the surrogates are visible, non-  
detects are valid. If peaks are present  
and cannot be identified through pattern  
recognition or using a revised RT window,  
qualify all positive results and non-detects  
as unusable (R).  
For aroclors, RT may be outside the RT window,  
but the aroclor may still be identified from the  
individual pattern.7.5 Are the linearity criteria for the initial  
analyses of Individual Standards A & B within  
limits for both columns? (% RSD must be < 20.0%  
for all analytes except for the 2 surrogates,  
which must not exceed 30.0 % RSD). See Form VI  
PEST - 2. ☐ ☐ ☐



YES NO N/A

**ACTION:** If no, qualify all associated positive results generated during the entire analytical sequence "J" and all non-detects "UJ". When RSD >90%, flag all non-detect results for that analyte R (unusable).

- 7.6 Is the resolution between any two adjacent peaks in the Resolution Check Mixture > 60.0% for both columns? (Form VI-PEST - 4)

☐ ☐ ☐

**ACTION:** If no, positive results for compounds that were not adequately resolved should be qualified "J". Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable (R).

- 7.7 Is Form VII - Pest-1 present and complete for each Performance Evaluation Mixture analyzed during the analytical sequence for both columns?

☐ ☐ ☐

**ACTION:** If no, take action as specified in 3.2 above.

- 7.8 Has the individual % breakdown exceeded 20.0% on either column.

☐ ☐ ☐

- for 4,4' - DDT?

☐ ☐ ☐

- for endrin?

☐ ☐ ☐

Has the combined % breakdown for 4,4'- DDT/ Endrin exceeded 30.0% on either column? (required in all instances)

☐ ☐ ☐

**ACTION:** 1. If any % breakdown has failed the QC criteria in either PEM in steps 2 and 17 in the initial calibration sequence (p. D-38/Pest SOW 3/90), qualify all sample analyses in the entire analytical sequence as described below.

YES NO N/A

2. If any % breakdown has failed the QC criteria in a PEM Verification calibration, review data beginning with the samples which followed the last in-control standard until the next acceptable PEM % and qualify the data as described below.
  - a. 4,4'-DDT Breakdown: If 4,4'-DDT breakdown is greater than 20.0%:
    - i. Qualify all positive results for DDT with "J". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).
    - ii. Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).
  - b. Endrin Breakdown: If endrin breakdown is greater than 20.0%:
    - i. Qualify all positive results for endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R).
    - ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ).
  - c. Combined Breakdown: If the combined 4,4'-DDT and endrin breakdown is greater than 30.0%:
    - i. Qualify all positive results for DDT and endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R). If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).

YES NO N/A

- ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ). Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).

7.9 Are the relative percent difference (RPD) values for all PEM analytes <25.0%? (Form VII-PEST-1) ☒ ☐ ☐

ACTION: If no, qualify all associated positive results generated during the analytical sequence "J" and sample quantitation limits "UJ".

NOTE: If the failing PEM is part of the initial calibration, all samples are potentially affected. If the offending standard is a verification calibration, the associated samples are those which followed the last in-control standard until the next passing standard.

7.10 Have all samples been injected within a 12 hr. period beginning with the injection of an Instrument Blank? ☒ ☐ ☐

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify accordingly.

7.11 Is Form VII - Pest-2 present and complete for each INDA and INDB Verification Calibration analyzed? ☒ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

7.12 Are there any transcription/calculation errors between raw data and Form VII - Pest-2? ☐ ☒ ☐

ACTION: If large errors exists, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments. under "Conclusions".

YES NO N/A

- 7.13 Do all standard retention times for each INDA and INDB Verification Calibration fall within the windows established by the initial calibration sequence? ☐ ☐ ☐

ACTION: If no, beginning with the samples which followed the last in-control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).

- 7.14 Are RPD values for all verification calibration standard compounds < 25.0%? ☐ ☐ ☐

ACTION: If the RPD is >25.0% for the compound being quantitated, qualify all associated positive results "J" and non-detects "UJ". The "associated samples" are those which followed the last in-control standard up to the next passing standard containing the analyte which failed the criteria. If the RPD is >90%, flag all non-detects for that analyte R (unusable).

8.0 Analytical Sequence Check (Form VIII-PEST)

- 8.1 Is Form VIII present and complete for each column and each period of analyses? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 8.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses? (see CLP SOW p. D-39 & D-41/PEST) ☐ ☐ ☐

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.

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YES NO N/A

9.0 Cleanup Efficiency Verification (Form IX)

- 9.1 Is Form IX - Pest-1 present and complete for each lot of Florisil Cartridges used? (Florisil Cleanup is required for all Pest/PCB extracts.) ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above. If data suggests that florisil cleanup was not performed, make note in "Contract Problems/Non-Compliance".

- 9.2 Are all samples listed on the Pesticide Florisil Cartridge Check Form? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 9.3 If GPC Cleanup was performed, (mandatory for all soil sample extracts) is Form IX - Pest-2 present? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

ACTION: If GPC was not performed when required, make note in "Contract Problems/Non-Compliance" section of data assessment.

- 9.4 Are percent recoveries (% R) of the pesticide and surrogate compounds used to check the efficiency of the cleanup procedures within QC limits:

80-120% for florisil cartridge check? ☐ ☐ ☐

80-110% for GPC calibration? ☐ ☐ ☐

Qualify only the analyte(s) which fail the recovery criteria as follows:

ACTION: If % R are < 80%, qualify positive results "J" and quantitation limits "UJ". Non-detects should be qualified "R" if zero %R was obtained for pesticide compounds. Use professional judgement to qualify positive results if recoveries are greater than the upper limit.

YES NO N/A

NOTE: Sample data should be evaluated for potential interferences if recovery of 2,4,5-trichlorophenol was > 5% in the Florisil Cartridge Performance Check analysis. Make note in Contract Problems/Non-Compliance section of reviewer narrative.

NOTE: The raw data of the GPC Calibration Check analysis is evaluated for pattern similarity with previously run Aroclor standards.

#### 10.0 Pesticide/PCB Identification

10.1 Is Form X complete for every sample in which a pesticide or PCB was detected? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

10.2 Are there any transcription/calculation errors between raw data and Forms 6E, 6G, 7E, 7D, 8D, 9A, B, 10A. ☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and note error under "Conclusions".

10.3 Are retention times (RT) of sample compounds within the established RT windows for both analyses? ☐ ☐ ☐

Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in final extract)? ☐ ☐ ☐

Action: Use professional judgement to qualify positive results which were not confirmed by GC/MS. Qualify as unusable (R) all positive results which were not confirmed by second GC column analysis. Also qualify as unusable (R) all positive results not meeting RT window unless associated standard compounds are similarly biased. (see Functional Guidelines) The reviewer should use professional judgement to assign an appropriate quantitation limit.

YES NO N/A

- 10.4 Is the percent difference (% D) calculated for the positive sample results on the two GC columns < 25.0%?   1

ACTION: If the reviewer finds neither column shows interference for the positive hits, the data should be flagged as follows:

% Difference                      Qualifier

|         |    |
|---------|----|
| 25-50 % | J  |
| 50-90 % | JN |
| > 90 %  | R  |

NOTE: The lower of the two values is reported on Form I. If using professional judgement, the reviewer determines that the higher result was more acceptable, the reviewer should replace the value and indicate the reason for the change in the data assessment.

- 10.5 Check chromatograms for false negatives, especially the multiple peak compounds toxaphene and PCBs. Were there any false negatives?        1

ACTION: Use professional judgement to decide if the compound should be reported. If the appropriate PCB standards were not analyzed, qualify the data unusable (R).

11.0 Compound Quantitation and Reported Detection Limits

- 11.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Were any errors found?        1

NOTE: Single-peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an approximated quantity (NJ). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has interfered with the evaluation of the second column confirmation.

YES NO N/A

- 11.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, % moisture? ☒ ☐ ☐

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

ACTION: Quantitation limits affected by large, off-scale peaks should be qualified as unusable (R). If the interference is on-scale, the reviewer can provide an approximated quantitation limit (UJ) for each affected compound.

12.0 Chromatogram Quality

- 12.1 Were baselines stable? ☒ ☐ ☐

- 12.2 Were any electropositive displacement (negative peaks) or unusual peaks seen? ☐ ☒ ☐

ACTION: Address comments under System Performance of data assessment.



STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

13.0 Field Duplicates

13.1 Were any field duplicates submitted for  
PEST/PCB analysis? ☐ ☐ ☐

ACTION: Compare the reported results for  
field duplicates and calculate the  
relative percent difference.

ACTION: Any gross variation between field  
duplicate results must be addressed  
in the reviewer narrative. However, if  
large differences exist, identification  
of field duplicates should be confirmed  
by contacting the sampler.

## TOTAL REVIEW

### CLP DATA ASSESSMENT

#### Functional Guidelines for Evaluating Organics Analysis

Case No. - SDG No. 24744, 24950, 24997, 25009, 25052, 25071, 25091

LABORATORY Enseco - East SITE Tutu Service Station Investigation

#### DATA ASSESSMENT:

The current functional guidelines (USEPA February 1988) for evaluating organic data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U" (undetected), "R" (unusable), or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable and rejected. In other words, due to significant QC problems the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains some error.

Reviewer's  
Signature:

Lauren Sjogren / vvd

Date: 2/26/1993

Verified by:

Udya Gorizia

Date: 2/26/1993

## 1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded are qualified as estimated (J). The non-detects (sample quantitation limits) are qualified as estimated (J), unless the holding times are grossly exceeded (over one week beyond maximum holding time), in which case the associated data are unusable and rejected (R).

The following action was taken in the samples and analytes shown due to excessive holding time:

### **Volatile Organic Compounds**

*All of the samples including the associated trip blanks and field blanks for SDGs # 24997, 25009, and 25052 were reanalyzed because the continuing calibration criteria for bromoform was not met in the initial analysis. All of the samples were reanalyzed beyond the holding time due to the calibration deficiency. The reanalysis sample results were qualified as estimated based on holding time exceedances. Since the reanalysis results (estimated for holding time) were similar to the results calculated from the initial analyses (estimated due to calibration), the initial analyses of all the samples and blanks were used when reporting the data. No further discussion of the reanalysis results will be given unless reanalysis was required for other reasons than those stated above.*

*The volatile analysis vials for MW-13D were not preserved with hydrochloric acid (HCl) and the sample was analyzed two days out of the prescribed holding time (seven days) for aromatic volatile organic compound (VOC) analyses. All aromatic compounds for this sample were qualified as estimated (J) if detected and estimated at the quantitation limit (UJ) if not detected.*

*The dilution analyses for unpreserved VOC sample MW-9, MW-9 FR (MW-106), and MW-9S were analyzed outside of the seven-day holding time for aromatic VOC analyses. As the dilutions were for quantitation of MTBE only and not for any aromatic VOC, no qualifications to the data were made.*

### **Semivolatile Organic Compounds**

*The reextraction of sample MW-6D was performed 12 days beyond the holding time of seven days (calculated from time of sample collection) for base neutral and acid (BNA) extractable compounds. All positive results for this sample were qualified as estimated (J) and all non-detects for this sample were qualified as estimated at the quantitation limit (UJ). All other extractions and instrumental analyses were performed within the prescribed holding times.*

*A summary of holding time outliers is provided in Table D3-2.*

## 2. BLANK CONTAMINATION

Quality assurance (QA) blanks, i.e., method, trip, field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than five times the blank contaminant level (ten times for the common contaminants), the analytes are negated and qualified as undetected, "U".

*A summary of all contaminants detected in the method, field, and trip blanks associated with the VOC, BNA, and total petroleum hydrocarbon (TPH) analyses of the ground-water samples is presented in Table D3-3. Additionally, the table summarizes the SDGs and the ground-water samples that are associated and would be qualified, if appropriate, using the USEPA Region II validation guidelines. Sample qualifications were assessed using the following guidelines:*

- *If the sample concentration was less than five times ( $<5x$ ) the blank contaminant level (or less than ten times [ $<10x$ ] for the common laboratory contaminants) and less than the quantitation limit, the analyte was negated, the sample result was raised to the quantitation limit, and qualified as undetected (U).*
- *If the sample concentration was  $<5x$  the blank contaminant level (or  $<10x$  for the common laboratory contaminants) and greater than the quantitation limit, the analyte was negated and qualified as undetected (U) at the reported concentration.*
- *If the sample concentration was greater than five times ( $5x$  [or ten times ( $10x$ ) for the common laboratory contaminants]) and greater than the quantitation limit, no qualification for blank contamination was assessed.*
- *Method blanks were evaluated and the contaminants detected in them were used to assess all associated samples with the exception of the trip and/or field blanks. Trip and/or field blanks were used in the assessment of associated ground-water samples and were not used in the evaluation of each other. The highest contaminant level for an analyte from all of the associated blanks (method, trip, or field) was used in the determination of the  $5x$  (or  $10x$ ) upper limit for blank negation.*
- *Tentatively-identified compounds (TICs) and unknowns of similar retention times (RT) were evaluated using the  $5x$  multiplier of the highest-concentration, associated blank contaminant. In those instances where blank contamination was*

*determined to be present, the TIC or unknown were rejected, qualified "R", and subsequently, not reported on the data summaries.*

*Table D3-4 summarizes all analyte sample-result qualifications for each ground-water sample for which the sample result and sample qualifier were changed due to suspected blank-contamination. Only those samples and analytes that were qualified in some manner due to this criterion are summarized. In the analysis of TPH, all field and method blanks were free of contamination and reported as non-detects at the quantitation limit.*

*Two volatile target compounds, dibromochloromethane and tetrachloroethene, were reported as TICs in the semivolatiles analysis of several samples. Since these two VOCs were analyzed and quantitated in the volatiles analysis, the estimated sample results for each of these VOCs were rejected in the semivolatiles TIC analysis, qualified "R", and will not be reported as a semivolatile TIC. Tetrachloroethene was rejected from the semivolatiles analysis in the following samples: MW-1, MW-1D, MW-2, MW-3, MW-4, MW-4D, MW-7, MW-7 FR (MW-105), MW-10, and MW-10D. Dibromochloroethane, reported as a semivolatile TIC, was rejected from the semivolatiles analysis in the following samples: MW-6D, MW-11D, and MW-12D.*

### 3. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper compound identification, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organic compounds (VOCs) is bromofluorobenzene (BFB).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

*All mass calibrations associated with the VOC and BNA analyses for these SDGs have met the QC criteria to ensure adequate mass resolution, proper compound identification, and instrument response.*

### 4. CALIBRATION

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an analytical sequence. The continuing calibrations document that the instrument is giving satisfactory daily performance.

## A) RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be  $\geq 0.05$  (a ratio of areas) in both the initial and continuing calibrations. A value  $< 0.05$  indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

*For the volatile analyses, two initial calibration verifications (ICVs) for TCL analytes and one ICV for the site-specific VOCs were associated with all VOC sample analyses. A total of eight continuing calibration verification (CCV) TCL analyses and five CCVs for the site-specific VOCs were used to confirm precision and accuracy of instrument calibration.*

*In the analysis and quantitation of TCL semivolatiles (i.e., BNAs) in the ground-water and associated QC sample analyses, three ICVs and 11 CCVs were analyzed.*

*In the analyses of VOCs and BNAs for all SDGs and associated ground-water and QC samples, the response factors for all the TCL constituents and the site-specific target VOCs were greater than 0.05, based on a ratio of peak areas, in all initial and continuing calibrations. No sample result qualifications were assessed due to deficient response factors for any of the target and site-specific analytes.*

## 5. CALIBRATION:

### A) PERCENT RELATIVE STANDARD DEVIATION AND PERCENT DIFFERENCE:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the average response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be  $< 30\%$  and %D must be  $< 25\%$ . A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J", and non-detects are flagged "UJ" (if %D or RSD  $> 50\%$ ). If there is a gross deviation (i.e.  $> 90\%$ ) of %RSD and %D, the non-detects may be rejected (R).

### Volatile Organic Compounds

*In the analysis of VOCs, 2-butanone in the TCL ICV analyzed on August 3, 1992 and n-propylbenzene analyzed on November 5, 1992 in the ICV for site-specific VOCs exceeded the plus or minus ( $\pm$ ) 30 percent RSD limit used to evaluate linearity and precision of calibration. All ground-water samples, QC samples, and most sample reanalyses are within these ICVs. All positive results above the quantitation limit and estimated results below the quantitation limit for*

each of these outlier VOCs were qualified as estimated (J). Similarly, non-detects for outlier VOCs were flagged as estimated at the quantitation limits (UJ). For the ICV analyzed for TCL constituents associated with sample reanalyses for bromoform on November 22, 1992, no calibration outliers were found for any VOC.

In the review of the volatile analysis CCVs, a total of seven of eight CCVs for TCL quantitation were found to have calibration outliers outside the  $\pm 25\%$  D limit. None of the five CCVs associated with any sample analysis for the site-specific VOCs were found to have any calibration outlier for %D. The compounds that were found to have %D exceedances were primarily either (1) a ketone compound, (2) an early-eluting VOC, or (3) a common laboratory contaminant. In all cases, %D was not exceeded by greater than  $\pm 47$  percent. The following VOCs were reported with exceeded %D in one or more of the CCVs: acetone, bromoform, 2-butanone, 2-hexanone, methylene chloride, 4-methylene-2-pentanone, and vinyl chloride.

A complete summary of all outlier ICVs and CCVs for VOC analyses and the associated samples qualified due to the QC exceedances are summarized in Table D3-5. Positive sample results for those analytes for which the %D in the associated CCV exceeded  $\pm 25$  percent were qualified as estimated (J). Non-detect sample results for analytes in CCVs with an exceeded %D were qualified as estimated at the quantitation limit (UJ). When appropriate, qualifications were applied to all blanks (method, field, and trip); other QC samples, such as matrix spikes (MS) and matrix spike duplicates (MSD); and to all associated ground-water samples, their dilution analyses, and reanalyses.

Other qualifications to sample results or anomalies due to VOC calibration issues are as follows:

- In the VOC analysis of ground-water sample MW-3, the concentration of total 1,2-dichloroethene (1,2-DCE) exceeded the calibration range of the instrument. The sample result for this analyte in MW-3 was qualified "E" by the data reviewer to reflect the linear range exceedance.
- Samples MW-9, MW-9 FR (MW-106), and MW-9S were diluted and reanalyzed because the concentration of MTBE exceeded the calibration range of the instrument. The dilution analyses of these samples were used to report the MTBE results for each sample. For all other VOCs, the initial analyses were used to quantitate and report the VOC data.
- All of the ground-water samples, including the field and trip blanks for SDGs 24997, 25009, and 25052 were reanalyzed for VOCs outside their holding time since the continuing calibration criteria for bromoform was not met initially. The data reviewer assessed all of the bromoform results for these samples as estimated (J) or estimated at the quantitation limit (UJ) based on the initial analyses. The bromoform reanalysis results were also qualified as estimated (J or UJ) based on the holding-time exceedance. It was determined that the initial analysis results

would be used for this report and in the evaluation of bromoform sample concentrations. The samples affected in the SDGs listed above are as follows: MW-5, MW-5 FR (MW-104), MW-14, TB100192, FB100192, MW-10, MW-11D, MW-11D MS, MW-11D MSD, MW-13D, TB100692, FB100692, MW-12D, MW-7 FR (MW-105), MW-4D, TB100592, and FB100592.

### **Semivolatile Organic Compounds**

Three semivolatile ICVs for TCL only were analyzed and are associated with the BNA analyses of the samples. All response factors were greater than the 0.05 lower limit for all ICVs and CCVs. The RSD for all compounds in the associated ICVs were within the  $\pm 30$  percent upper limit.

The BNA analyses for the ground-water samples, QC samples, sample reanalyses, and dilution analyses are associated with 11 semivolatile CCVs. Each of these CCVs were reported with at least one, but no more than seven compounds with %D greater than  $\pm 25$  percent. A summary of each CCV with the calibration outliers and associated samples is presented in Table D3-5 following the volatiles summary. All outlier compounds for each CCV were qualified (J) if detected in the associated samples and estimated at the quantitation limit (UJ) if not detected in these samples.

In general, the frequency of the calibration outliers for some compound classes and specific compounds in the 11 semivolatile CCVs may be summarized as follows:

- In seven of 11 CCVs, one or more of the phthalate compounds, such as butylbenzylphthalate, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate, were reported with %D greater than  $\pm 25$  percent. These compounds are common laboratory contaminants associated with semivolatile analyses.
- In seven of 11 CCVs, an acid-fraction semivolatile surrogate compound (2,4,6-tribromophenol) was reported with %D above  $\pm 25$  percent. Surrogates are used to monitor the extraction efficiency of the method in the sample matrix.

### **Total Petroleum Hydrocarbons**

The CCVs in the TPH analyses were evaluated to determine if the precision of calibration was adequate for accurate, quantitative analysis of the samples. Most of the CCVs were reported with less than 10%D calculated from the initial calibration curve and all were less than 15%D. Although no strict criteria was established for the evaluation of this criterion for TPH analyses, it is the data reviewer's determination that an acceptable level of %D was exhibited for the analyses associated with this parameter.



## 6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

### Volatile Organic Compounds

*The system monitoring compound (SMC) recovery of toluene-d8 in sample MW-6D was below the QC limit (88 percent), but above 10 percent. The sample was reanalyzed (MW-6DRE) with the surrogate recovery of toluene-d8 also found to be below QC limit, but again, above 10 percent. All volatile compounds detected in MW-6D and MW-6DRE were qualified as estimated (J) and all non-detects were qualified as estimated at the quantitation limit (UJ). It is the data reviewer's opinion that the initial analysis of sample MW-6D be used when reporting the data.*

*The SMC recovery of toluene-d8 for the initial analysis of sample MW-11D was below the QC limit, but above 10 percent. This sample was reanalyzed and the SMC recovery was again below the lower limit for toluene-d8. Additionally, sample MW-11D was analyzed as the matrix spike and matrix spike duplicate (MS and MSD). The SMC recoveries of toluene-d8 were also below the QC limits for MW-11D MS and MW-11D MSD. Reanalysis of the MS/MSD resulted in toluene-d8 SMC recoveries below 88 percent. Since all six VOC analyses results for toluene-d8 were below the lower acceptance limit, a matrix interference is suspected. All volatile compounds detected in the initial analysis, reanalysis, and spike analyses of this sample were qualified as estimated (J) and all non-detects were qualified as estimated at the quantitation limit (UJ).*

### Semivolatile Organic Compounds

*In the semivolatiles analysis and reanalysis of MW-6D, the acid-extractable surrogate spike recoveries for phenol-d5 and 2-fluorophenol were less than 10 percent. The recoveries for the advisory acid surrogate, 2-chlorophenol-d4, were reported to be 11 percent in each analysis. For the analysis and reanalysis results for MW-6D, all detected acid-extractable compounds were qualified as estimated (J) and all non-detects were qualified as unusable (R).*

*The recovery values for all three acid-extractable surrogates and for the advisory acid surrogate were less than 10 percent for sample MW-11D. This sample was also analyzed as the MS/MSD. In the MS/MSD, two of the three acid-extractable surrogates and the advisory acid surrogate spike recoveries were found to be less than 10 percent. For samples MW-11D, MW-11D MS and MW-11D MSD, all acid extractable compounds detected were qualified as estimated (J) and all non-detects were qualified as unusable (R). All other sample and all blank surrogate spike recoveries were within the prescribed QC limits.*

## 7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every analytical run. The internal standard area count must not vary by more than a factor of two (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than  $\pm 30$  seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated (J), and all non-detects as estimated at the reporting limit (UJ), or unusable and rejected (R), if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgement to determine either partial or total rejection of the data for that sample fraction.

*The internal standard areas were above QC limits for chrysene-d12 and perylene-d12 in the semivolatiles analysis for sample MW-11D MSD. All compounds quantitated in the semivolatiles analysis using these two internal standards were qualified as estimated (J) in MW-11D MS.*

## 8. COMPOUND IDENTIFICATION:

### A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within  $\pm 0.06$  RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TICs), the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

*1,2-DCE (total) was detected and reported in several samples. The retention time (RT) of this compound in the quantitation reports does not match the RTs in the associated CCV standard quantitation reports. This discrepancy is attributed to the use of the trans isomer in the calibration standard solution while the cis isomer was detected in the field samples. The RTs for 1,2-DCE in the sample quantitation reports for the following samples were greater than 0.06 RRT units when compared to the associated CCVs: MW-1, MW-1D, MW-2, MW-3, MW-4, MW-4D, MW-6R, MW-8, MW-9S, MW-10, MW-10D, and MW-14.*

*Xylene (total) was detected in samples MW-5, MW-5 FR (MW-104), and MW-5RE. The retention time of this compound in the quantitation reports does not match the retention time in*

*the standard quantitation report because the isomer used in the standard solution was a different isomer than that detected in the samples.*

#### 9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

The matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

#### **Volatile Organic Compounds**

*Sample MW-11D was designated as the MS/MSD for the VOC analyses. Two matrix spike recoveries and one matrix spike duplicate recovery were found to be below QC limits, but above 10 percent. The MS/MSD were reanalyzed due to calibration criteria not being met in the initial analysis. All subsequent spike recoveries in the reanalyses were found to be within the appropriate QC limits. All relative percent difference (RPD) values for both MS/MSD analyses were within the QC limits. It is the data reviewer's determination that since all the spike recoveries were within QC limits for the MS/MSD reanalyses that no data should be qualified based on the initial MS/MSD results. Refer to Table D3-6 for a summary of outlier MS/MSD results for the volatile and semivolatile fractions.*

#### **Semivolatile Organic Compounds**

*Sample MW-11D was designated as the MS/MSD for the semivolatiles analyses. Twelve out of the twenty-two spike recoveries were found to be outside the QC acceptance limits. The acid-extractable compounds for sample MW-11D have already been qualified based on the surrogate spike results. Based on the MS/MSD data, it is the data reviewers' determination that the base neutral compounds for sample MW-11D be qualified as estimated (J) if detected and estimated (UJ) if not detected. This matrix interference was not observed for the other samples collected in this sampling round since surrogate recoveries were within the appropriate acceptance limits. Therefore, further qualification of other samples based on the MS/MSD results for sample MW-11D was not performed.*

#### **Total Petroleum Hydrocarbons**

*Sample MW-11D was designated as the MS/MSD for the TPH analyses. The recovery for each of the spikes was 108 percent (with zero RPD) which is within the 80 to 120 percent window established for the evaluation of accuracy in this parameter. No qualification of sample data was required.*

## 10. OTHER QC DATA OUT OF SPECIFICATION:

### A) Sample Disposition

*Five out of the five volatile organic analysis (VOA) vials for samples MW-1D, ESSO-TAP, and FB100792 were received by the laboratory containing air bubbles and headspace. All positive results for these samples were qualified as estimated (J) and all non-detects were qualified as unusable (R).*

*The VOA vials for sample MW-7 were received with headspace at the laboratory. This sample was replicated in the field and designated MW-105. Since the VOA vials for MW-105 (the field replicate for MW-7) were received in good condition and without headspace at the laboratory, the VOC results for MW-105 (i.e., MW-7 FR) were substituted for the VOC analysis of MW-7 after the laboratory data was received.*

*Sample MW-1 was initially sampled on October 2, 1992. Since the VOA vials were received at the laboratory with headspace, the sample was resampled in entirety for all analytical parameters on October 6, 1992. All sample analyses associated with the October 2, 1992 field collection of MW-1 were cancelled and the results for the sample collected on October 6, 1992 were used in the remedial investigation and reviewed in this validation report.*

*Due to laboratory error, the field blank collected on October 2, 1992 for SDG 25009 was cancelled for analysis at the laboratory. This sample (FB100292) was associated with samples MW-1D, MW-11D (and the MS/MSD for this sample), and the previously cancelled MW-1 (see above discussion). The samples in this SDG were qualified for blank contamination using the trip blank (TB100292) and the associated method blanks for each parameter.*

### B) Field Replicates

*All results for the comparison of the sample/field replicate pairs are reported in micrograms per liter (ug/L) or milligrams per liter (mg/L).*

### Volatile Organic Compounds

*A field replicate of MW-7 was collected and labeled MW-105. However, sample MW-7 was not analyzed for VOCs and the results of MW-7 FR (MW-105) are presented and discussed for the VOC analysis of MW-7 in the remedial investigation report.*

*Sample MW-5 was collected in duplicate. The field replicate of MW-5 was labeled MW-104. The compounds listed below were detected in the sample/field-replicate pair and resulted in the following RPDs between the sample results:*

| <u>Compound/TIC</u> | <u>Concentration (ug/L)</u> |                         | <u>RPD (%)</u> |
|---------------------|-----------------------------|-------------------------|----------------|
|                     | <u>MW-5</u>                 | <u>MW-5 FR (MW-104)</u> |                |
| Benzene             | 1000                        | 950                     | 5              |
| Toluene             | 180J                        | 170J                    | 6              |
| Ethylbenzene        | 930                         | 890                     | 4              |
| Xylenes (total)     | 1600                        | 1500                    | 6              |
| MTBE                | 6200                        | 6200                    | 0              |
| n-Propylbenzene     | 180J                        | 170J                    | 6              |
| C-3 Benzene         |                             |                         |                |
| Isomers (total)     | 2600J                       | 2500                    | 4              |
| C-4 Benzene Isomer  | not reported                | 250J                    | not calculated |
| C6H12 Isomer        | 250J                        | not reported            | not calculated |
| C9H10 Isomer        | 500J                        | 500J                    | 0              |
| C11H14 Isomer       | not reported                | 400J                    | not calculated |

Sample MW-9 was also collected in duplicate. The field replicate of MW-9 was labeled MW-106. The following compounds were detected in the sample and replicate with the corresponding RPD values:

| <u>Compound/TIC</u>                | <u>Concentration (ug/L)</u> |                         | <u>RPD (%)</u> |
|------------------------------------|-----------------------------|-------------------------|----------------|
|                                    | <u>MW-9</u>                 | <u>MW-9 FR (MW-106)</u> |                |
| Acetone                            | 10                          | 10                      | 0              |
| Benzene                            | 26                          | 28                      | 7              |
| Ethylbenzene                       | 19                          | 24                      | 23             |
| Xylenes (total)                    | 2J                          | 3J                      | 40             |
| MTBE                               | 2700                        | 2900                    | 7              |
| n-Propylbenzene                    | 8                           | 13                      | 48             |
| 1,2,3,4-Tetrahydro-<br>naphthalene | 11JN                        | 14JN                    | 24             |
| C-3 Benzene Isomer                 | 15J                         | 15J                     | 0              |
| C-4 Benzene                        |                             |                         |                |
| Isomers (total)                    | 270                         | 310                     | 14             |
| C10H12 Isomers (total)             | 150J                        | 160J                    | 6              |

#### Semivolatile Organic Compounds

Sample MW-5 was collected in duplicate. The field replicate of MW-5 was labeled MW-104. The following compounds were detected in the sample and replicate with the corresponding RPD values:

| <u>Compound/TIC</u>                             | <u>Concentration (ug/L)</u> |                         | <u>RPD (%)</u> |
|-------------------------------------------------|-----------------------------|-------------------------|----------------|
|                                                 | <u>MW-5</u>                 | <u>MW-5 FR (MW-104)</u> |                |
| 4-Methylphenol                                  | 3J                          | 3J                      | 0              |
| 2,4-Dimethylphenol                              | 7J                          | 7J                      | 0              |
| Naphthalene                                     | 310D                        | 230D                    | 30             |
| 2-Methylnaphthalene                             | 130D                        | 110D                    | 17             |
| 1-Methylcyclopentanol                           | 64JN                        | 60JN                    | 6              |
| C-2 Benzene Isomers<br>(total)                  | 600J                        | 440J                    | 31             |
| C-3 Benzene Isomers<br>(total)                  | 1900J                       | 1500J                   | 24             |
| C-4 Benzene Isomers<br>(total)                  | 7200J                       | 2100J                   | 110            |
| Unknowns (total)                                | 3500J                       | 770J                    | 131            |
| 2,3-Dihydromethyl-1H-<br>indene Isomers (total) | 7100J                       | 2300J                   | 100            |
| 1-Methylnaphthalene                             | 4100JN                      | 1200JN                  | 110            |

Sample MW-7 was also collected in duplicate. The field replicate of MW-7 was labeled MW-105. The following compound was detected in the sample and replicate with the corresponding RPD value:

| <u>Compound/TIC</u> | <u>Concentration (ug/L)</u> |                      | <u>RPD (%)</u> |
|---------------------|-----------------------------|----------------------|----------------|
|                     | <u>MW-7</u>                 | <u>MW-7 (MW-105)</u> |                |
| Unknowns (total)    | 660J                        | 6J                   | 95             |

#### Total Petroleum Hydrocarbons

Sample MW-5 and MW-7 were collected in duplicate. The field replicates of MW-5 and MW-7 were labeled MW-104 and MW-105, respectively. The following results for TPH were calculated for the sample/field-replicate pairs with the corresponding RPD values:

| <u>Sample/Field Replicate</u> | <u>Concentration (mg/L)</u> |                        | <u>RPD (%)</u> |
|-------------------------------|-----------------------------|------------------------|----------------|
|                               | <u>Sample</u>               | <u>Field Replicate</u> |                |
| MW-5/MW-104                   | 4.2                         | 2.2                    | 63             |
| MW-7/MW-105                   | not detected                | not detected           | 0              |

#### 11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT:

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness. There are no indications that the instrument performance has degraded to a point that would affect the quality of the data for these SDGs.

*No abrupt shifts occurred in the chromatographic baselines in the VOC and BNA analyses and minimal baseline drift was observed.*

*The majority of the data for the VOC and BNA analyses and all of the data for the TPH analyses are valid with the following qualifications.*

- *In the analysis of volatiles, several SDGs were reanalyzed outside of the holding time for bromoform since the CCV criteria for this compound had not been met initially. Since the initial data and reanalysis data were fairly similar, and both were estimated due to either deficient CCV criteria or exceeded holding time, the initial results, estimated for the CCV deficiency, were reported.*
- *With the exception of one analyte in one ground-water sample (see contract non-compliance), data derived from dilution analyses for analytes found to be above the linear range in the initial analysis, were incorporated into the Form I data summary forms from the initial analyses or the more concentrated analysis (i.e., less diluted). The data from the dilution analysis were flagged D to indicate data originating from a secondary dilution.*
- *The volatile organic SMC recoveries and the surrogate recoveries for BNA analyses were all within the appropriate acceptance windows for all ground-water samples and QC samples, except for in samples MW-6D and MW-11D. For the BNA analyses, only the acid-extractable compounds were affected in these samples. Repeat analyses of both samples for both analytical fractions (and additional review of the MS/MSD surrogate and SMC recoveries in MW-11D) resulted in and confirmed similar surrogate outliers. Because of this, matrix interferences are suspected in these sample matrices which may preclude accurate, quantitation of volatile and acid-extractable analyte concentrations. Both samples were qualified in accordance with the validation guidelines.*
- *Some matrix precision and accuracy data, generated by the analysis of MW-11D as the MS and MSD for VOCs and BNAs were outside the SOW acceptance limits. The initial MS/MSD outliers in the VOC analyses were established to be the result of poor calibration precision since the VOC reanalyses exhibited acceptable recoveries for the MS/MSD. The BNA outliers in the MS/MSD for MW-11D are suspected to be the result of matrix interferences since poor recoveries were also reported for the surrogate compounds.*
- *Field-replicate analyses for VOCs, BNAs, and TPH were performed on sample MW-5. Field-replicate analysis for BNAs and TPH were performed on sample MW-7. Field-replicate analyses for VOCs were performed on sample MW-9. Most RPD results were within 20 percent, indicating acceptable precision. In analyses where estimated concentrations and/or low-level sample concentrations above the quantitation limit were reported, greater variability in RPD was noted.*

*Similarly, TIC concentrations displayed RPDs greater than 20 percent in most cases; however, this may be primarily due to the method of quantitation used in TIC library searches.*

- *Some TCL data were negated and some TIC rejected due to associated blank contamination.*
- *Several ketone compounds, phthalate compounds, and some of the common laboratory contaminants, in addition to other TCL analytes, were qualified as estimated due to exceeded CCV criteria.*
- *No TCL or site-specific targets were rejected due to calibration, internal standard, and/or tuning accuracy and precision.*
- *Sample MW-11D was reanalyzed because a low SMC spike recovery was reported for toluene-d8. A low SMC recovery was also reported for toluene-d8 in the reanalysis of MW-11D. The initial analysis of MW-11D will be used when reporting the data.*
- *The VOC analysis data for sample MW-7 FR is referred to in this SDG as MW-105. Sample MW-105 was originally collected as the field replicate of MW-7. However, the VOA vials for the sample MW-7 were received at the laboratory with headspace. The VOC analyses for MW-7 were canceled by Geraghty & Miller, and the VOC results obtained for the MW-7 FR (MW-105) were substituted for MW-7 for the purposes of the remedial investigation.*
- *Sample MW-6D was reextracted and reanalyzed because of low acid-extractable surrogate recoveries. The reextraction was performed out of holding time and low surrogate recoveries were again reported. Since the results of both analyses were similar and the reextraction was performed out of the holding time, the initial results of sample MW-6D will be used when reporting the data.*
- *Samples MW-5 and MW-5 FR (MW-104) were diluted and reanalyzed because the concentrations of 2-methylnaphthalene and naphthalene exceeded the calibration range of the instrument. The dilution analysis results for 2-methylnaphthalene and naphthalene and the initial results for all other compounds will be used when reporting the data for MW-5 and MW-5 FR (MW-104).*

## CONTRACT NON-COMPLIANCE

*The following section presents a non-compliance summary for general issues associated with all of the SDGs in this investigation.*



- *Two volatile TCL constituents (tetrachloroethene and dibromochloromethane) were rejected from the semivolatile TIC fraction for several samples since they were quantitated as a volatile target compound.*
- *In the analysis of the tuning standards for VOCs and semivolatiles, greater than two significant figures were used when reporting the tune information.*
- *The response factors were not shown in the quantitation reports.*
- *TICs for which presumptive evidence in the sample existed and were identified by the laboratory with a chemical abstracts services (CAS) number were not reported with the "N" qualifier. The "N" qualifier was applied to these TICs by the data reviewer.*
- *The total 1,2-DCE result in the volatile analysis of sample MW-3 was qualified "E" by the data reviewer since the concentration exceeded the linear range of the instrument and no dilution for this target compound was analyzed.*

tuturi-wp DV/021993.rpt

**ATTACHMENT D2**

**INORGANIC DATA VALIDATION REPORT**

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW. 3/90

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(SOP Revision XI)

PREPARED BY:

Hanif Sheikh  
Hanif Sheikh, Quality Assurance Chemist  
Toxic and Hazardous Waste Section

DATE:

1-30-92

APPROVED BY:

Kevin W. Kubik  
Kevin Kubik, Chief  
Toxic and Hazardous Waste Section

DATE:

1-30-92

APPROVED BY:

Robert Runyon  
Robert Runyon, Chief  
Monitoring Management Branch

DATE:

1/30/92

Title: Evaluation of Metals Data for the  
Contract Laboratory Program

Date: Jan. 1992

Number: HW-2

Revision: 11

## 1.0 Scope

1.1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 3/90.

## 2.0 Responsibilities - Data reviewers will complete the following tasks as assigned by the Data Review Coordinator:

### 2.1. For a total review:

2.1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1).  
The reviewer must answer every question on the checklist.

2.1.2 Data Assessment - Data Assessment Narrative (Appendix A.2)  
The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

2.1.3 Contract Non-Compliance - SMD Report (Appendix A.3)  
This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Validation Task Monitor, or Technical Project Officer (TPO). Forward 5 copies: one each for internal files, appropriate Regional TPO, Sample Management Office (SMD) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to the end of the Data Assessment Narrative (Sec. A.2.2).

### 2.1.4 CLP Data Assessment Summary Forms

2.1.4.1 Appendix A.5  
Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

2.1.4.2 Appendix A.6  
Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

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2.1.5 Data Review Log: It is recommended that each data reviewer should maintain a log of the reviews completed to include: a. date of start of case review

- b. date of completion of case review
- c. site
- d. case number
- e. contract laboratory
- f. number of samples
- g. matrix
- h. hours worked
- i. reviewer's initials

2.1.6 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMO. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

2.1.7 Forwarded Paperwork

2.1.7.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSOC) located in the Surveillance and Monitoring Branch:

- a. data package
- b. completed data assessment checklist (Appendix A.1, original)
- c. SMO Contract Compliance Screening (CCS)
- d. Record of Communication (copy)
- e. CLP Reanalysis Request/Approval Record (original + 3 copies)
- f. Appendix A.6 (original).

2.1.7.2 Forward 2 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.6) and Telephone Record Log, if any, : one each for appropriate Regional TPO, and the other one to EPA EMSL office in Las Vegas. The addresses of TPOs and EPA office in Las Vegas are given in Appendix A-4.

2.1.8 Filed Paperwork - Upon completion of review, the following are to be filed within MMB files:

- a. Two copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.6.
- b. Telephone Record Log (copy)
- c. SMO Report (copy Appendix A-3)
- d. CLP Reanalysis Request/Approval Record (copy)

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3.0 Data Completeness

Each data package is checked by a Regional Sample Control Coordinator (RSSC) for completeness. A data package is assumed to be complete when all the deliverables required under the contract are present. If a data package is incomplete, the RSSC would call the laboratory for missing document(s). If the laboratory does not respond within a week, SMO and MMB coordinator of Region II will be notified.

4.0 Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Data Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

5.0 Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance can be found in the National Inorganic Functional Guidelines of October 1, 1989.

6.0 SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from laboratory in response to CCS must be used by the reviewer.

7.0 Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative. If holding times and sample storage times have not been exceeded, TPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

8.0 Record of Communication - Provided by the Regional Sample Control Center (RSCC) to indicate which data packages have been received and are ready to be reviewed.

9.0 Rounding off numbers - The data reviewer will follow the standard practice.

## STANDARD OPERATING PROCEDURE

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Appendix A.1: Data Assessment - Contract  
Compliance (Total Review)

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|                                                                                           | YES                                 | NO                       | N/A                                 |
|-------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|
| A.1.1 <u>Contract Compliance Screening Report (CCS)</u> - Present?                        | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| <u>ACTION:</u> If no, contact RSOC.                                                       |                                     |                          |                                     |
| A.1.2 <u>Record of Communication (from RSOC)</u> - Present?                               | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| <u>ACTION:</u> If no, request from RSOC.                                                  |                                     |                          |                                     |
| A.1.3 <u>Trip Report</u> - Present and complete?                                          | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| <u>ACTION:</u> If no, contact RSOC for trip report.                                       |                                     |                          |                                     |
| A.1.4 <u>Sample Traffic Report</u> - Present?                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Legible?                                                                                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| <u>ACTION:</u> If no, request from Regional Sample Control Center (RSOC).                 |                                     |                          |                                     |
| A.1.5 <u>Cover Page</u> - Present?                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Is cover page properly filled in and signed by the lab manager or the manager's designee? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| <u>ACTION:</u> If no, prepare Telephone Record Log, and contact laboratory.               |                                     |                          |                                     |
| Do numbers of samples correspond to numbers on Record of Communication?                   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Do sample numbers on cover page agree with sample numbers on:                             |                                     |                          |                                     |
| (a) Traffic Report Sheet?                                                                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| (b) Form I's?                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| <u>ACTION:</u> If no for any of the above, contact RSOC for clarification.                |                                     |                          |                                     |

## STANDARD OPERATING PROCEDURE

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Title: Evaluation of Metals Data for the  
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Appendix A.1: Data Assessment - Contract  
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A.1.6 Form I to IX Yes No N/A

A.1.6.1 Are all the Form I through Form IX labeled with:

|                  |                                     |                          |                                     |
|------------------|-------------------------------------|--------------------------|-------------------------------------|
| Laboratory name? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Case/SAS number? | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| EPA sample No.?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| SDG No.?         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Contract No.?    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Correct units?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Matrix?          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |

ACTION: If no for any of the above, note under  
Contract Problem/Non-Compliance section  
of the "Data Assessment Narrative".

A.1.6.2 Do any computation/transcription errors exceed 10% of  
reported values on Forms I-IX for:

(NOTE: Check all forms against raw data.)

|                                        |                          |                                     |                                     |
|----------------------------------------|--------------------------|-------------------------------------|-------------------------------------|
| (a) all analytes analyzed by ICP?      | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| (b) all analytes analyzed by GFAA?     | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| (c) all analytes analyzed by AA Flame? | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| (d) Mercury?                           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| (e) Cyanide?                           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

ACTION: If yes, prepare Telephone Log, contact  
laboratory for corrected data and  
correct errors with red pencil and initial.



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|                                                                                    | YES                                 | NO                                  | N/A                                 |
|------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| A.1.7 <u>Raw Data</u>                                                              |                                     |                                     |                                     |
| A.1.7.1 Digestion Log* for flame AA/ICP (Form XIII) present?                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Digestion Log for furnace AA Form XIII present?                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Distillation Log for mercury Form XIII present?                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Distillation Log for cyanides Form XIII present?                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Are pH values (pH<2 for all metals, pH>12 for cyanide) present?                    | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| *Weights, dilutions and volumes used to obtain values.                             |                                     |                                     |                                     |
| Percent solids calculation present for soils/sediments?                            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are preparation dates present on sample preparation logs/bench sheets?             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| A.1.7.2 Measurement read out record present?                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| ICP                                                                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Flame AA                                                                           | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Furnace AA                                                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Mercury                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cyanides                                                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| A.1.7.3 Are all raw data to support all sample analyses and QC operations present? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Legible?                                                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Properly Labeled?                                                                  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |

**ACTION:** If no for any of the above questions in sections A.1.7.1 through A.1.7.3, write Telephone Record Log and contact laboratory for resubmittals.

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YES NO N/A

(Examine sample traffic reports and digestion/distillation logs.)

Mercury analysis (28 days). . . . . exceeded?

Cyanide distillation (14 days). . . . exceeded?

Other Metals analysis (6 months) . . . exceeded?

**NOTE:** Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

**ACTION:** If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.

A.1.8.2 Is pH of aqueous samples for:

Metals Analysis >2?

Cyanides Analysis <12?

**Action:** If yes, flag the associated metals and cyanides data as estimated.

A.1.9 Form I (Final Data)

A.1.9.1 Are all Form I's present and complete?

**ACTION:** If no, prepare telephone record log and contact laboratory for submittal.

A.1.9.2 Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?

Are soil sample results for each parameter corrected for percent solids?

Are all "less than IDL" values properly coded with "U"?

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Appendix A.1: Data Assessment - Contract  
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|                                                                                                                                     | YES                                 | NO                                  | N/A                                 |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Are the correct concentration qualifiers used with final data?                                                                      | <input checked="" type="checkbox"/> | —                                   | —                                   |
| <b>ACTION:</b> If no for any of the above, prepare Telephone Record Log, and contact laboratory for corrected data.                 |                                     |                                     |                                     |
| A.1.9.3 Are EPA sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?  | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Was a brief physical description of samples given on Form I's?                                                                      | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Was the dilution of any sample diluted beyond the requirements of the contract noted on Form I or Form XIV?                         | —                                   | <input checked="" type="checkbox"/> | —                                   |
| <b>ACTION:</b> If no for any of the above, note under Contract-Problem/Non-Compliance of the "Data Assessment Narrative".           |                                     |                                     |                                     |
| A.1.10 <u>Calibration</u>                                                                                                           |                                     |                                     |                                     |
| A.1.10.1 Is record of at least 2 point calibration present for ICP analysis?                                                        | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Is record of 5 point calibration present for Hg analysis?                                                                           | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Is record of 4 point calibration present for:                                                                                       |                                     |                                     |                                     |
| Flame AA?                                                                                                                           | <input type="checkbox"/>            | —                                   | <input checked="" type="checkbox"/> |
| Furnace AA?                                                                                                                         | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Cyanides?                                                                                                                           | <input checked="" type="checkbox"/> | —                                   | —                                   |
| Is one calibration standard at the CRDL level for all AA (except Hg) and cyanides analyses?                                         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | —                                   |
| <b>ACTION:</b> If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative". |                                     |                                     |                                     |

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|                                                                                                                                                                                                                                               | <u>YES</u>                                                          | <u>NO</u>                           | <u>N/A</u>                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------|-------------------------------------|
| A.1.10.2 Is correlation coefficient less than 0.995 for:                                                                                                                                                                                      |                                                                     |                                     |                                     |
| Mercury Analysis?                                                                                                                                                                                                                             | —                                                                   | <input checked="" type="checkbox"/> | —                                   |
| Cyanide Analysis?                                                                                                                                                                                                                             | —                                                                   | <input checked="" type="checkbox"/> | —                                   |
| Atomic Absorption Analysis?                                                                                                                                                                                                                   | —                                                                   | <input checked="" type="checkbox"/> | —                                   |
| <b><u>ACTION:</u></b> If yes, flag the associated data as estimated.                                                                                                                                                                          |                                                                     |                                     |                                     |
| <b><u>NOTE:</u></b> The data validator shall calculate the correlation coefficient using concentrations of the standards and the corresponding instrument response ( e.g. absorbance, peak area, peak height, etc.).                          |                                                                     |                                     |                                     |
| A.1.10.3                                                                                                                                                                                                                                      |                                                                     |                                     |                                     |
| In the instance where less than 4 standards are measured in absorbance (or peak area, peak height, etc.) mode, are the remaining standards analyzed in concentration mode immediately after calibration within $\pm 10\%$ of the true values? | <input type="checkbox"/>                                            | —                                   | <input checked="" type="checkbox"/> |
| <b><u>ACTION:</u></b> If no, flag the associated data as estimated if standards are not within $\pm 10\%$ of true values. Do not flag the data as estimated in linear range indicated by good recovery of standard(s).                        |                                                                     |                                     |                                     |
| A.1.11                                                                                                                                                                                                                                        | <u>Form II A (Initial and Continuing Calibration Verification)-</u> |                                     |                                     |
| A.1.11.1                                                                                                                                                                                                                                      |                                                                     |                                     |                                     |
| Present and complete for every metal and cyanide?                                                                                                                                                                                             | <input checked="" type="checkbox"/>                                 | —                                   | —                                   |
| Present and complete for AA and ICP when both are used for the same analyte?                                                                                                                                                                  | <input type="checkbox"/>                                            | —                                   | <input checked="" type="checkbox"/> |
| <b><u>ACTION:</u></b> If no for any of the above, prepare Telephone Record Log and contact laboratory.                                                                                                                                        |                                                                     |                                     |                                     |
| A.1.11.2                                                                                                                                                                                                                                      |                                                                     |                                     |                                     |
| Circle on each Form IIA all percent recoveries that are outside the contract windows.<br>Are all calibration standards (initial and continuing) within control limits:                                                                        |                                                                     |                                     |                                     |
| Metals- 90-110%R?                                                                                                                                                                                                                             | <input checked="" type="checkbox"/>                                 | —                                   | —                                   |
| Hg - 80-120%R?                                                                                                                                                                                                                                | <input checked="" type="checkbox"/>                                 | —                                   | —                                   |
| Cyanides- 85-115%R?                                                                                                                                                                                                                           | <input checked="" type="checkbox"/>                                 | —                                   | —                                   |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | YES                                 | NO | N/A |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----|-----|
| <p><b>ACTION:</b> Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with %R between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results &lt;IDL as estimated (U) if the ICV or OCV %R is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or OCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.</p> |                                     |    |     |
| A.1.11.3 Was continuing calibration performed every 10 samples or every 2 hours?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input checked="" type="checkbox"/> | —  | —   |
| Was ICV for cyanides distilled?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input checked="" type="checkbox"/> | —  | —   |
| <p><b>ACTION:</b> If no for any of the above, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |    |     |
| <p>A.1.12 <u>Form II B (CRDL Standards for AA and ICP) -</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                     |    |     |
| A.1.12.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals ( <u>except Hg</u> )?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input checked="" type="checkbox"/> | —  | —   |
| Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <input checked="" type="checkbox"/> | —  | —   |
| Was a 2xCRDL ( or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?<br>(Note: CRI for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input checked="" type="checkbox"/> | —  | —   |
| <p><b>ACTION:</b> If no for any of the above, flag as estimated all data falling within the affected ranges.<br/>The affected ranges are:<br/>AA Analysis - **True Value <math>\pm</math> CRDL<br/>ICP Analysis - **True Value <math>\pm</math> 2CRDL<br/>CN Analysis - **True Value <math>\pm</math> 0.5 x True Value.</p>                                                                                                                                                                                                                                                                              |                                     |    |     |

\*\*True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.  
Compute the concentration of the missing mid-range standard from the calibration range.

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|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | YES                                 | NO                                  | N/A                                 |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| A.1.12.2 | Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and twice every eight hours of ICP run?                                                                                                                                                                                                                                                                                                                                                                                | <input checked="" type="checkbox"/> | —                                   | —                                   |
|          | <u>ACTION:</u> If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".                                                                                                                                                                                                                                                                                                                                                                          |                                     |                                     |                                     |
| A.1.12.3 | Circle on each Form IIB all the percent recoveries that are outside the acceptance windows.                                                                                                                                                                                                                                                                                                                                                                                         |                                     |                                     |                                     |
|          | Are CRA and CRI standards within control limits:                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     |                                     |                                     |
|          | Metals 80 - 120%R?                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | —                                   |
|          | Is mid-range standard within control limits:                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                     |                                     |                                     |
|          | Cyanide 80 - 120%R?                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> | —                                   | —                                   |
|          | <u>ACTION:</u> Flag as estimated all sample results within the affected range if the recovery of the standard is between 50-79%; flag only positive data within the affected range if the recovery is between 121-150%; reject all data within the affected range if the recovery is less than 50%; reject only positive data within the affected range if the recovery is greater than 150%. Qualify 50% of the samples on either side of CRI standard outside the control limits. |                                     |                                     |                                     |
|          | <u>Note:</u> Flag or reject the final results only when sample <u>raw data</u> are within the affected ranges and the CRDL standards are outside the acceptance windows.                                                                                                                                                                                                                                                                                                            |                                     |                                     |                                     |
| A.1.13   | <u>Form III (Initial and Continuing Calibration Blanks)</u>                                                                                                                                                                                                                                                                                                                                                                                                                         |                                     |                                     |                                     |
| A.1.13.1 | Present and complete?                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input checked="" type="checkbox"/> | —                                   | —                                   |
|          | For both AA and ICP when both are used for the same analyte?                                                                                                                                                                                                                                                                                                                                                                                                                        | <input type="checkbox"/>            | —                                   | <input checked="" type="checkbox"/> |
|          | Was an initial calibration blank analyzed?                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input checked="" type="checkbox"/> | —                                   | —                                   |
|          | Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (which ever is more frequent)?                                                                                                                                                                                                                                                                                                                                                                  | <input checked="" type="checkbox"/> | —                                   | —                                   |

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|                                                                                                                                                                                                                                                                                                                                                                 | YES                                 | NO | N/A                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----|-------------------------------------|
| <b>ACTION:</b> If no, prepare Telephone Record Log, contact laboratory and write in the Contract-Problems/Non-Compliance section of the "Data Assessment Narrative".                                                                                                                                                                                            |                                     |    |                                     |
| A.1.13.2 Circle on each Form III all calibration blank values that are above CRDL (or 2 x IDL when IDL > CRDL).                                                                                                                                                                                                                                                 |                                     |    |                                     |
| Are all calibration blanks (when IDL < CRDL) less than or equal to the Contract Required Detection Limits (CRDLs)?                                                                                                                                                                                                                                              | <input checked="" type="checkbox"/> | —  | —                                   |
| Are all calibration blanks less than two times Instrument Detection Limit (when IDL > CRDL)?                                                                                                                                                                                                                                                                    | <input type="checkbox"/>            | —  | <input checked="" type="checkbox"/> |
| <b>ACTION:</b> If no for any of the above, flag as estimated (J) positive sample results when raw sample value is less than or equal to calibration blank value analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank.<br>Flag five samples on either side of the calibration blank outside the control limits. |                                     |    |                                     |
| A.1.14 <u>FORM III (Preparation Blank) -</u><br>(Note: The preparation blank for mercury is the same as the calibration blank.)                                                                                                                                                                                                                                 |                                     |    |                                     |
| A.1.14.1 Was one prep. blank analyzed for:                                                                                                                                                                                                                                                                                                                      |                                     |    |                                     |
| each Sample Delivery Group (SDG)?                                                                                                                                                                                                                                                                                                                               | <input checked="" type="checkbox"/> | —  | —                                   |
| each batch of digested samples?                                                                                                                                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> | —  | —                                   |
| each matrix type?                                                                                                                                                                                                                                                                                                                                               | <input checked="" type="checkbox"/> | —  | —                                   |
| both AA and ICP when both are used for the same analyte?                                                                                                                                                                                                                                                                                                        | <input type="checkbox"/>            | —  | <input checked="" type="checkbox"/> |
| <b>ACTION:</b> If no for any of the above, flag as estimated (J) all the associated positive data < 10 x IDLs for which prep. blank was not analyzed.                                                                                                                                                                                                           |                                     |    |                                     |
| <b>NOTE:</b> If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).                                                                                                                                                                                                                |                                     |    |                                     |

## STANDARD OPERATING PROCEDURE

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|                                                                                                                                             | YES                                 | NO                                  | N/A                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| A.1.14.2                                                                                                                                    |                                     |                                     |                                     |
| Is concentration of prep. blank value greater than the CRDL when IDL is less than or equal to CRDL?                                         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep. blank?                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <u>ACTION:</u> If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value. |                                     |                                     |                                     |
| A.1.14.3                                                                                                                                    |                                     |                                     |                                     |
| Is concentration of prep. blank value (Form III) less than two times IDL, when IDL is greater than CRDL?                                    | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <u>ACTION:</u> If no, reject (red-line) all positive sample results when sample raw data are less than 10 times the prep. blank value.      |                                     |                                     |                                     |
| A.1.14.4                                                                                                                                    |                                     |                                     |                                     |
| Is concentration of prep. blank below the negative CRDL?                                                                                    | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <u>ACTION:</u> If yes, reject (red-line) all associated sample results less than 10xCRDL.                                                   |                                     |                                     |                                     |
| A.1.15                                                                                                                                      |                                     |                                     |                                     |
| <u>Form IV (ICP Interference Check Sample)</u>                                                                                              |                                     |                                     |                                     |
| A.1.15.1                                                                                                                                    |                                     |                                     |                                     |
| Present and complete?                                                                                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| (NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)                                                       |                                     |                                     |                                     |
| Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <u>ACTION:</u> If no, flag as estimated (J) all the samples for which AL, Ca, Fe, or Mg is higher than in ICS.                              |                                     |                                     |                                     |
| A.1.15.2                                                                                                                                    |                                     |                                     |                                     |
| Circle all values on each Form IV that are more than $\pm 20\%$ of true or established mean value.                                          |                                     |                                     |                                     |
| Are all Interference Check Sample results inside the control limits ( $\pm 20\%$ )?                                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| If no, is concentration of Al, Ca, Fe, or Mg lower than the respective concentration in ICS?                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |



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YES                      NO                      N/A

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YES NO N/A

**ACTION:** If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.

Are results outside the control limits (75-125%)  
flagged with "N" on Form I's and Form VA?

☒

—

—

**ACTION:** If no, write in the Contract - Problem/Non -  
Compliance section of "Data Assessment Narrative".

A.1.16.4 Aqueous

Are any spike recoveries:

(a) less than 30%?

☒

[ ]

—

(b) between 30-74%?

—

☒

—

(c) between 126-150%?

—

☒

—

(d) greater than 150%?

—

☒

—

**ACTION:** If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

A.1.16.5 Soil/Sediment

Are any spike recoveries:

(a) less than 10%?

—

[ ]

☒

(b) between 10-74%?

—

[ ]

☒

(c) between 126-200%?

—

[ ]

☒

(d) greater than 200%?

—

[ ]

☒

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|                |                                                                                                                                                                                                                                                                                                                                                                  | YES                                 | NO                                  | N/A                                 |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <b>ACTION:</b> | If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".                                                                                          |                                     |                                     |                                     |
| A.1.17         | <u>Form VI (Lab Duplicates)</u>                                                                                                                                                                                                                                                                                                                                  |                                     |                                     |                                     |
| A.1.17.1       | Present and complete for: each SDG?                                                                                                                                                                                                                                                                                                                              | <input checked="" type="checkbox"/> | —                                   | —                                   |
|                | each matrix type?                                                                                                                                                                                                                                                                                                                                                | <input checked="" type="checkbox"/> | —                                   | —                                   |
|                | each concentration range (i.e. low, med., high)?                                                                                                                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> | —                                   | —                                   |
|                | both AA and ICP when both are used for the same analyte?                                                                                                                                                                                                                                                                                                         | <input type="checkbox"/>            | —                                   | <input checked="" type="checkbox"/> |
| <b>ACTION:</b> | If no for any the above, flag as estimated (J) all the data $\geq$ CRDL* for which duplicate sample was not analyzed.                                                                                                                                                                                                                                            |                                     |                                     |                                     |
| <b>Note:</b>   | 1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated.<br>2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in ug/L on wet weight basis and calculate RPD or Difference for each analyte. |                                     |                                     |                                     |
| A.1.17.2       | Was field blank used for duplicate analysis?                                                                                                                                                                                                                                                                                                                     | —                                   | <input checked="" type="checkbox"/> | —                                   |
| <b>ACTION:</b> | If yes, flag all data $\geq$ CRDL* as estimated (J) for which field blank was used as duplicate.                                                                                                                                                                                                                                                                 |                                     |                                     |                                     |
| A.1.17.3       | Are all values within control limits (RPD 20% or difference $\leq \pm$ CRDL)?                                                                                                                                                                                                                                                                                    | <input checked="" type="checkbox"/> | —                                   | —                                   |
|                | If no, are all results outside the control limits flagged with an * on Form I's and VI?                                                                                                                                                                                                                                                                          | <input type="checkbox"/>            | —                                   | <input checked="" type="checkbox"/> |
| <b>ACTION:</b> | If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".                                                                                                                                                                                                                                                                   |                                     |                                     |                                     |

\* Substitute IDL for CRDL when IDL > CRDL.

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YES NO N/A

- NOTE:** 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.
2. If the result of lab duplicate analyzed by GFAA is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria to metals analyzed by GFAA.

A.1.17.4 Aqueous

Circle on each Form VI all values that are:

RPD > 50%, or  
Difference > CRDL\*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times \*CRDL?

— ☒ —

Is any difference\*\* between sample and duplicate greater than \*CRDL where sample and/or duplicate is less than 5 times \*CRDL?

— ☒ —

**ACTION:** If yes, flag the associated data as estimated.

A.1.17.5 Soil/Sediment

Circle on each Form VI all values that are:

RPD > 100%, or  
Difference > 2 x CRDL\*

Is any RPD (where sample and duplicate are both greater than or equal to 5 times \*CRDL) :

> 100%? — ☐ ☒

Is any \*\*difference between sample and duplicate (where sample and/or duplicate is less than 5x\*CRDL) :

> 2x\*CRDL? — ☐ ☒

\* Substitute IDL for CRDL when IDL > CRDL.

\*\* Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

ACTION: If yes, flag the associated data as estimated.

A.1.18 Field Duplicates

A.1.18.1 Were field duplicates analyzed?

[X] — —

ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.

NOTE: 1. Do not calculate RPD when both values are less than IDL.  
2. Flag all associated data only for field duplicate pair.

A.1.18.2 Aqueous

Circle all values on self prepared Form VI for field duplicates that are:

RPD > 50%, or  
Difference > CRDL\*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times \*CRDL?

— [X] —

Is any \*\*difference between sample and duplicate greater than \*CRDL where sample and/or duplicate is less than 5 times \*CRDL?

— [X] —

ACTION: If yes, flag the associated data as estimated.

\* Substitute IDL for CRDL when IDL > CRDL.

\*\* Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

A.1.18.3 Soil/Sediment

Circle all values on self prepared Form VI for  
field duplicates that are:

RPD >100%, or

Difference > 2 x CRDL\*

Is any RPD (where sample and duplicate are both  
greater than 5 times \*CRDL) :

>100%?

— ☐ ☒

Is any \*\*difference between sample and duplicate  
(where sample and/or duplicate is less than 5x \*CRDL) :

>2x \*CRDL?

— ☐ ☒

ACTION: If yes, flag the associated data as estimated.

A.1.19 Form VII (Laboratory Control Sample) (Note: LCS - not  
required for aqueous Hg and cyanide analyses.)

A.1.19.1 Was one LCS prepared and analyzed for:

each SDG?

☒ — —

each batch samples digested/distilled?

☒ — —

both AA and ICP when both are used for the same  
analyte?

☐ — ☒

ACTION: If no for any of the above, prepare Telephone  
Record Log and contact laboratory for submittal  
of results of LCS. Flag as estimated (J) all  
the data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20  
samples, then first 20 samples close to LCS  
do not have to be flagged as estimated.

\* Substitute IDL for CRDL when IDL > CRDL.

\*\* Use absolute values of sample and duplicate to calculate the difference.

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|  | YES | NO | N/A |
|--|-----|----|-----|
|--|-----|----|-----|

A.1.19.2 Aqueous LCS

Circle on each Form VII the LCS percent recoveries outside control limits (80 - 120%) except for aqueous Ag and Sb.

|                      |                        |   |                                     |   |
|----------------------|------------------------|---|-------------------------------------|---|
| Is any LCS recovery: | less than 50%?         | — | <input checked="" type="checkbox"/> | — |
|                      | between 50% and 79%?   | — | <input checked="" type="checkbox"/> | — |
|                      | between 121% and 150%? | — | <input checked="" type="checkbox"/> | — |
|                      | greater than 150%?     | — | <input checked="" type="checkbox"/> | — |

ACTION: Less than 50%, reject (red-line) all data; between 50% and 79%, flag all associated data as estimated (J); between 121% and 150%, flag all positive (not flagged with a "U") results as estimated; greater than 150%, reject all positive results.

A.1.19.3 Solid LCS

- NOTE: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).
2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

|                                                                  |   |                          |                                     |
|------------------------------------------------------------------|---|--------------------------|-------------------------------------|
| Is LCS "Found" value higher than the control limits on Form VII? | — | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|------------------------------------------------------------------|---|--------------------------|-------------------------------------|

ACTION: If yes, qualify all associated positive data as estimated.

|                                                                 |   |                          |                                     |
|-----------------------------------------------------------------|---|--------------------------|-------------------------------------|
| Is LCS "Found" value lower than the Control limits on Form VII? | — | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|-----------------------------------------------------------------|---|--------------------------|-------------------------------------|

ACTION: If yes, qualify all associated data as estimated.

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|          |                                                                                                                                                                                                                                                    | YES                                 | NO                                  | N/A |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-----|
| A.1.20   | <u>Form IX (ICP Serial Dilution) -</u>                                                                                                                                                                                                             |                                     |                                     |     |
|          | <u>NOTE:</u> Serial dilution analysis is required only<br>for initial concentrations equal to or<br>greater than 10 x IDL.                                                                                                                         |                                     |                                     |     |
| A.1.20.1 | Was Serial Dilution analysis performed for:                                                                                                                                                                                                        |                                     |                                     |     |
|          | each SDG?                                                                                                                                                                                                                                          | <input checked="" type="checkbox"/> | —                                   | —   |
|          | each matrix type?                                                                                                                                                                                                                                  | <input checked="" type="checkbox"/> | —                                   | —   |
|          | each concentration range (i.e. low, med.)?                                                                                                                                                                                                         | <input checked="" type="checkbox"/> | —                                   | —   |
|          | <u>ACTION:</u> If no for any of the above, flag as estimated<br>all the positive data $\geq 10 \times \text{IDL}$ s or $\geq \text{CRDL}$ when<br>$10 \times \text{IDL} \leq \text{CRDL}$ for which Serial Dilution Analysis<br>was not performed. |                                     |                                     |     |
| A.1.20.2 | Was field blank(s) used for Serial Dilution Analysis?                                                                                                                                                                                              | —                                   | <input checked="" type="checkbox"/> | —   |
|          | <u>ACTION:</u> If yes, flag all associated data $\geq 10 \times \text{IDL}$<br>as estimated (J). If $10 \times \text{IDL} \leq \text{CRDL}$ , flag all<br>data $\geq \text{CRDL}$ .                                                                |                                     |                                     |     |
| A.1.20.3 | Are results outside control limit flagged with an "E"<br>on Form I's and Form IX when initial concentration on<br>Form IX is equal to 50 times IDL or greater.                                                                                     | <input checked="" type="checkbox"/> | —                                   | —   |
|          | <u>ACTION:</u> If no, write in the Contract-Problem/Non-<br>Compliance section of the "Data Assessment<br>Narrative".                                                                                                                              |                                     |                                     |     |
| A.1.20.4 | Circle on each Form IX all percent difference<br>that are outside the control limits for initial<br>concentrations equal to or greater than 10 x IDLs only.                                                                                        |                                     |                                     |     |
|          | Are any % difference values:                                                                                                                                                                                                                       |                                     |                                     |     |
|          | > 10%?                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | —   |
|          | $\geq 100\%$ ?                                                                                                                                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | —   |



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|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | YES                                 | NO                       | N/A                      |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|--------------------------|
|          | <b><u>ACTION:</u></b> Flag as estimated (J) all the associated sample data $\geq 10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$ ) for which percent difference is greater than 10% but less than 100%. Reject (red-line) all the associated sample results equal to or greater than $10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$ ) for which PD is greater than or equal to 100%. |                                     |                          |                          |
|          | <b><u>Note:</u></b> Flag or reject on Form I's only the sample results whose associated raw data are $\geq 10 \times \text{IDL}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$ )                                                                                                                                                                                                                                                                       |                                     |                          |                          |
| A.1.21   | <b><u>Furnace Atomic Absorption (AA) OC Analysis</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                          |                          |
| A.1.21.1 | Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA?                                                                                                                                                                                                                                                                                                                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|          | <b><u>ACTION:</u></b> If no, <u>reject</u> the data on Form I's for which duplicate injections were not performed.                                                                                                                                                                                                                                                                                                                                                           |                                     |                          |                          |
| A.1.21.2 | Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL?                                                                                                                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|          | Was a dilution analyzed for sample with analytical spike recovery less than 40%?                                                                                                                                                                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|          | <b><u>ACTION:</u></b> If no for any of the above, flag all the associated data as estimated.                                                                                                                                                                                                                                                                                                                                                                                 |                                     |                          |                          |
| A.1.21.3 | Is *analytical spike recovery outside the control limits (85-115%) for any sample?                                                                                                                                                                                                                                                                                                                                                                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|          | <b><u>ACTION:</u></b> If yes, flag as estimated the affected sample results if the recovery is between 10-84%; if the recovery is between 115-200%, flag the associated positive sample results as estimated; reject the associated sample results if the recovery is less than 10%; reject positive sample results if the recovery is greater than 200%.                                                                                                                    |                                     |                          |                          |

\* Analytical spike is not required on the pre-digestion spiked sample.

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|                                                                                                                                            | YES                                                                                                                                                 | NO                                  | N/A                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|
| <p><b>NOTE:</b> Reject or flag the data only when the affected sample(s) was not subsequently analyzed by Method of Standard Addition.</p> |                                                                                                                                                     |                                     |                                     |
| A.1.22                                                                                                                                     | <u>Form VIII (Method of Standard Addition Results)</u>                                                                                              |                                     |                                     |
| A.1.22.1                                                                                                                                   | <input checked="" type="checkbox"/>                                                                                                                 | <input type="checkbox"/>            | <input type="checkbox"/>            |
|                                                                                                                                            | Present?                                                                                                                                            |                                     |                                     |
|                                                                                                                                            | <input type="checkbox"/>                                                                                                                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
|                                                                                                                                            | If no, is any Form I result coded with "S" or a "+"?                                                                                                |                                     |                                     |
|                                                                                                                                            | <b>ACTION:</b> If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII.                                     |                                     |                                     |
| A.1.22.2                                                                                                                                   | <input checked="" type="checkbox"/>                                                                                                                 | <input type="checkbox"/>            | <input type="checkbox"/>            |
|                                                                                                                                            | Is coefficient of correlation for MSA less than 0.990 for any sample?                                                                               |                                     |                                     |
|                                                                                                                                            | <b>ACTION:</b> If yes, reject (red-line) the affected data.                                                                                         |                                     |                                     |
| A.1.22.3                                                                                                                                   | <input checked="" type="checkbox"/>                                                                                                                 | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
|                                                                                                                                            | Was *MSA required for any sample but not performed?                                                                                                 |                                     |                                     |
|                                                                                                                                            | <input checked="" type="checkbox"/>                                                                                                                 | <input type="checkbox"/>            | <input type="checkbox"/>            |
|                                                                                                                                            | Is coefficient of correlation for MSA less than 0.995?                                                                                              |                                     |                                     |
|                                                                                                                                            | <input type="checkbox"/>                                                                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
|                                                                                                                                            | Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?                            |                                     |                                     |
|                                                                                                                                            | <b>ACTION:</b> If yes for any of the above, flag all the associated data as estimated (J).                                                          |                                     |                                     |
| A.1.22.4                                                                                                                                   | <input checked="" type="checkbox"/>                                                                                                                 | <input type="checkbox"/>            | <input type="checkbox"/>            |
|                                                                                                                                            | Was proper quantitation procedure followed correctly as outlined in the SOW on page E-23?                                                           |                                     |                                     |
|                                                                                                                                            | <b>ACTION:</b> If no, note exception under Contract Problem/Non-Compliance section of the "Data Assessment Narrative", and prepare a separate list. |                                     |                                     |

\* MSA is not required on LCS and prep. blank.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | YES                                 | NO                                  | N/A                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| A.1.23 <u>Dissolved/Total or Inorganic/Total Analytes -</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     |                                     |                          |
| A.1.23.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s).                                                                                                                                                                                                                                                                                                                                                                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <p><u>NOTE:</u> 1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration.</p> <p>2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents.</p> <p>3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.</p> |                                     |                                     |                          |
| A.1.23.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?                                                                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| A.1.23.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?                                                                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <p><u>ACTION:</u> If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.</p>                                                                                                                                                                                                                                                                                                                                                    |                                     |                                     |                          |
| A.1.24 <u>Form I (Field Blank) -</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                     |                                     |                          |
| (Note: Designate "Field Blank" as such on Form I.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                     |                                     |                          |
| A.1.24.1 Circle all field blank values on Form I that are greater than CRDL, (or 2 x IDL when IDL > CRDL).                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                                     |                          |
| Is field blank concentration less than CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?                                                                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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|                                                                                                                                                                                                                                                                                                                      | YES                                 | NO                                  | N/A                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| If no, was field blank value already rejected due to other QC criteria?                                                                                                                                                                                                                                              | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <p><b>ACTION:</b> If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value. Reject on Form I's the soil sample results that when converted to ug/L on wet basis are less than or equal to five times the field blank value in ug/L.</p> |                                     |                                     |                                     |
| <p>A.1.25 <u>Form X, XI, XII (Verification of Instrumental Parameters).</u></p>                                                                                                                                                                                                                                      |                                     |                                     |                                     |
| A.1.25.1 Is verification report present for:                                                                                                                                                                                                                                                                         |                                     |                                     |                                     |
| Instrument Detection Limits (quarterly)?                                                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| ICP Interelement Correction Factors (annually)?                                                                                                                                                                                                                                                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| ICP Linear Ranges (quarterly)?                                                                                                                                                                                                                                                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <p><b>ACTION:</b> If no, contact TPO of the lab.</p>                                                                                                                                                                                                                                                                 |                                     |                                     |                                     |
| A.1.25.2 <u>Form X (Instrument Detection Limits)</u> - (Note: IDL is not required for Cyanide.)                                                                                                                                                                                                                      |                                     |                                     |                                     |
| A.1.25.2.1 Are IDLs present for:                                                                                                                                                                                                                                                                                     |                                     |                                     |                                     |
| all the analytes?                                                                                                                                                                                                                                                                                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| all the instruments used?                                                                                                                                                                                                                                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| For both AA and ICP when both are used for the same analyte?                                                                                                                                                                                                                                                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <p><b>ACTION:</b> If no for any of the above, prepare Telephone Record Log and contact laboratory.</p>                                                                                                                                                                                                               |                                     |                                     |                                     |
| A.1.25.2.2 Is IDL greater than CRDL for any analyte?                                                                                                                                                                                                                                                                 | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL.                                                                                                                                                                                        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

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YES NO N/A

Action : If no, flag as estimated all values less than five times IDL of the instrument whose IDL exceeds CRDL.

A.1.25.3 Form XI (Linear Ranges)

A.1.25.3.1 Was any sample result higher than high linear range of ICP.

— ☒ —

Was any sample result higher than the highest calibration standard for non-ICP parameters?

— ☒ —

If yes for any of the above, was the sample diluted to obtain the result on Form I?

☐ — ☒

ACTION: If no, flag the result reported on Form I as estimated(J).

A.1.26 Percent Solids of Sediments

A.1.26.1 Are percent solids in sediment(s):

< 50%?

— ☐ ☒

< 10%?

— ☐ ☒

ACTION: If yes, qualify as estimated all the results of a sample that has per cent solids between 10%-50% (i.e. moisture content between 50%-90%). Reject all the results of a sample that has per cent solids less than 10% (i.e. moisture content greater than 90%).

NOTE: Reject or flag(J) only the sample results that were not previously rejected or flagged due to other QC criteria.

## STANDARD OPERATING PROCEDURE

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Case# - Site Tutu Service Station Investigation Matrix: Soil         
SDG# 24744, 24950, 24997, 25009 Lab Enseco-East Water X  
25052, 25071, 25091  
Contractor Geraghty & Miller, Inc. Reviewer Lauren Sjogren Other       

### A.2.1. Validation Flags -

The following flags have been applied in red by the data validator and must be considered by the data user.

J -

This flag indicates the results qualified as estimated.

Red-Line -

A red-line drawn through a sample result indicates unusable value. The red-line data are known to contain significant errors based on documented information and must not be used by the data user.

Fully Usable Data-

The results that do not carry "J" or "red-line" are fully usable.

Contractual Qualifiers -

The legend of contractual qualifiers applied by the lab on Form I's is found on page B-20 of SOW ILM01.0.

A.2.2 The data assessment is given below and on the attached sheets.

The quality of the data was acceptable with the appropriate qualifiers as discussed below.

## HOLDING TIMES/SAMPLE PRESERVATION

*Samples MW-6R and MW-8 were analyzed for total cyanide out of the 12-day holding time by two days. Cyanide was not detected in either sample, therefore, these non-detect cyanide results were qualified as unusable (R).*

*No mention is made in the cyanide distillation logs as to whether the pH of samples FB092992, FB093092, MW-6D, MW-2, MW-4, and MW-3 were greater than ( $>$ ) 12 standard pH units. The laboratory was contacted and it was determined that the pH of these samples had not been measured. Cyanide was not detected in any of the samples, therefore, the non-detect cyanide results were qualified as estimated (UJ).*

*The pH of the cyanide samples MW-6R and MW-8 were less than ( $<$ ) 12. The non-detect cyanide results for MW-6R and MW-8 were already qualified as unusable (R) based on the holding times, therefore, further qualification of this data was not necessary.*

*The pH of all cyanide samples contained in sample delivery groups (SDGs) 24997, 25009, 25052, 25071, and 25091 were  $< 12$ . Cyanide was not detected in any of these samples, therefore, the non-detect cyanide results were qualified as estimated (UJ).*

*The pH of the total metals sample for MW-1D  $> 2$ . All total metals detected for MW-1D were qualified as estimated (J) and non-detects were qualified as estimated at the quantitation limit (UJ).*

## CALIBRATION

*For the majority of the arsenic, lead, selenium, and thallium initial calibrations, the data reviewer could not confirm the correlation coefficients ( $r$ ) reported by the laboratory. The  $r$  values were calculated using a non-linear regression formula; all reported  $r$  values were  $> 0.995$ .*

## CRDL STANDARDS

*For SDGs 25071 and 25091, the spike recovery for the lead CRDL standard analyzed on October 19, 1992 was 70 percent which is outside the acceptance range of 80 to 120 percent. Therefore, all total lead sample results contained in SDGs 25071 and 25091 were qualified as estimated (J) if detected and estimated (UJ) if not detected.*

## MATRIX SPIKE RESULTS

*Sample MW-11D was designated for the matrix spike analysis. All matrix spike recoveries were within the 75 to 125 percent range with the exception of the cyanide analysis.*

*A zero percent recovery for cyanide was reported for the matrix spike analysis of MW-11D. The laboratory also analyzed sample MW-10 as a matrix spike sample with a 104 percent recovery for cyanide. Therefore, the cyanide result for sample MW-11D was qualified as unusable (R) since there was no recovery of cyanide. No other cyanide sample results were qualified since the cyanide matrix spike recovery for sample MW-10 was within the quality control (QC) limits of 75 to 125 percent.*

## **LAB DUPLICATE RESULTS**

*Sample MW-11D was designated for the laboratory duplicate analysis. All laboratory duplicate results were within the appropriate QC limits.*

## **FURNACE ATOMIC ABSORPTION ANALYSES**

*Duplicate injections and furnace post-digestion spikes are used to establish the precision and accuracy of individual analytical determinations.*

### **Arsenic**

*The arsenic post-digestion spike recoveries were between 115 to 200 percent for total metals sample MW-14 and all the total metal samples contained in SDGs 24744 and 24950. Arsenic post-digestion spike recoveries for the dissolved metal analyses for samples MW-12D, MW-7, MW-7 FR (MW-105), MW-4D, MW-10, MW-10D, MW-1, and ESSO-TAP were also between 115 percent and 200 percent. As a result, the positive arsenic result for total metals sample MW-10 was qualified as estimated (J). Since arsenic was not detected in any of the other samples, no qualification of these results was necessary.*

### **Lead**

*With the exception of the total metals sample for MW-6R, the lead post-digestion spike recoveries for all other total samples contained in SDGs 24744 and 24950 were between 115 to 200 percent. The lead concentrations detected in the total analyses for samples MW-4 and MW-3 were qualified as estimated (J). Lead was not detected in any of the other associated samples, therefore, further qualification of this data was not necessary.*

### **Selenium**

*The selenium post-digestion spike recovery was outside the QC limits of 85 to 115 percent for total sample MW-6R. The selenium detected in this sample was qualified as estimated (J).*



*Selenium post-digestion spike recoveries between 10 to 84 percent were reported for dissolved metals sample MW-11D and for total metals sample MW-1. The selenium detected in dissolved metals sample MW-11D and for total metals sample MW-1 were qualified as estimated (J).*

*Selenium post-digestion spike recoveries were between 10 and 84 percent for dissolved metals samples MW-14 and MW-3 and total metal samples MW-9, MW-9S, and MW-14. Since selenium was not detected in these samples, these results were qualified as estimated at the quantitation limit (UJ).*

*Selenium post-digestion spike recoveries for dissolved metals sample FB093092 and total metal samples MW-12D and MW-7 were between 115 and 200 percent. Since selenium was not detected in these samples, no qualification of these results was necessary.*

### **Thallium**

*Thallium post-digestion spike recoveries were between 10 and 84 percent for total metal samples MW-10, MW-10D, MW-1, MW-13D, MW-8, MW-6R, and MW-4. Thallium was not detected in any of these samples, therefore, these non-detect thallium results were qualified as estimated (UJ).*

*Thallium post-digestion spike recoveries were between 10 and 84 percent for dissolved metal samples MW-10D, MW-1D, MW-5, MW-14, MW-5FR (MW-104), MW-8, MW-6R, MW-2, MW-4, and MW-3. Thallium was not detected in any of these samples, therefore, these non-detect thallium results were qualified as estimated (UJ).*

*Thallium post-digestion spike recoveries for dissolved metal samples MW-7, MW-10, MW-1, MW-9S, and ESSO-TAP were between 115 and 200 percent. Thallium was not detected in any of these samples, therefore, these results were not qualified.*

*All other post-digestion sample spike recoveries were within the QC limits of 85 to 115 percent with the exception of those samples analyzed by the method of standard addition.*

### **ICP SERIAL DILUTION**

*For SDG number 24997, sample MW-5 FR (MW-104) was used for the inductively coupled plasma (ICP) serial dilution analysis. The percent difference between the total zinc initial sample result and the total zinc serial dilution result was > 10, but < 100 percent. As a result, all total zinc sample results contained in SDG number 24997 greater than ten times the instrument detection limit (IDL) were qualified as estimated (J).*

*For SDG number 25009, sample MW-11D was used for the ICP serial dilution analysis. The percent difference between the total sodium initial sample result and the total sodium serial dilution result was > 10, but < 100 percent. As a result, all positive total sodium sample*

results contained in SDG number 25009 greater than ten times the IDL were qualified as estimated (J).

For SDG number 25052, sample MW-12D was used for the ICP serial dilution analysis. The percent difference between the total manganese, sodium, and zinc initial sample results and the total manganese, sodium, and zinc serial dilution results were  $> 10$ , but  $< 100$  percent. As a result, all positive total manganese, sodium, and zinc sample results contained in SDG number 25052 greater than the contract required detection limit (CRDL) or ten times the IDL, whichever was greater, were qualified as estimated (J). The percent difference between the dissolved chromium initial sample result and the dissolved chromium serial dilution result was  $> 10$ , but  $< 100$  percent. As a result, all positive dissolved chromium results contained in SDG number 25052 greater than ten times the IDL were qualified as estimated (J).

Sample MW-9 was used for the ICP serial dilution analysis for SDG number 25091. The percent difference between the dissolved iron and zinc initial sample results and the dissolved iron and zinc serial dilution results were  $> 10$ , but  $< 100$  percent. As a result, all positive dissolved iron and zinc sample results contained in SDG number 25091 greater than the CRDL were qualified as estimated (J). The percent difference between the total copper initial sample result and the total copper serial dilution result was  $> 10$ , but  $< 100$  percent. As a result, all positive total copper results contained in SDG number 25091 greater than ten times the IDL were qualified as estimated (J).

Sample MW-10 was used for the ICP serial dilution analysis for SDG number 25071. The percent difference between the total potassium, vanadium, and zinc initial sample results and the total potassium, vanadium, and zinc serial dilution results were  $> 10$ , but  $< 100$  percent. As a result, all positive vanadium and zinc sample results contained in SDG number 25071 greater than the CRDL were qualified as estimated (J). All positive potassium sample results contained in SDG number 25071 greater than ten times the IDL were qualified as estimated (J).

All other ICP serial dilution results were acceptable.

## BLANKS

With the exception of the field blank FB100792, all analytes detected in any other blanks associated with the samples had concentrations below the CRDL.

Aluminum, chromium, and iron were detected in the total metals analysis of field blank FB100792 with concentrations of 776 micrograms per liter (ug/L), 16.2 ug/L, and 820 ug/L, respectively. The following sample results were qualified as unusable (R) because the concentration was  $<$  five times the associated blank value.

| <u>Sample ID</u> | <u>Analyte</u>   |
|------------------|------------------|
| ESSO-TAP         | Aluminum (total) |
| ESSO-TAP         | Iron (total)     |
| MW-9             | Chromium (total) |
| MW-9S            | Chromium (total) |
| MW-1             | Chromium (total) |

## SAMPLE RESULTS

*Only one transcription error was found. Iron originally reported as not detected (7U) in the dissolved metals analysis of sample MW-3 was detected at a concentration of 55.6 ug/L. The sample result was corrected by the data reviewer.*

## DISSOLVED/TOTAL ANALYTES

*The concentration of dissolved calcium was greater than total calcium for sample MW-5 FR (MW-104) by more than 10 percent. Total and dissolved calcium for sample MW-5 FR (MW-104) were qualified as estimated (J).*

*The concentration of dissolved manganese was greater than total manganese for sample MW-4D by more than 10 percent. Total and dissolved manganese for sample MW-4D were qualified as estimated (J).*

*The concentration of dissolved arsenic was greater than total arsenic for sample MW-9 by more than 10 percent. Total and dissolved arsenic for sample MW-9 were qualified as estimated (J).*

*The concentration of dissolved sodium was greater than total sodium for sample MW-1 by more than 10 percent. Total and dissolved sodium for sample MW-1 were qualified as estimated (J).*

*The concentration of dissolved arsenic was greater than total arsenic for sample MW-9S by more than 50 percent. Total and dissolved arsenic for sample MW-9S were qualified as unusable (R).*

### A.2.3 Contract-Problem/Non-Compliance

*For the arsenic, lead, selenium, and thallium initial calibrations, none of the calibration standards were at the CRDL level. However, after each one of these initial calibrations were analyzed and prior to the analysis of any samples, standards with a concentration at the CRDL*

were analyzed for each furnace sequence. The recovery of these standards were found to be within a range of 94 to 118 percent. It is this data reviewer's opinion that the data was not compromised.

MMB/ESAT Reviewer: \_\_\_\_\_  
Signature

Date: \_\_\_\_\_

Contractor Reviewer: Lauren Sjogren /AD  
Signature

Date: 2/26/93

Verified by: Lidya Grizian

Date: 2/26/93

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## U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

MW-5

Total

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 24997Matrix (soil/water): --Level (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

| Analyte   | Control Limit | Sample (S) | C | Duplicate (D) | C | RPD  | Q | M |
|-----------|---------------|------------|---|---------------|---|------|---|---|
| Aluminum  |               | 1490       |   | 1140          |   | 26.6 |   |   |
| Antimony  |               | 20.0       | U | 20.0          | U |      |   |   |
| Arsenic   |               | 3.9        | B | 4.0           | B | 2.5  |   |   |
| Barium    |               | 167        | B | 167           | B | 0    |   |   |
| Beryllium |               | 1.0        | U | 1.0           | U |      |   |   |
| Cadmium   |               | 3.0        | U | 3.0           | U |      |   |   |
| Calcium   |               | 40100      |   | 40100         |   | 0    |   |   |
| Chromium  |               | 15.7       |   | 12.5          |   | 22.6 |   |   |
| Cobalt    |               | 6.9        | B | 6.5           | B | 6.0  |   |   |
| Copper    |               | 9.2        | B | 10.9          | B | 16.9 |   |   |
| Iron      |               | 2280       |   | 1910          |   | 17.7 |   |   |
| Lead      |               | 1.0        | U | 1.0           | U |      |   |   |
| Magnesium |               | 21700      |   | 21400         |   | 1.4  |   |   |
| Manganese |               | 407        |   | 406           |   | 0.2  |   |   |
| Mercury   |               | 0.10       | U | 0.10          | U |      |   |   |
| Nickel    |               | 54.3       |   | 49.0          |   | 10.3 |   |   |
| Potassium |               | 9310       |   | 8970          |   | 3.7  |   |   |
| Selenium  |               | 2.0        | U | 2.0           | U |      |   |   |
| Silver    |               | 4.0        | U | 4.0           | U |      |   |   |
| Sodium    |               | 21400      |   | 213000        |   | 0.5  |   |   |
| Thallium  |               | 3.0        | U | 3.0           | U |      |   |   |
| Vanadium  |               | 6.4        | B | 4.9           | B | 26.5 |   |   |
| Zinc      |               | 26.1       |   | 26.4          |   | 1.1  |   |   |
| Cyanide   |               | 10.0       | U | 10.0          | U |      |   |   |

PR01301/MW-5TOTAL.WK3

## U.S.EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

MW-5

Dissolved

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 24997Matrix (soil/water): --Level (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

| Analyte   | Control Limit | Sample (S) | C | Duplicate (D) | C | RPD  | Q | M |
|-----------|---------------|------------|---|---------------|---|------|---|---|
| Aluminum  |               | 34.9       | B | 36.1          | B | 3.3  |   |   |
| Antimony  |               | 20.0       | U | 24.8          | B |      |   |   |
| Arsenic   |               | 3.9        | B | 3.9           | B | 0    |   |   |
| Barium    |               | 172        | B | 162           | B | 5.6  |   |   |
| Beryllium |               | 1.0        | U | 1.0           | U |      |   |   |
| Cadmium   |               | 3.0        | U | 3.0           | U |      |   |   |
| Calcium   |               | 40300      |   | 39500         |   | 2.0  |   |   |
| Chromium  |               | 4.0        | U | 4.0           | U |      |   |   |
| Cobalt    |               | 4.0        | U | 5.4           | B |      |   |   |
| Copper    |               | 4.0        | U | 4.0           | U |      |   |   |
| Iron      |               | 278        |   | 278           |   | 0    |   |   |
| Lead      |               | 1.0        | U | 1.0           | U |      |   |   |
| Magnesium |               | 21600      |   | 23200         |   | 7.1  |   |   |
| Manganese |               | 373        |   | 383           |   | 2.6  |   |   |
| Mercury   |               | 0.10       | U | 0.10          | U |      |   |   |
| Nickel    |               | 39.7       | B | 48.8          | B | 20.7 |   |   |
| Potassium |               | 9850       |   | 9380          |   | 4.9  |   |   |
| Selenium  |               | 2.0        | U | 2.0           | U |      |   |   |
| Silver    |               | 4.0        | U | 4.0           | U |      |   |   |
| Sodium    |               | 233000     |   | 236000        |   | 1.3  |   |   |
| Thallium  |               | 3.0        | U | 3.0           | U |      |   |   |
| Vanadium  |               | 4.0        | U | 4.0           | U |      |   |   |
| Zinc      |               | 7.5        | B | 5.6           | B | 29.0 |   |   |
| Cyanide   |               |            |   |               |   |      |   |   |

PR01301/MW-5DIS.WK3

## U.S. EPA - CLP

6  
 DUPLICATES

EPA SAMPLE NO.

MW-7

Total

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 25052Matrix (soil/water): WaterLevel (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

| Analyte   | Control Limit | Sample (S) | C | Duplicate (D) | C | RPD  | Q | M |
|-----------|---------------|------------|---|---------------|---|------|---|---|
| Aluminum  |               | 3640       |   | 4000          |   | 9.4  |   |   |
| Antimony  |               | 20.0       | U | 20.0          | U |      |   |   |
| Arsenic   |               | 2.0        | U | 2.0           | U |      |   |   |
| Barium    |               | 18.8       | B | 16.5          | B | 13.0 |   |   |
| Beryllium |               | 1.0        | B | 1.0           | U |      |   |   |
| Cadmium   |               | 3.0        | U | 3.0           | U |      |   |   |
| Calcium   |               | 49200      |   | 51700         |   | 5.0  |   |   |
| Chromium  |               | 12.7       |   | 10.4          |   | 20.0 |   |   |
| Cobalt    |               | 5.1        | B | 4.8           | B | 6.1  |   |   |
| Copper    |               | 19.9       | B | 14.4          | B | 32.0 |   |   |
| Iron      |               | 5120       |   | 5470          |   | 6.6  |   |   |
| Lead      |               | 1.0        | U | 1.0           | U |      |   |   |
| Magnesium |               | 30300      |   | 30500         |   | 0.7  |   |   |
| Manganese |               | 120        |   | 132           |   | 9.5  |   |   |
| Mercury   |               | 0.10       | U | 0.10          | U |      |   |   |
| Nickel    |               | 8.0        | U | 8.0           | U |      |   |   |
| Potassium |               | 21100      |   | 22100         |   | 4.6  |   |   |
| Selenium  |               | 2.0        | U | 2.0           | U |      |   |   |
| Silver    |               | 4.0        | U | 4.0           | U |      |   |   |
| Sodium    |               | 199000     |   | 201000        |   | 1.0  |   |   |
| Thallium  |               | 3.0        | U | 3.0           | U |      |   |   |
| Vanadium  |               | 103        |   | 106           |   | 2.9  |   |   |
| Zinc      |               | 16.0       | B | 17.0          | B | 6.1  |   |   |
| Cyanide   |               | 10.0       | U | 10.0          | U |      |   |   |

PR01301/MW-7TOTAL.WK3

## U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

MW-7

Dissolved

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 25052Matrix (soil/water): WaterLevel (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

| Analyte   | Control Limit | Sample (S) | C | Duplicate (D) | C | RPD  | Q | M |
|-----------|---------------|------------|---|---------------|---|------|---|---|
| Aluminum  |               | 32.0       | U | 32.0          | U |      |   |   |
| Antimony  |               | 20.1       | B | 20.0          | U | 200  |   |   |
| Arsenic   |               | 2.0        | U | 2.0           | U |      |   |   |
| Barium    |               | 4.8        | B | 7.4           | B | 42.6 |   |   |
| Beryllium |               | 1.0        | U | 1.0           | U |      |   |   |
| Cadmium   |               | 3.0        | U | 3.0           | U |      |   |   |
| Calcium   |               | 41200      |   | 41100         | U | 0.2  |   |   |
| Chromium  |               | 4.0        | U | 4.0           | U |      |   |   |
| Cobalt    |               | 4.0        | U | 4.0           | U |      |   |   |
| Copper    |               | 4.0        | U | 4.0           | U |      |   |   |
| Iron      |               | 7.0        | U | 10.5          | B | 200  |   |   |
| Lead      |               | 1.0        | U | 1.0           | U |      |   |   |
| Magnesium |               | 28600      |   | 28700         |   | 0.3  |   |   |
| Manganese |               | 1.2        | B | 2.0           | B | 50.0 |   |   |
| Mercury   |               | 0.10       | U | 0.10          | U |      |   |   |
| Nickel    |               | 8.0        | U | 8.0           | U |      |   |   |
| Potassium |               | 20100      |   | 22400         |   | 10.8 |   |   |
| Selenium  |               | 2.1        | B | 2.0           | U |      |   |   |
| Silver    |               | 4.0        | U | 4.0           | U |      |   |   |
| Sodium    |               | 209000     |   | 211000        |   | 1.1  |   |   |
| Thallium  |               | 3.0        | U | 3.0           | U |      |   |   |
| Vanadium  |               | 96.8       |   | 99.2          |   | 2.4  |   |   |
| Zinc      |               | 3.9        | B | 7.4           | B | 61.9 |   |   |
| Cyanide   |               |            |   |               |   |      |   |   |

PR01301/MW-7DIS.WK3



**ATTACHMENT D3**

**TABLES**

Table D3-1. Ground-Water Sample Delivery Groups for September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Sample Delivery Group | Sample Identification | Laboratory Identification | Collection Date    |
|-----------------------|-----------------------|---------------------------|--------------------|
| 24744                 | FB092992              | 24744-1                   | September 29, 1992 |
|                       | TB092992              | 24744-2                   | September 29, 1992 |
|                       | MW-8                  | 24744-3                   | September 29, 1992 |
|                       | MW-6R                 | 24744-4                   | September 29, 1992 |
| 24950                 | FB093092              | 24950-1                   | September 30, 1992 |
|                       | TB093092              | 24950-2                   | September 30, 1992 |
|                       | MW-6D                 | 24950-3                   | September 30, 1992 |
|                       | MW-2                  | 24950-4                   | September 30, 1992 |
|                       | MW-4                  | 24950-5                   | September 30, 1992 |
|                       | MW-3                  | 24950-6                   | September 30, 1992 |
| 24997                 | TB100192              | 24997-1                   | October 1, 1992    |
|                       | FB100192              | 24997-2                   | October 1, 1992    |
|                       | MW-5                  | 24997-3                   | October 1, 1992    |
|                       | MW-14                 | 24997-4                   | October 1, 1992    |
|                       | MW-104                | 24997-5                   | October 1, 1992    |
| 25009                 | FB100292              | 25009-1 (cancelled)       | October 2, 1992    |
|                       | TB100292              | 25009-2                   | October 2, 1992    |
|                       | MW-1                  | 25009-3 (resampled)       | October 2, 1992    |
|                       | MW-1D                 | 25009-4                   | October 2, 1992    |
|                       | MW-11D                | 25009-5                   | October 2, 1992    |
|                       | MW-11D MS             | 25009-5 MS                | October 2, 1992    |
|                       | MW-11D MSD            | 25009-5 MSD               | October 2, 1992    |
| 25052                 | FB100592              | 25052-1                   | October 5, 1992    |
|                       | TB100592              | 25052-2                   | October 5, 1992    |
|                       | MW-12D                | 25052-3                   | October 5, 1992    |
|                       | MW-7                  | 25052-4                   | October 5, 1992    |
|                       | MW-105                | 25052-5                   | October 5, 1992    |
|                       | MW-4D                 | 25052-6                   | October 5, 1992    |
| 25071                 | FB100692              | 25071-1                   | October 6, 1992    |
|                       | TB100692              | 25071-2                   | October 6, 1992    |
|                       | MW-10                 | 25071-3                   | October 6, 1992    |
|                       | MW-10D                | 25071-4                   | October 6, 1992    |
|                       | MW-1                  | 25071-5                   | October 6, 1992    |
|                       | MW-13D                | 25071-6                   | October 6, 1992    |
| 25091                 | MW-4D                 | 25091-1                   | October 7, 1992    |
|                       | MW-9                  | 25091-2                   | October 7, 1992    |
|                       | MW-9S                 | 25091-3                   | October 7, 1992    |
|                       | FB100792              | 25091-4                   | October 7, 1992    |
|                       | TB100792              | 25091-5                   | October 7, 1992    |
|                       | ESSO-TAP              | 25091-6                   | October 7, 1992    |
|                       | MW-106                | 25091-7                   | October 7, 1992    |

FB Field blank.  
TB Trip blank.  
MS Matrix spike.  
MSD Matrix spike duplicate.

PR01301.DV/Tabld3-1.wp

Table D3-2. Summary of Volatile and Semivolatile Holding-Time Outliers Associated with Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter  | Sample ID              | Collection Date/Acid Preserved | Analysis (or Preparation) Date | Days Holding Time Exceeded | Action                               |
|-----------------------|------------------------|--------------------------------|--------------------------------|----------------------------|--------------------------------------|
| VOCs                  | MW-13D                 | October 6, 1992/No             | October 16, 1992               | 3                          | Estimated data for aromatic VOCs.    |
| VOCs (bromoform only) | TB100192 RE            | October 1, 1992/Yes            | October 23, 1992               | 8                          | Used initial analysis for bromoform. |
|                       | FB100192 RE            | October 1, 1992/Yes            | October 16, 1992               | 1                          |                                      |
|                       | MW-5 RE                | October 1, 1992/Yes            | October 16, 1992               | 1                          |                                      |
|                       | MW-5 FR RE (MW-104 RE) | October 1, 1992/Yes            | October 23, 1992               | 8                          |                                      |
|                       | MW-14 RE               | October 1, 1992/Yes            | October 16, 1992               | 1                          |                                      |
| VOCs (bromoform only) | TB100292 RE            | October 2, 1992/Yes            | October 29, 1992               | 13                         | Used initial analysis for bromoform. |
|                       | MW-1D RE               | October 2, 1992/Yes            | October 29, 1992               | 13                         |                                      |
|                       | MW-11D RE              | October 2, 1992/Yes            | October 29, 1992               | 13                         |                                      |
| VOCs (bromoform only) | FB100592 RE            | October 5, 1992/Yes            | October 22, 1992               | 3                          | Used initial analysis for bromoform. |
|                       | TB100592 RE            | October 5, 1992/Yes            | October 23, 1992               | 4                          |                                      |
|                       | MW-12D RE              | October 5, 1992/Yes            | October 22, 1992               | 3                          |                                      |
|                       | MW-7 FR RE (MW-105 RE) | October 5, 1992/Yes            | October 23, 1992               | 4                          |                                      |
| Semivolatiles         | MW-6D RE               | September 30, 1992/NA          | October 20, 1992               | 12                         | Estimated data.                      |

ID Identification.  
VOCs Volatile organic compounds.  
RE Reanalysis.  
NA Not applicable.

PR013.01.DV/TableD3-2.wk3

Table D3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| SDG No.          | Blank<br>(Lab or Field ID/ File ID) | Compound or TIC (RT) Found/<br>Concentration (ug/L)                              | Associated<br>Ground-Water Samples                                  |
|------------------|-------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <u>Volatiles</u> |                                     |                                                                                  |                                                                     |
| 24744            | Method<br>(05 Oct 92-A/C1412)       | Methylene chloride/3J                                                            | MW-6R, MW-8, MW-2, MW-3, MW-4, MW-6D                                |
| 24950            | Method<br>(06 Oct 92-A/C1426)       | Methylene chloride/3J<br>Acetone/8J                                              | MW-6D RE, MW-5, MW-14, MW-5 FR (MW-104),<br>MW-11D, MW-1D, TB100292 |
| 24997            | Method<br>(23 Oct 92-A/J0166)       | Unknown (22.92)/8J                                                               | MW-5 FR RE (MW-104 RE)                                              |
| 25052            | Method<br>(07 Oct 92-A/C1445)       | Methylene chloride/5J<br>Acetone/9J                                              | MW-12D, MW-7 FR (MW-105) *                                          |
| 25071            | Method<br>(09 Oct 92-A/C1469)       | Methylene chloride/14                                                            | MW-1, MW-10, MW-10D, MW-4D, MW-9,<br>MW-9 FR (MW-106), MW-9S        |
| 24744            | Trip<br>(TB092992)                  | Methylene chloride/3BJ<br>Acetone/7J<br>Unknown (20.05)/6J<br>Unknown (26.15)/5J | MW-6R, MW-8                                                         |
| 24950            | Trip<br>(TB093092)                  | Methylene chloride/4BJ<br>Acetone/7J<br>Carbon disulfide/1J                      | MW-2, MW-3, MW-4, MW-6D                                             |
| 24997            | Trip<br>TB100192                    | Methylene chloride/1BJ<br>1,1,2-Trichloro-1,2,2-trifluoroethane (4.43)/21JN      | MW-5, MW-5 FR (MW-104), MW-14                                       |

See last page for footnotes.

Table D3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| SDG No. | Blank<br>(Lab or Field ID/ File ID) | Compound or TIC (RT) Found/<br>Concentration (ug/L)                                                                                | Associated<br>Ground-Water Samples                |
|---------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 25009   | Trip<br>(TB100292)                  | Methylene chloride/2BJ<br>Acetone/9BJ<br>Unknown (4.49)/7J<br>Octamethylcyclotetrasiloxane (20.04)/5JN<br>C12H12 Isomer (31.55)/8J | MW-11D, MW-1D, MW-1                               |
| 25052   | Trip<br>(TB100592)                  | Methylene chloride/4BJ<br>Acetone/6BJ                                                                                              | MW-12D, MW-7, MW-7 FR (MW-105)                    |
| 25071   | Trip<br>(TB100692)                  | Methylene chloride/1J                                                                                                              | MW-1, MW-10, MW-10D, MW-13D                       |
| 25091   | Trip<br>(TB100792)                  | Methylene chloride/4BJ                                                                                                             | MW-4D, MW-9, MW-9 FR (MW-106), MW-9S,<br>ESSO-TAP |
| 24744   | Field<br>(FB092992)                 | Methylene chloride/4BJ<br>Acetone/6J<br>Unknown (20.03)/6J                                                                         | MW-6R, MW-8                                       |
| 24950   | Field<br>(FB093092)                 | Methylene chloride/4BJ<br>Acetone/8J<br>Carbon disulfide/3J<br>Octamethylcyclotetrasiloxane (20.03)/8JN<br>Unknown (26.13)/6J      | MW-2, MW-3, MW-4, MW-6D                           |
| 24997   | Field<br>(FB100192)                 | Methylene chloride/2BJ<br>Acetone/7BJ<br>Unknown (4.54)/9J                                                                         | MW-5, MW-5 FR (MW-104), MW-14                     |

See last page for footnotes.

Table D3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| SDG No.                      | Blank<br>(Lab or Field ID/ File ID) | Compound or TIC (RT) Found/<br>Concentration (ug/L)                                                          | Associated<br>Ground-Water Samples                                            |
|------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <u>Volatiles (continued)</u> |                                     |                                                                                                              |                                                                               |
| 25052                        | Field<br>(FB100592)                 | Methylene chloride/5BJ<br>Acetone/6BJ                                                                        | MW-12D, MW-7, MW-7 FR (MW-105)                                                |
| 25071                        | Field<br>(FB100692)                 | Methylene chloride/1J<br>Hexane (5.59)/5JN                                                                   | MW-1, MW-10, MW-10D, MW-13D                                                   |
| 25091                        | Field<br>(FB100792)                 | Methylene chloride/5BJ<br>Hexane (5.62)/120JN                                                                | MW-4D, MW-9, MW-9 FR (MW-106)                                                 |
| <u>Semivolatiles</u>         |                                     |                                                                                                              |                                                                               |
| 24744                        | Method<br>(WMB - 01Oct92B/H3261)    | bis(2-Ethylhexyl)phthalate/17<br>1,1'-Sulfonylbis[4-chlorobenzene] (30.58)/6JN                               | MW-6R, MW-8, FB092992                                                         |
| 24950                        | Method<br>(WMB - 05Oct92A/G8631)    | Substituted 1,2-benzenedicarboxylic acid (33.31)/39J                                                         | FB093092, MW-2, MW-3, MW-4, MW-6D, FB100192,<br>MW-5, MW-5 FR (MW-104), MW-14 |
| 24997                        | Method<br>(WMB - 2Oct92A/H3479)     | Unknown amide (35.24)/5J                                                                                     | MW-6D RE                                                                      |
| 25009                        | Method<br>(WMB - 06Oct92B/G8680)    | bis(2-Ethylhexyl)phthalate/1B<br>cis-Terpin hydrate (16.86)/22JN<br>Unknown (17.23)/6J<br>Unknown (29.55)/3J | MW-11D<br>MW-1D                                                               |
| 25052                        | Method<br>(WMB - 07Oct92B/G8691)    | Unknown (15.60)/3J                                                                                           | MW-4D, FB100592, MW-105, MW-12D, MW-7                                         |

See last page for footnotes.

Table D3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| SDG No. | Blank<br>(Lab or Field ID/ File ID) | Compound or TIC (RT) Found/<br>Concentration (ug/L)                                                  | Associated<br>Ground-Water Samples     |
|---------|-------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------|
| 24744   | Field<br>(FB092992)                 | bis(2-Ethylhexyl)phthalate/50                                                                        | MW-6R, MW-8                            |
| 24950   | Field<br>(FB093092)                 | bis(2-Ethylhexyl)phthalate/17                                                                        | MW-6D, MW-2, MW-3, MW-4, MW-6D RE      |
| 24997   | Field<br>(FB100192)                 | bis(2-Ethylhexyl)phthalate/15                                                                        | MW-5, MW-5 FR (MW-104), MW-14, MW-5 DL |
| 25052   | Field<br>(FB100592)                 | bis(2-Ethylhexyl)phthalate/16                                                                        | MW-7, MW-4D, MW-12D                    |
| 25071   | Field<br>(FB100692)                 | bis(2-Ethylhexyl)phthalate/16<br>1,1'-Sulfonylbis[4-chlorobenzene] (30.34)/18JN                      | MW-1, MW-10, MW-10D, MW-13D            |
| 25091   | Field<br>(FB100792)                 | bis(2-Ethylhexyl)phthalate/41<br>1,1'-Sulfonylbis[4-chlorobenzene] (30.33)/3J<br>Unknown (41.88)/21J | MW-9, MW-9S, ESSO-TAP                  |

\* The results for the VOC analysis of MW-7 FR (MW-105) have been reported for MW-7 in the remedial investigation report.

SDG No. Sample delivery group number.

ID Identification.

TIC Tentatively-identified compound.

RT Retention time in minutes.

ug/L Micrograms per liter.

J Result is detected below the reporting limit and/or is an estimated concentration.

B Analyte is detected in the laboratory blank.

N Presumptive evidence to make a tentative identification.

RE Reanalysis.

FR Field replicate of previous sample.

DL Dilution analysis.

tuturi-wp dv/tbld2.wk3

Table D3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter | Sample ID        | Target Compound or TIC (RT)                  | Reported Result (ug/L) | Qualified Result (ug/L) |
|----------------------|------------------|----------------------------------------------|------------------------|-------------------------|
| Volatiles            | MW-8             | Methylene chloride                           | 3 BJ                   | 10 U                    |
|                      | MW-6R            | Methylene chloride                           | 3 BJ                   | 10 U                    |
|                      |                  | Unknown (26.14)                              | 5 J                    | R                       |
|                      | MW-6D            | Methylene chloride                           | 3 BJ                   | 10 U                    |
|                      |                  | Acetone                                      | 12                     | 12 U                    |
|                      | MW-6D RE         | Methylene chloride                           | 2 BJ                   | 10 U                    |
|                      |                  | Acetone                                      | 11 B                   | 11 U                    |
|                      | MW-2             | Methylene chloride                           | 2 BJ                   | 10 U                    |
|                      |                  | Acetone                                      | 6 J                    | 10 U                    |
|                      |                  | Octamethylcyclotetrasiloxane (20.04)         | 6 J                    | R                       |
|                      | MW-4             | Methylene chloride                           | 1 BJ                   | 10 U                    |
|                      |                  | Acetone                                      | 5 BJ                   | 10 U                    |
|                      | MW-3             | Methylene chloride                           | 5 BJ                   | 10 U                    |
|                      | MW-5             | Methylene chloride                           | 160 BJ                 | 500 U                   |
|                      |                  | 1,1,2-Trichloro-1,2,2-trifluoroethane (4.38) | 1100 J                 | R                       |
|                      | MW-5 FR (MW-104) | Methylene chloride                           | 130 BJ                 | 500 U                   |
|                      |                  | 1,1,2-Trichloro-1,2,2-trifluoroethane (4.48) | 550 J                  | R                       |
|                      | MW-14            | Methylene chloride                           | 1 BJ                   | 10 U                    |
|                      |                  | Acetone                                      | 7 BJ                   | 10 U                    |
|                      | MW-1D            | Methylene chloride                           | 4 BJ                   | 20 U                    |
|                      |                  | Acetone                                      | 22 B                   | 22 U                    |



Table D3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter  | Sample ID        | Target Compound or TIC (RT) | Reported Result (ug/L) | Qualified Result (ug/L) |
|-----------------------|------------------|-----------------------------|------------------------|-------------------------|
| Volatiles (continued) | MW-11D           | Methylene chloride          | 1 BJ                   | 10 U                    |
|                       |                  | Acetone                     | 12 B                   | 12 U                    |
|                       | MW-11D RE        | Acetone                     | 8 J                    | 10 U                    |
|                       | MW-12D           | Methylene chloride          | 3 BJ                   | 10 U                    |
|                       |                  | Acetone                     | 11 B                   | 11 U                    |
|                       | MW-7             | Methylene chloride          | 3 BJ                   | 10 U                    |
|                       |                  | Acetone                     | 4 BJ                   | 10 U                    |
|                       | MW-10            | Methylene chloride          | 21 BJ                  | 21 U                    |
|                       | MW-1             | Methylene chloride          | 20 BJ                  | 50 U                    |
|                       | MW-10D           | Methylene chloride          | 28 BJ                  | 50 U                    |
|                       | MW-4D            | Methylene chloride          | 5 BJ                   | 10 U                    |
|                       | MW-9             | Methylene chloride          | 3 BJ                   | 10 U                    |
|                       | MW-9 FR (MW-106) | Methylene chloride          | 5 BJ                   | 10 U                    |
|                       | MW-9S            | Methylene chloride          | 4 BJ                   | 10 U                    |
|                       | MW-9S DL         | Methylene chloride          | 62 DJ                  | 170 U                   |
|                       | ESSO-TAP         | Methylene chloride          | 2 J                    | 10 U                    |

Table D3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter | Sample ID        | Target Compound or TIC (RT)               | Reported Result (ug/L) | Qualified Result (ug/L) |
|----------------------|------------------|-------------------------------------------|------------------------|-------------------------|
| Semivolatiles        | MW-8             | bis(2-Ethylhexyl)phthalate                | 10 B                   | 10 U                    |
|                      | MW-6R            | bis(2-Ethylhexyl)phthalate                | 64 B                   | 64 U                    |
|                      | MW-6D            | bis(2-Ethylhexyl)phthalate                | 5 J                    | 10 U                    |
|                      | MW-6D RE         | bis(2-Ethylhexyl)phthalate                | 6 J                    | 10 U                    |
|                      | MW-2             | bis(2-Ethylhexyl)phthalate                | 11                     | 11 U                    |
|                      | MW-4             | bis(2-Ethylhexyl)phthalate                | 56                     | 56 U                    |
|                      | MW-3             | bis(2-Ethylhexyl)phthalate                | 18                     | 18 U                    |
|                      | MW-5             | bis(2-Ethylhexyl)phthalate                | 22                     | 22 U                    |
|                      | MW-5 DL          | bis(2-Ethylhexyl)phthalate                | 31 DJ                  | 50 U                    |
|                      | MW-5 FR (MW-104) | bis(2-Ethylhexyl)phthalate                | 22                     | 22 U                    |
|                      | MW-14            | bis(2-Ethylhexyl)phthalate                | 7 J                    | 10 U                    |
|                      | MW-11D           | bis(2-Ethylhexyl)phthalate                | 1 BJ                   | 10 U                    |
|                      | MW-12D           | bis(2-Ethylhexyl)phthalate                | 2 J                    | 10 U                    |
|                      | MW-7             | bis(2-Ethylhexyl)phthalate                | 1 J                    | 10 U                    |
|                      | MW-4D            | bis(2-Ethylhexyl)phthalate                | 1 J                    | 10 U                    |
|                      | MW-10            | bis(2-Ethylhexyl)phthalate                | 3 J                    | 10 U                    |
|                      |                  | 1,1'-Sulfonylbis[4-chlorobenzene] (30.34) | 3 J                    | R                       |

Table D3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter      | Sample ID | Target Compound or TIC (RT)              | Reported Result (ug/L) | Qualified Result (ug/L) |
|---------------------------|-----------|------------------------------------------|------------------------|-------------------------|
| Semivolatiles (continued) | MW-10D    | bis(2-Ethylhexyl)phthalate               | 7 J                    | 10 U                    |
|                           |           | 1,1'-Sulfonylbis[4-chlorobenzene](30.31) | 3 J                    | R                       |
|                           | MW-1      | bis(2-Ethylhexyl)phthalate               | 30                     | 30 U                    |
|                           |           | 1,1'-Sulfonylbis[4-chlorobenzene](30.31) | 3 J                    | R                       |
|                           | MW-13D    | bis(2-Ethylhexyl)phthalate               | 23                     | 23 U                    |
|                           |           | 1,1'-Sulfonylbis[4-chlorobenzene](30.33) | 3 J                    | R                       |
|                           | MW-9      | bis(2-Ethylhexyl)phthalate               | 8 J                    | 10 U                    |
|                           | MW-9S     | bis(2-Ethylhexyl)phthalate               | 13                     | 13 U                    |
|                           | ESSO-TAP  | bis(2-Ethylhexyl)phthalate               | 6 J                    | 14 U                    |
|                           |           | 1,1'-Sulfonylbis[4-chlorobenzene](30.33) | 3 J                    | R                       |

ID Identification.  
 TIC Tentatively-identified compound.  
 RT Retention time in minutes.  
 ug/L Micrograms per liter.  
 J Result is detected below the reporting limit and/or is an estimated concentration.  
 U Compound or element analyzed for, but not detected at the corresponding reporting limit.  
 R Sample results are rejected and will not be reported.  
 B Analyte is detected in the laboratory blank.  
 FR Field replicate.  
 RE Reanalysis.  
 DL Dilution analysis.  
 D Analyte identified at a secondary dilution (when qualifier is appended to a sample result).

Table D3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter | Calibration (Initial/Continuing) | Date Analyzed | File ID(s)         | Outliers (RSD or %D)                                                                                         | Associated Samples                                                                                       |
|----------------------|----------------------------------|---------------|--------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <u>Volatiles</u>     |                                  |               |                    |                                                                                                              |                                                                                                          |
|                      | Initial (TCL)                    | 8/3/92        | C0280, C0282-C0285 | 2-Butanone (30.3)                                                                                            | All samples.                                                                                             |
|                      | Initial (non-TCL)                | 10/5/92       | C1405-C1410        | n-Propylbenzene (34.1)                                                                                       | All samples.                                                                                             |
|                      | Continuing (TCL)                 | 10/5/92       | C1404              | Acetone (45.5)<br>2-Butanone (39.9)<br>Bromoform (-28.3)                                                     | MB 05OCT92-A, TB092992, FB092992, MW-6R, MW-8, MB 05OCT92-A, TB093092, FB093092, MW-6D, MW-2, MW-4, MW-3 |
|                      | Continuing (TCL)                 | 10/6/92       | C1424              | Acetone (41.7)<br>2-Butanone (34.7)<br>Bromoform (-42.2)                                                     | MB 06OCT92-A, TB100292, TB100192, FB100192, MW-5, MW-5 FR (MW-104), MW-14, MW-1D, MW-11D, MW-6D RE       |
|                      | Continuing (TCL)                 | 10/29/92      | C1822              | Vinyl chloride (-31.2)<br>Acetone (32.8)<br>4-Methyl-2-pentanone (26.5)<br>2-Hexanone (31.3)                 | MB 29OCT92-A, MW-11D RE, TB100292 RE, MW-11D RE                                                          |
|                      | Continuing (TCL)                 | 10/7/92       | C1444              | 2-Butanone (32.4)<br>Bromoform (-44.0)                                                                       | MW-12D, MW-7 FR (MW-105), TB100592, FB100592, MW 07OCT92-A                                               |
|                      | Continuing (TCL)                 | 10/09/92      | C1467              | Acetone (31.9)<br>2-Butanone (45.1)<br>Bromoform (-36.1)<br>4-Methyl-2-pentanone (25.1)<br>2-Hexanone (30.2) | MW-10, MW-10D, MW-1, TB100792, FB100792, MW-4D, MW-9, MW-9S, MW-9 FR (MW-106)                            |

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Table D3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter         | Calibration (Initial/Continuing) | Date Analyzed | File ID(s) | Outliers (RSD or %D)                                                                                                                                                | Associated Samples                                                          |
|------------------------------|----------------------------------|---------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <u>Volatiles (Continued)</u> |                                  |               |            |                                                                                                                                                                     |                                                                             |
|                              | Continuing (TCL)                 | 10/16/92      | C1567      | Vinyl chloride (-25.7)<br>Methylene chloride (26.5)<br>Acetone (33.6)<br>2-Butanone (35.2)<br>Bromoform (-28.3)<br>4-Methyl-2-pentanone (27.6)<br>2-Hexanone (30.2) | MB 16OCT92-D, MW-5 RE, MW-14 RE,<br>FB100692 RE, TB100692, MW-13D, ESSO-TAP |
|                              | Continuing (TCL)                 | 10/17/92      | C1586      | Methylene chloride (29.5)<br>Acetone (46.0)<br>2-Butanone (43.8)<br>Bromoform (-26.2)<br>4-Methyl-2-pentanone (27.9)<br>2-Hexanone (31.9)                           | MW-9 DL, MW-9S DL,<br>MW-9 FR DL (MW-106 DL)                                |
| <u>Semivolatiles</u>         |                                  |               |            |                                                                                                                                                                     |                                                                             |
|                              | Continuing (TCL)                 | 10/08/92      | H3260      | 4-Chloroaniline (40.8)<br>3-Nitroaniline (54.7)<br>2,4-Dinitrophenol (25.2)<br>4-Nitrophenol (28.6)<br>4-Nitroaniline (29.6)<br>Benzo(k)fluoranthene (-31.9)        | WMB-01OCT92B                                                                |
|                              | Continuing (TCL)                 | 10/15/92      | H3384      | Pentachlorophenol (31.6)                                                                                                                                            | MW-6R, MW-8                                                                 |

See last page for footnotes.

Table D3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter             | Calibration (Initial/Continuing) | Date Analyzed | File ID(s) | Outliers (RSD or %D)                                                                                                                                                                                              | Associated Samples            |
|----------------------------------|----------------------------------|---------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| <u>Semivolatiles (Continued)</u> |                                  |               |            |                                                                                                                                                                                                                   |                               |
|                                  | Continuing (TCL)                 | 10/16/92      | H3399      | Hexachlorobutadiene (-28.3)<br>4-Nitrophenol (38.5)<br>Pentachlorophenol (36.3)<br>Butylbenzylphthalate (31.1)<br>bis(2-Ethylhexyl)phthalate (30.3)<br>Di-n-octylphthalate (33.3)<br>2,4,6-Tribromophenol (-42.0) | FB092992                      |
|                                  | Continuing (TCL)                 | 10/16/92      | G8630      | Butylbenzylphthalate (-33.4)<br>bis(2-Ethylhexyl)phthalate (-28.2)<br>Di-n-octylphthalate (-44.9)<br>2,4,6-Tribromophenol (37.5)                                                                                  | WMB-05OCT92A                  |
|                                  | Continuing (TCL)                 | 10/18/92      | G8655      | 2,2'-oxybis(1-Chloropropane) (40.4)<br>Hexachlorobenzene (28.1)<br>Butylbenzylphthalate (-37.7)<br>bis(2-Ethylhexyl)phthalate (-38.4)<br>Di-n-octylphthalate (-49.8)<br>2,4,6-Tribromophenol (38.2)               | MW-5, MW-14, MW-5 FR (MW-104) |
|                                  | Continuing (TCL)                 | 10/19/92      | G8672      | Butylbenzylphthalate (-33.1)<br>bis(2-Ethylhexyl)phthalate (-26.9)<br>Di-n-octylphthalate (-37.7)                                                                                                                 | MW-5 DL                       |
|                                  | Continuing (TCL)                 | 10/22/92      | H3458      | 2,2'-oxybis(1-Chloropropane) (-30.9)<br>2,4-Dinitrophenol (42.6)<br>3,3'-Dichlorobenzidine (-27.3)<br>Di-n-octylphthalate (28.7)<br>2,4,6-Tribromophenol (-46.1)                                                  | MW-6D RE                      |

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Table D3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter             | Calibration (Initial/Continuing) | Date Analyzed | File ID(s) | Outliers (RSD or %D)                                                                                                                                | Associated Samples                       |
|----------------------------------|----------------------------------|---------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <u>Semivolatiles (Continued)</u> |                                  |               |            |                                                                                                                                                     |                                          |
|                                  | Continuing (TCL)                 | 10/23/92      | H3477      | 2,2'-oxybis(1-Chloropropane) (-40.5)<br>Pentachlorophenol (25.6)<br>2,4,6-Tribromophenol (-26.9)                                                    | WMB-20OCT92A                             |
|                                  | Continuing (TCL)                 | 10/20/92      | G8686      | 2,4-Dinitrophenol (37.2)<br>Pentachlorophenol (37.3)<br>Di-n-octylphthalate (-30.8)<br>Dibenz(a,h)anthracene (-29.0)<br>2,4,6-Tribromophenol (40.4) | MW-5 FR DL (MW-104 DL)                   |
|                                  | Continuing (TCL)                 | 10/21/92      | G8703      | Pentachlorophenol (26.9)<br>2,4,6-Tribromophenol (27.9)                                                                                             | WMB-10OCT92A                             |
|                                  | Continuing (TCL)                 | 10/22/92      | G8719      | Hexachloroethane (-29.6)<br>4-Nitrophenol (-28.5)<br>Butylbenzylphthalate (-26.9)<br>Di-n-octylphthalate (-28.5)                                    | MW-10, MW-10D, MW-1, MW-13D,<br>FB100692 |

|     |                                                                                                                                    |
|-----|------------------------------------------------------------------------------------------------------------------------------------|
| ID  | Identification.                                                                                                                    |
| RSD | Relative standard deviation expressed as a percentage.                                                                             |
| %D  | Percent difference.                                                                                                                |
| TCL | Target compound list of the U.S. Environmental Protection Agency March 1990 organic routine analytical services statement of work. |
| FR  | Field replicate of previous sample.                                                                                                |
| DL  | Dilution analysis.                                                                                                                 |
| RE  | Reanalysis.                                                                                                                        |
| MB  | Method blank/numerical suffix denotes analysis date and batch ID.                                                                  |
| WMB | Water method blank for aqueous semivolatiles extraction; numerical suffix denotes analysis date and batch ID.                      |

Table D3-6. Summary of Matrix Spike and Matrix Spike Duplicate Outliers for Ground-Water Samples Collected September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

| Analytical Parameter | Sample ID | Accuracy                |                       |         |          |
|----------------------|-----------|-------------------------|-----------------------|---------|----------|
|                      |           | Compound                | Acceptance Range (%R) | MS (%R) | MSD (%R) |
| Volatiles            | MW-11 D   | 1,1-Dichloroethene      | 61 to 145             | 55      | -        |
|                      |           | Toluene                 | 76 to 125             | 67      | 75       |
| Semivolatiles        | MW-11 D   | Phenol                  | 12 to 110             | 1       | 1        |
|                      |           | 2-Chlorophenol          | 27 to 123             | 4       | 5        |
|                      |           | 4-Chloro-3-methylphenol | 23 to 97              | 1       | 1        |
|                      |           | Acenaphthene            | 46 to 118             | 2       | 2        |
|                      |           | 2,4-Dinitrotoluene      | 24 to 96              | -       | 99       |
|                      |           | Pentachlorophenol       | 9 to 103              | -       | 108      |
|                      |           | Pyrene                  | 26 to 127             | 4       | 5        |

ID Identification.  
 %R Percent recovery.  
 MS Matrix spike.  
 MSD Matrix spike duplicate.  
 - No outlier found.

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